SAMPLING AND ANALYSIS PLAN

Big Laramie and Little Laramie Rivers

Prepared By

Tony Hoch, Laramie Rivers Conservation District

Project Sponsor

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April 2014

Reviewed and Approved by:

Jennifer Zygmunt — Date
Wyoming Department of Environmental Quality

Nancy Bath Chairman — Date
Laramie Rivers Conservation District

Tony Hoch, Director (primary sampler) — Date
Laramie Rivers Conservation District

Martin Curry, Resource Specialist (secondary sampler) — Date
Laramie Rivers Conservation District

Theresa Jarvis, Analytical Services Laboratory — Date
Wyoming Department of Agriculture

INTRODUCTION

This Sampling and Analysis Plan (SAP) is intended as a field guide for personnel who will be conducting the water quality monitoring activities for this project, as a QA/QC plan, and as a data management plan. This document also meets the requirements of the Wyoming Environmental Quality Act, Wyoming Statute 35-11-302, known as the Credible Data Law.

Samples are collected using the methods, procedures and/or protocols in the Natural Resources Conservation Service *National Handbook of Water Quality Monitoring*, May 1998, and the Wyoming Department of Environmental Quality, Water Quality Division, Watershed Program *Manual of Standard Operating Procedures for Sample Collection and Analysis*, November 2011 incorporated by reference in this Sampling and Analysis Plan.

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Background:

In the Spring of 2011 reaches of the Big Laramie River near Woods Landing and Bosler did not meet their designated use of primary contact recreation due to elevated levels of *E. coli* bacteria. In addition, a reach of the Little Laramie River from Mandel Lane to the old rail bridge near Millbrook Lane did not meet its designated use of primary contact recreation due to elevated levels of *E. coli* bacteria in the Spring of 2011. Elevated levels of bacteria in the Little Laramie and Big Laramie Rivers have resulted in these water bodies not meeting water quality standards for contact recreational water uses as defined by the Wyoming Department of Environmental Quality (DEQ) and reported in the 2012 Integrated 305(b) Report and 303(d) list of impaired waters in Wyoming.

Purpose Statement: This water quality monitoring plan has been developed by the Laramie Rivers Conservation District (LRCD). The purpose of this plan is to define the objectives and protocols for water quality sampling in 2013 and subsequent years, which may be necessary to address bacterial water quality issues in the Upper Laramie River drainage, should they persist. Since the samples taken in 2011, which led to the 2012 "listing" were taken during extraordinary high water conditions, LRCD is choosing to continue sampling to see if the problem persists if sampling is conducted only when the streams are confined to their respective channels.

Credible Data Legislation: Monitoring under this SAP is in accordance with Wyoming Statute (W.S.) 35-11-103(b) and (c) and W.S. 35-11-302, commonly referred to as Credible Data Law.

> §35-11-103. " 'Credible Data' means scientifically valid chemical, physical, and biological monitoring data collected under an acceptable sampling and analysis plan, including quality control, quality assurance procedures and available historical data."
>
> §35-11-302. "The rules, regulations and standards shall prescribe: The use of credible data in determining water body's attainment of designated uses. The exception to the use of credible data may be in instances where numeric standards are exceeded, or in ephemeral or intermittent water bodies where chemical or biological sampling is not practical or feasible."

Corrective Actions: The Director will work cooperatively with the Board of Supervisors to implement corrective actions when they become necessary. The LRCD Board of Supervisors has the authority to make decisions regarding the sampling schedule, sample locations, choice of laboratories, parameters, methods, etc. Decisions made by the LRCD Board of Supervisors will be recorded in the meeting minutes. Corrective actions will be summarized in the annual data report, which is submitted to the Wyoming Department of Environmental Quality.

If the primary sampler is unable to collect a scheduled sample, he will attempt to collect the sample on the next scheduled sampling day. If the primary sampler knows in advance that he will be unable to collect a scheduled sample, he will contact the secondary samplers and arrange for the sample to be taken in his absence.

SAMPLING

Sample Objectives: There are two sampling objectives for this Sampling and Analysis Plan. Objectives are reviewed each year and they are updated based on previous data results.

Objective 1: Collect samples for *E. coli* concentrations at the designated sites on the Big Laramie and Little Laramie that exceeded numeric water quality criteria in 2011 as reported by the Wyoming Department of Environmental Quality. Also, continue to monitor one site on the North Fork of the Laramie River, inside the Medicine Bow National Forest in order to maintain the continuity of data from there.

Objective 2: Maintain continuity of past dataset, with respect to measuring water temperature, air temperature, pH and dissolved oxygen on site, and recording discharge for sites 1.1, 1.6, and 2.2 which have State Engineer Office gauging stations nearby.

Sampling Design: Grab samples will be collected at two locations on the Little Laramie River, one location on the North Fork of the Little Laramie River, and two locations on the Big Laramie River to obtain bacterial trend data. The locations are all designated locations that have been monitored bi-annually by LRCD since 1999.

Sample Frequency: Samples will be collected weekly beginning early-May through the end of September 2014. Each sample period will contain at least 5 samples in 60 days so that geometric means for E. Coli can be calculated per Section 27, Chapter 1 of the Water Quality Division Rules and Regulations (WYDEQ, 2013). To meet "Wyoming's Methods for Determining Surface Water Quality Condition and TMDL Prioritization" (2014); each of the five samples within the sampling period will be separated by a minimum of 10 days. If more than five samples are collected, samples within ten day periods will be averaged before being used to calculate the 60 day geometric mean. In an effort to represent overall conditions during the sample period, rather than an individual event, samples will be taken weekly and not concentrated to shorter periods.

Sample Duration: Weekly for each site, May through September.

Responsibility: Laramie Rivers Conservation District will conduct all sampling.

Sampling Personnel and Training: Tony Hoch will serve as the primary sampler for this project. In the event that Tony is unable to collect samples, Martin Curry will collect the necessary samples.

Table A. Sampling Personnel

Sampler Name & Organization	Type of Sampler	Type of Training	Date of Last Training	Previous Sampling Experience
Tony Hoch, Laramie Rivers Conservation District	Primary Sampler	PhD Aqueous Geochemistry; 2 yrs USGS Water Resources Division; 3.5 yrs professor for various water quality classes. NRCS water quality training through UW / WACD	2012	Sampling for LRCD 2003-2013. Field studies at USGS and U. of Wyoming 1993-2002
Martin Curry, Laramie	Secondary	B.A. Watershed Mgmt.	2012	Sampled with

Rivers Conservation District	Sampler	NRCS water quality training through NRCS/UW / WACD		Tony Hoch at least once annually since 2007

Sampling Locations and ID Codes: This SAP includes two locations on the Little Laramie River, one location on the North Fork, Little Laramie, and two locations on the Big Laramie River. A map of the sampling locations is included in Appendix C.

Table B. Sampling Locations

Sample Site ID	Latitude / Longitude Coordinates	HUC Code	Type of Land Ownership	Sample Site Location Narrative
N. Fork Little Laramie @ Corner Mountain	41°20.266'/ 106°9.845'	10180011	USFS	Site 2.0 - Corner Mountain
Little Laramie @ Millbrook Lane	41°18.326'/ 105°58.955'	10180011	State Land Board	Site 2.2 - Millbrook Lane
Little Laramie @ Mandell Lane	41°23'243/ 105°54.120'	10180011	Private	Site 2.3 - Mandell Lane
Big Laramie @ Woods Landing	41°6.631'/ 106°0.708'	10180010	Private	Site 1.1 Woods Landing
Big Laramie @ Bosler	41°35.482'/ 105°41.422'	10180010	Private	Site 1.6 Bosler

Parameters, Units, Analytical Methods, Holding Times: The primary water quality parameter collected addressed under this field SAP is *E. coli* bacteria. Additional parameters including pH, conductivity, temperature, dissolved oxygen and discharge from nearby gauges are also collected as supplemental data in the field, to maintain continuity in the dataset we started in 1999. E. Coli numbers are actually measured in the Wyoming Department of Agriculture's State Analytical Lab, along with pH conductivity, total dissolved solids, total suspended solids and turbidity as listed below.

Photographs: Two photographs are taken each time a water sample is taken: one looking across the sampling location and the stream, and one looking across the sampling location at the nearby downstream bridge for a qualitative gauging reference. Samples are downloaded weekly into a folder for the 2014 season for example, in individual folders marked by date. Individual files are labeled by sampling site.

Table C. Parameters and Sample Collection Methods				
Field				
Parameter	**Reporting Units**	**Analytical Method**	**Preservative**	**Holding Time**
Sample E. coli bacteria in WhirlPak	Sampling only for CFU Colony forming units per 100ml	n/a	Ice to keep samples between 1° and 4°C until processing	6 hours
Temperature Conductivity pH Dissolved Oxygen	°F µS/cm - mg/L	YSI 650MDS meter with YSI 600R sonde	None	Instant
At the Wyoming State Analytical Lab, Standard Methods*				
E. coli bacteria	Colony forming units per 100ml	9223, Colilert Quanti Tray 2000		
pH	-	4500-H B	none	
conductivity	µS/cm	2510B	none	
Total Dissolved Solids	mg/L	2540C	none	
Total Suspended Solids	mg/L	2540D	none	
Turbidity	NTU	2130B	none	

Standard Methods for the Examination of Water and Waste Water, 19th Edition, APHA, AWWA, and WEF, Washington DC, 1995

Sampling Schedule: Samples will be collected weekly between early-May through the end of September 2014.

Table D. Proposed Field Sampling Schedule		
Sample Location (ID Code)	**Proposed Sampling Dates**	**Parameters to be Sampled/Measured in Field under this SAP**
All sites	Weekly beginning May 5 through September 30	E. Coli sampling only, pH, conductivity, temperature,dissolved oxygen.
		Parameters to be measured by the Wyoming State Analytical Lab
All sites	Weekly beginning May 5 through September 30	E. coli analyses, pH, Conductivity, TDS, TSS, Turbidity

Safety: The sampler will carry a cell phone so that help can be reached in the event of an emergency. The sampler will use best judgment regarding the safety of the sampling situation. In the event of a flash flood, the sampler will not enter flooded areas or a stream with fast moving water. The sampler will not attempt to sample from the channel if the stream is higher than bank full. The safety level of any given situation is solely left to the sampler's discretion. If a sample is unable to be collected due to safety concerns, the sampler will attempt to collect a sample on the next available sampling day. The sampler will make a record in the sampling field book if a sample is unable to be collected due to safety reasons. The sampler will utilize sanitary practices and carry disposable disinfecting wipes to keep surfaces clean.

Nearest Hospital:
Ivinson Memorial Hospital
255 North 30th Street
Laramie, WY
(307) 742-2141

Sample Labeling: Samples are labeled according to the requirements of the WDA Analytical Services Laboratory and will include the sampling location ID code, time, and date, organization and name of sampler. An example of a sample label has been included in Appendix B.

Agency Contacts: Contact information is provided below:

Table E. Agency Contact Information

Name and Title	Agency	Contact Info
Tony Hoch Director	Laramie Rivers Conservation District	5015 Stone Rd. Laramie, WY 82070 Phone: (307) 721-0072 FAX: (307) 745-6764 E-mail: tony.hoch@lrcd.net
Martin Curry Resource Specialist	Laramie Rivers Conservation District	5015 Stone Rd. Laramie, WY 82070 Phone: (307) 721-0072 FAX: (307) 745-6764 E-mail: martin.curry@lrcd.net

Sampling Methods Reference: This Sampling and Analysis Plan utilizes the Wyoming DEQ, Water Quality Division, Watershed Program *Manual of Standard Operating Procedures for Sample Collection and Analysis*, 2011. The SOP references are listed below. Copies of the applicable Standard Operating Procedures will be kept in a folder in the water sampling truck for reference while in the field.

Table F. Standard Operating Procedures References		
Topic	**Title**	**SOP Pages**
E. coli	***Escherichia coli* & Total Coliform Bacteria** Colilert®-Defined Enzyme Substrate Method	63-68
Whirl-Pak™ Bacteria Sampling	**Coliform Bacteria Sampling Procedure**	pp. 59-62
Geometric Mean	**Geometric Mean, Calculating and Using**	75-76
Conductivity	**Conductance, Specific (Conductivity)**	160
pH	**pH**	170-171
Temperature	**Temperature, Water**	176
Dissolved Oxygen	**Dissolved Oxygen (D.O)**	162
TSS	**Total Suspended Solids**	177
Turbidity	**Turbidity**	178
Blanks	**Blanks**	191-193
Duplicates	**Duplicates**	222-223
Sample Collection	**Sample Collection**	245-246
Temperature Blank	**Temperature Blank**	275
Quality Control	**Quality Control Measures, Summary of**	239-242

QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

Field Log Books/Data Sheets: Field notebooks will be kept by LRCD Director and remain in the district's office when not in use. Name of sampler, calibration information, field conditions, field observations, sampling location and time information, working condition of equipment and narrative information concerning any special circumstances or corrective action will be recorded in the field notebooks.

Calibration Standards: Equipment will be calibrated according to the equipment manuals and the DEQ Standard Operating Procedures. Calibration is conducted in the office by the sampler prior to sample collection. Standards are purchased for pH and conductivity on an annual basis in order to not exceed expiration dates.

Duplicates and Blanks: One duplicate sample will be taken from a different site during every weekly sampling trip. One blank (distilled water) will be taken after the last field sample at the end of every sampling trip (before driving to the lab). This blank will serve multiple purposes: as a trip blank, since it will be placed in the cooler with the field unknowns, as a check for the performance of the D.O. meter (should be about 7 mg/L D.O. at room temperature and about 7000' elevation, as a check for the performance of the conductivity meter (~0 µS/cm) and as part of a procedure to thoroughly rinse the YSI sonde after the field day is completed.

Chain of Custody: Forms provided by the WDA Analytical Services Laboratory serve as chain of custody forms. The forms include sample ID, date, time and the signature of the sampler. Employees of the lab record the date and time when the sample is received and assign the sample a lab ID. Analysts at the lab record the time at which procedures are started and the time when the sample is read. The laboratory manager signs off on the completed data sheet. Hard copies

of these records remain in the laboratory office and a copy is sent electronically to the LRCD office. These records are kept electronically and backed up weekly in addition to printed copies that are kept in a notebook at the LRCD office.

Equipment/Equipment Maintenance and Calibration and Logs: The calibration of the YSI 600 Meter (SN 03H1218 AB) will be conducted using standard pH 7 and pH 10 buffer solutions for the two point calibration method on a weekly basis. Specific conductivity will be calibrated using a standard solution (1413 µS/cm) on a weekly basis. Dissolved oxygen is calibrated weekly based on internal temperature and barometric pressure sensors in the instrument with the sensor in water-saturated air. Calibration standards are usually purchased from Ben Meadows located in Janesville, Wisconsin (800-241-6401). All equipment will be calibrated according to the manufacturers' recommendations. A calibration log will be kept in the LRCD office to record calibrations completed. The log will include the dates of calibration, calibration solutions, expiration dates and initials of the person performing the calibrations, copies of the equipment manuals, and ordering information. Manuals will also be kept with the equipment for field use. Equipment manual references are included in Appendix E.

Table G. Equipment Calibration and Maintenance

Item	Calibration	Maintenance	SOP or Method
Field pH, D.O., Conductivity*	Prior to weekly monitoring: pH 7 and pH 10 standards for pH; 1413 µS/cm conductivity solution; D.O. relative to current barometric pressure.	Replace D.O. membrane and KCl as calibration performance requires; replace permeable pH electrode as calibration performance requires	YSI MDS 650 Operations Manual for all field parameters.

**This instrument does not require calibration for temperature.*

Data Verification and Validation: The LRCD Director will perform the following data verification and validation procedures:

- Review the data to make sure all forms were filled out correctly and completely, including Field Log Books, Laboratory Data Sheets, Field Data Sheets, and equipment calibration logs.
- Verify holding times, techniques, duplicates and blanks were conducted according to the methods, SOPs and this SAP.
- Examine the raw data and verify geometric mean calculations by reviewing spreadsheet formulas utilized for geometric mean calculation.
- Examine data to verify that raw data is accurately transcribed for data management and storage.

The LRCD Director will review the water quality data at the end of each sampling season to look for consistency, completeness and accuracy of the data records. After the LRCD Director and Resource Specialist have reviewed the data, an annual data report will be written to include a summary of the data and to serve as the data verification and validation report. LRCD will

summary of the data and to serve as the data verification and validation report. LRCD will request third party data reviews from the WDEQ QA/QC Officer as needed. Our data quality objective for E. coli is a relative percent difference in duplicates of <50% in order for the data to be qualified. If a bacteria blank shows contamination, all samples collected that day will be considered suspect and these data will not be used in to calculate geometric means.

Field Quality Control (QC) Samples: Blanks and duplicates will be collected for Quality Control purposes and will be conducted according to the SOPs for Blanks, Duplicates and Temperature Blanks.

Table H. Quality Control Samples

Sample Site ID	Type of QC Sample	Number or % of QC Sample	QC Sample Schedule
Sample Site ID followed by "DUP"	Duplicate	1 per trip or 10%	Weekly
Field Blank	Field Blank	1 per trip	Weekly
Temperature	Temperature Blank	1 per trip	Weekly
Lab Blank	Lab Blank	1 per trip	Weekly

Sampling Methods: Bacterial samples (*E. coli*) will be collected using sterile Whirl-Pak™ bags, chilled and submitted to the Wyoming Department of Agriculture (WDA) Analytical Services Laboratory according to WYDEQ SOP Manual for Coliform Bacteria Sampling Procedures (WYDEQ, 2011, pp59-62. Samples are labeled in the field at the sampling location. Sample identification consists of site name, time collected and date of collection. Collection times, collector's name and chain of custody information are recorded on the laboratory data sheet. Samples are taken from the middle of the moving stream just below the surface when the stream is safe to wade (typically less than about 20" deep maximum). The Whirl-Pak™ samples are taken immediately after breaking the sterile seal. Samples are then placed in a cooler with ice, maintained at 1° to 4°C, and delivered to the lab within 6 hours. One field blank and one duplicate will be collected per sampling trip. One lab blank will be analyzed by the Dept. of Agriculture Analytical Lab.

E coli samples will be analyzed using the Colilert® method. Colilert®, developed by IDEXX Laboratories, Inc., is an enzyme substrate containing nutrient indicators that simultaneously detects both total coliforms and *E. coli* in water. IDEXX's multi-well quantification procedures (Quanti-Tray® and Quanti-Tray®/2000) estimate bacterial density according to the same probability model of the Most Probable Number (MPN). The Colilert® method of E. coli analysis will be administered by the WDA Analytical Services Laboratory according to procedures specific to the Colilert® method.

Water temperature, conductivity, D.O. and pH will be measured using the YSI 650MDS multi-meter with YSI 600R multi-electrode sonde. Staff gages are installed and maintained near sites

(SEO) and daily stream flows for these sites may be obtained by calling the SEO 307-742-7657. A Water Quality Field Sampling Record will be used to record chemical data. A copy of the Field Sampling Record is included in Appendix A.

Samples for TDS, TSS, and Turbidity are taken in one 250mL bottle and one 1L bottle provided by the Wyoming State Analytical Lab. These parameters, as well as pH and conductivity, are measured at the lab after they are delivered by LRCD staff. Procedures for these specific analyses are maintained by the Lab.

Assessment and Response Actions: For bacterial data, the LRCD Director will review data sheets received from the lab to verify that holding times do not exceed 6 hours and that all data fields are completed. The district will work cooperatively with the lab to verify that requirements are met. In accordance with Chapter 1 of the Wyoming Water Quality Rules and Regulations (2013) and Wyoming's Methods for Determining Surface Water Quality Condition and TMDL Prioritization (2014), LRCD will calculate geometric means for each site using a minimum of 5 samples over a 60 day period. Each of the 5 samples will be a minimum of 10 days apart; if more than five samples are collected, samples within ten day periods will be averaged before being used to calculate the 60 day geometric mean. The WYDEQ SOP Manual for Calculating and Using Geometric Means (WYDEQ, 2011, pp 75-76, will be used for geometric mean calculations. The calculation of geometric means during the sampling season will be considered provisional until all data are reviewed and a final data report is written after the monitoring season is completed. If chemical data are questionable or values seem odd, instruments will be recalibrated and standards will be checked for accuracy.

If any major problems are identified during the length of this sampling plan, the district will request technical assistance from the Wyoming DEQ. The LRCD Director will request annual QA/QC reviews from the Wyoming DEQ QA/QC officer. If requested, the LRCD will work with the Wyoming DEQ QA/QC officer or other third-party entity to complete a field audit.

LABORATORIES

Laboratory QA/QC Plans: The Wyoming Department of Agriculture Analytical Services Laboratory has provided LRCD with a copy of their Quality Assurance Plan (QAP) for both chemical and microbiological analysis of water. The QAP has been reviewed by the sampler and is stored in the LRCD Director's office with a copy of each Sampling and Analysis Plan.

Contract Laboratories:
Wyoming Department of Agriculture (WDA) Analytical Services Laboratory
1174 Snowy Range Road
Laramie, WY 82070
Phone: (307) 742-2984 E-mail: aslab@wyo.gov

Laboratory Results: WDA Lab scans the lab data sheets and e-mails the file to LRCD. The original data sheets are kept by the WDA Lab. LRCD reviews the electronic data sheets, print hard copies for files and stores an electronic copy on the LRCD network.

DATA

Data Entry: The LRCD Director will utilize the electronic lab sheets to enter data into Excel spreadsheets for calculating geometric mean data.

Data Archiving: Data will be maintained and kept on file at Laramie Rivers Conservation 5015 Stone Rd., Laramie WY 82070. LRCD will provide copies of all data to the Wyoming Department of Environmental Quality after completion of the 2014 sampling season. Data will be made available to any interested party upon request as soon as the internal QA/QC review has been conducted. Data are identified as provisional, until analysis and reporting are completed. Below are the agency contacts for sharing data:

Tony Hoch, Director
Laramie Rivers Conservation District
5015 Stone Rd. Road
Laramie, WY 82070
Phone: (307) 721-0072
FAX: (307) 745-6764
E-mail: tony.hoch@lrcd.net

Table I. Data Archiving

Data Item	Data Format	Backup Copy and Format	Location	Retention Time
Laboratory Data Sheets	Electronic Paper	.pdf	Laramie Rivers CD	Permanent
Equipment Calibration Logs	Paper	None	Laramie Rivers CD	Permanent
Field Data Sheets	Electronic Paper	.pdf	Laramie Rivers CD	Permanent
Field Log Books	Paper	None	Laramie Rivers CD	Permanent
Annual Data Reports	Electronic Paper	Word, Excel	Laramie Rivers CD	Permanent
Photographs	Electronic	.jpg, Multiple drive locations	Laramie Rivers CD	Permanent

Data Analysis: Data analysis will involve calculation of geometric means according to the WYDEQ SOP Manual for Sample Collection and Analysis. When duplicate samples are taken, the arithmetic mean of those samples will be used as the data point for that sample. The detection limit using Colilert is <1 cfu/100ml. When data results in <1 cfu/100ml, a value of 1 will be used for calculating the geometric mean. Analysis and reports will be completed after the 2014 sampling season.

REPORTS

Annual Data Report: An annual data report is completed by the LRCD Director at the end of the sampling season to summarize the water quality data collected and to serve as a method for sharing the data with involved agencies, land owners and the general public. The annual data report includes raw data, calculated geometric means, narrative of the water quality results, and a

brief summary of the monitoring efforts. This report will include an evaluation of data with historic or expected data. This report is not a required document, but it has proven to be an effective way to summarize water quality data within the conservation district and share the information with external parties.

Final Report: This sampling project is not funded by a Section 319 grant and will not require a final report. Annual data reports will be used to communicate data results to interested parties.

REFERENCES

WDEQ/WQD. 2011. Manual of Standard Operating Procedures for Sample Collection and Analysis. Wyoming Department of Environmental Quality, Water Quality Division, Watershed Program, Cheyenne, WY.

WDEQ/WQD. 2013. Water Quality Rules and Regulations, Chapter 1, Wyoming Surface Water Quality Standards

YSI 650 MDS Multiparameter Display System Operations Manual, August 2001

Appendix A-1

Field Data Sheet + Chemical Custody Form

App-A

WYOMING DEPARTMENT OF AGRICULTURE
ANALYTICAL SERVICES
1174 Snowy Range Road
Telephone: (307)-742-2984 Laramie, WY 82070

E-mail: aslab@missc.state.wy.us
Internet: http://wyagric.state.wy.us/aslab/aslab.htm

SURFACE WATER COLLECTION & OFFICIAL ANALYSIS REPORT

Laramie Rivers Conservation Dist.
c/o Anthony R. Hoch
5015 Stone Rd.
Laramie, WY 82070

Phone: 307-721-0072 FAX: 307-745-6764
e-mail: tony-hoch@wy.nacdnet.net

LAB No:

D/T REC: **BY:**

Temperataure of the Control °C **BY:**

Date Completed:

Comments

VOSR $25.00 per Sample

E. Coli Data

Start Date/Time:
Date/Time Read:
Analyzed By:

FIELD PARAMETER	UNITS	Sample Site Identification 1.1			
Date Collected		073112			
Time Collected		0920			
Discharge	CFS	49			
Temperature	F	60-90			
pH	Units	8.49			
Conductivity	umhos/cm	304			
Dissolved Oxygen	mg/L	8.00			
LAB RESULTS					
E. Coli	per 100 ml				
Turbidity	NTU				
TSS	mg/L				
TDS (ROE 180° C)	mg/L				
pH	Units				
Specific Conductance	umhos/cm				

Elect. File: LAR RIV CD04

I hereby certify the above was analyzed by myself or my assistant.

Section Supervisor

Laboratory Manager

July 31, 2012

Calibration & Maintenance

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.

* new glass electrode on pH meter

- calibrate conductivity 1413 µs/cm ✓

pH 7 = -29.9 mV ✓

pH 10 = -186.0 mV ✓

calibrate D.O. meter P = 590.8 torr

% D.O = 77.7 D.O. change 59.4 Gain = 0.88434

SEO 1877 1876 #244900

Big Laramie Below PC 49 cfs] = Woods Ldg

PC —

Fillmore 29 cfs

Bosler 27 cfs

1.1-0920-073112 Woods Landing

T 60.90

pH 8.49

cond 304 µs/cm

D.O. 8.00 mg/L

Air T 72 F

Sunny

calm

Q = 49 cfs

2.0-1015-073112 Corner Mtn

T 52.23 F

pH 8.57

cond 147 µs/cm

D.O. 8.68 mg/L

Air T 68F

Sunny

Light Breeze

Flat Tire! on 130 by L. Laramie Bridge 12

2.2-1105-073112 Millbrook Lane

T 63.55 F

pH 8.71

cond 193 µs/cm

D.O. 7.67 mg/L

Air T 76 F

Sunny

Light Breeze

Q = 29 cfs

2.3-1135-073112 Marbleh Lane

2.3-1135-073112 Dup

T 67.59 F

pH 8.91

cond 198 µs/cm

D.O. 7.98 mg/L

Air T 75 F

Sunny

Breezy

1.6-1255-073112 Bosler

T 71.69 F

pH 9.33

cond 947 µs/cm

D.O. 8.13 mg/L

Air T 78 F

P/sunny

breezy

Q = 27 cfs

Blank-1310-073112

T 72.34

pH 7.91

cond

D.O. 6.80

To lab @ 2:00

Field Note book + YSI Calibration and MainTenance Log

Appendix A:2

Tony Hoch Cell = 760-9386

SEO River 742-7657

Laramie Rivers Conservation District

Water Quality Field Book and calibration log Book 7

June 2012 →

Used with YSI 650 MDS meter
SN# 03H1218 AB

+ YSI 600R Sonde
SN 98J0542 AL
— for pH, D.O., conductivity, Temperature

Tony Hoch
Director
Helping you protect soil, water, wildlife and our way of life

Laramie Rivers Conservation District

5015 Stone Road
Laramie, WY 82070
307-721-0072 Fax: 307-745-6764
tony.hoch@wy.nacdnet.net
www.lrcd.net

Req. 1318-65

Appendix A-3

3616 (App-A)

Appendix B

RL-PAK. STAND-UP BAG WHIRL-PA STAND-UP BAG WHIRL-PAK. STA

1.1-0920-073112
Site 1.1
Time 0920
Date 073112
Tony Hoch, LRLD

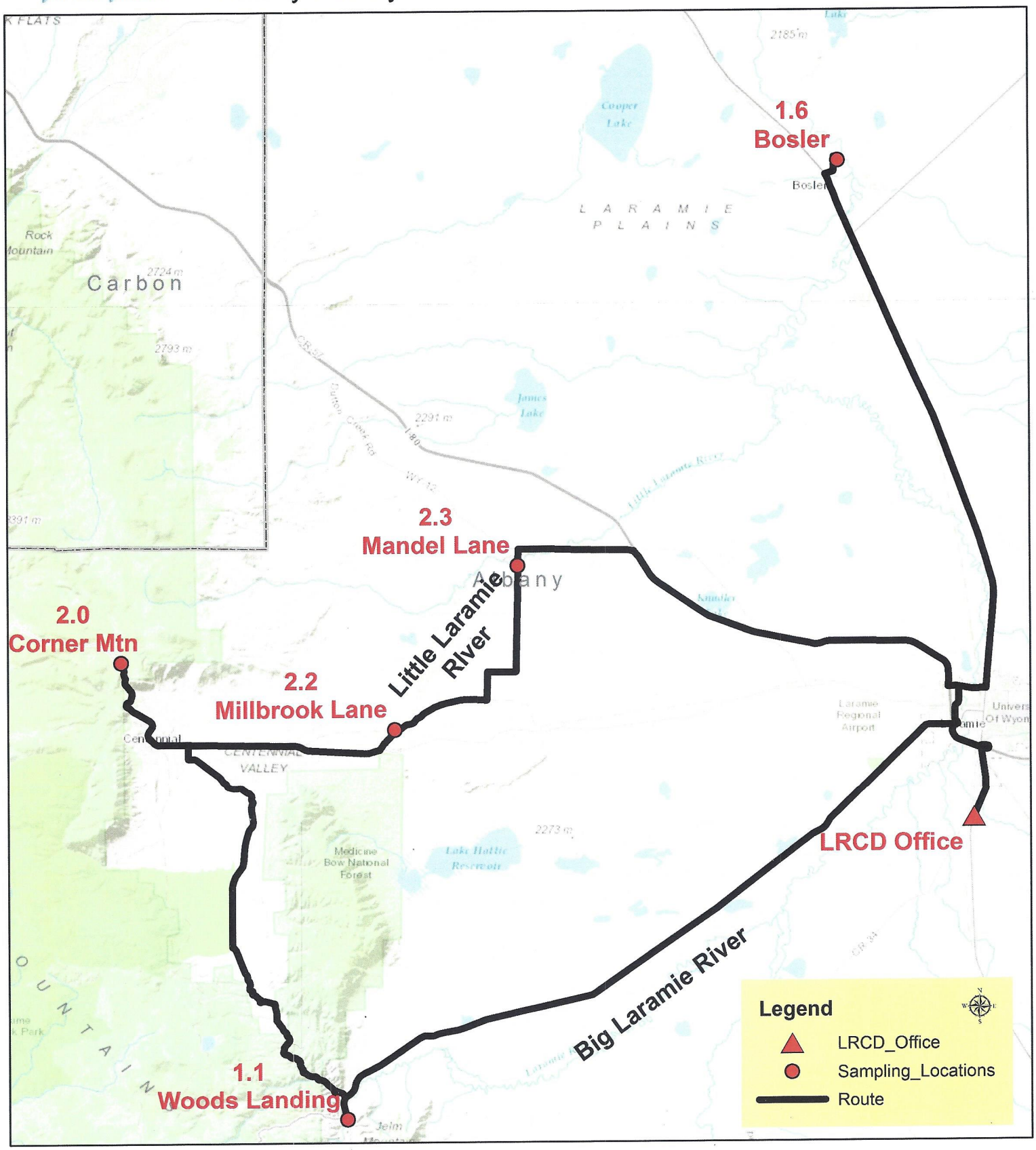
Nasco WHIRL-PAK® Nasco WHIRL-PAK® Nasco WHIRL-

conserving natural resources *for our future*

Laramie Rivers Conservation District

Appedix C: Sample Site Location and Driving Route Map

Albany County



Created by Martin Curry
dated April 30, 2014

APPENDIX D: Landowner permission information with statement about access from driving route.

Of the five sites sampled, three are on private land, one is on state land and one is on the national forest.

For the three private landowners, permission forms were signed by the land owners and are on file at the LRCD Office. The sampling sites are accessed directly from the public roads and no other properties are crossed.

For the state land Board site, permission was obtained from the SLB and the private grazing permittee was notified of our sampling program. The sampling site is accessed directly from the public road and no other properties are crossed.

For the national forest site, no permission is required, but the Forest Hydrologist and District Ranger were both notified. Medicine Bow National Forest staff have known about this program since its inception and they have always cooperated. The sampling site is accessed directly from the public road and no other properties are crossed.