SAMPLING THE GIBSON RESERVOIR TAILRACE POOL AND THE UPPPER SUN RIVER FOR DISSOLVED OXYGEN AND TOTAL DISSOLVED GAS

Sampling and Analysis Plan-2008 Addendum

Prepared for:

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
Water Quality Standards Section, Water Quality Planning Bureau
P.O. Box 200901
Helena, MT 59620-0901

Approvals

_____	_____
Michael Suplee (WQ Standards Section)	Date
_____	_____
Bob Bukantis (WQ Standards Section Supervisor)	Date
_____	_____
Rosie Sada (WQ Monitoring Section Supervisor)	Date
_____	_____
Mark Bostrom (QA Officer)	Date

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Purpose of the 2008 Addendum

MT DEQ has been working with Gibson Dam Hydroelectric Co., LLC to ensure that adequate data will exist when the Department makes its analysis, via 401 certification, of potential water quality impacts from the proposed hydroelectric project. Gibson Dam Hydroelectric Co., LLC is tentatively planning to apply for its final license in fall 2008.

Since the completion of the 2007 sampling, questions have arisen which should be answered prior to the final license application. Dissolved oxygen (DO) data from 2007 suggested that total dissolved gas (TDG) was supersaturated in the tailrace pool (Gibson Dam Hydro, 2008), how-ever, MT DEQ did not at that time have a TDG analyzer to confirm this. MT DEQ has since purchased a TDG analyzer and will verify the 2007 observations. Also, Montana Fish, Wildlife and Parks, in comments on Gibson Dam Hydroelectric Co.'s draft license application (Spring 2008), indicated there were concerns that reduced stream-water dissolved oxygen concentrations — which will almost certainly result from the installation of the turbines — will substantially lower *intergrave*l DO concentrations and impact the rainbow trout fishery found in the upper Sun River. "Intergravel" is the area in a streambed approximately 5-20 cm below the water-gravel interface where salmonid eggs and fry are found. State standards require that these areas have a minimum DO of 5 mg/L in the upper Sun River.

The following SAP addendum is intended to gather baseline data relevant to both of the issues outlined above.

1.0 Introduction and Background Information

1.1 The 401 Certification Process

See Original SAP. G:\WQP\WQS\401Cert\Gibson\WQ Monitoring\SAP

1.2 The Gibson Dam Hydroelectric Project

See Original SAP. G:\WQP\WQS\401Cert\Gibson\WQ Monitoring\SAP

2.0 Objectives and Design of the Investigation

2.1 Project Objectives

The work outlined in this SAP is intended to answer the following questions:

1. Under present operating conditions, does total gas supersaturation occur in the tailrace pool of the dam, and for several miles downstream?

2. Under present operating conditions, what are the intergravel dissolved oxygen concentrations in the stream bottom of the Sun River within two to three miles downstream of Gibson dam?

A baseline dataset for intergravel DO, stream DO, and stream TDG will be established by collecting data that will answer the two questions above. These can be compared to future changes

2.2 Sampling Timeframe

Sampling will occur from late July 2008 through October 2008. Sampling will occur about monthly (30 days apart) throughout this sampling period.

3.0 Field Sampling Methods

3.1 Dissolved Oxygen (DO) and TDG Sampling

In the tailrace pool: A 16' Jon boat will be employed in the tailrace pool. The boat, with electric motor, will be used to approach the face of the dam only as far as safety permits. (Based on experience from 2007 we know the safe areas to work in.) The boat will be anchored in place and sampling will proceed at 1 m sampling intervals to the river bottom (about 4 m). A calibrated YSI sonde will measure DO, temperature, pH, and conductivity, and a calibrated Common Sensing Model TBO-DL6 total dissolved gas (TDG) analyzer will be used to measure TDG.

In the Sun River: DO, temperature, conductivity, pH, and TDG will be measured (from upstream to downstream) at: the pool tail-out of the tailrace pool (47.6029, 112.7586), the Road 108 bridge crossing (47.6070, 112.7536), an intermediate location at about 47.6086, 112.7418 (to be specified upon arrival after site inspection/access evaluation), and at the Hannan Gulch bridge crossing (47.6162, 112.7342) (Figure 1).

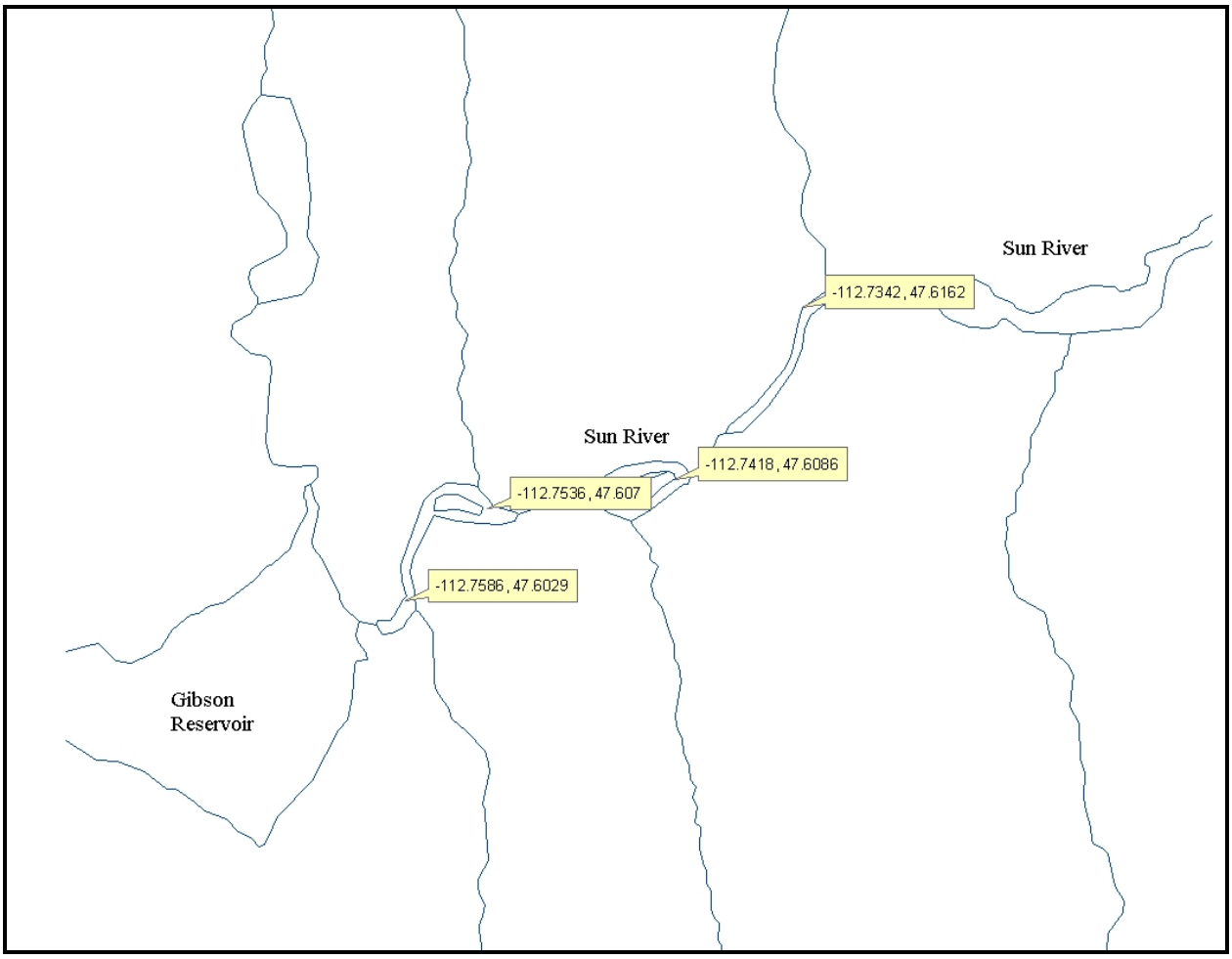

Figure 1. Map showing intended sampling locations along the upper Sun River.

3.2 Intergravel DO

Sites to measure intergravel DO will be located (from upstream to downstream) at: the pool tail-out of the tailrace pool (47.6029, 112.7586), the Road 108 bridge crossing (47.6070, 112.7536), an intermediate location at about 47.6086, 112.7418 (to be specified upon arrival after site inspection/access evaluation), and at the Hannan Gulch bridge crossing (47.6162, 112.7342).

Intergravel DO concentrations will be measured at each site using a steel standpipe following the original Mark VI design of Terhune (1958) as later modified by Barnard and McBain (1994). The design is shown in Figure 2. The device will be pounded in to the stream bottom so that the series of perforating holes will be centered 12 cm below the sediment-water interface. 12 cm was selected as it represents a typical burial depth of a rainbow trout redd, and falls midrange between the depth where streambed scouring would begin to affect a

rainbow trout redd (10 cm) and the depth where scouring would cause total egg loss (25 cm)(DeVries, 1997). The standpipe will be place in a near-bank area where stream depth (surface to stream bottom) is about 5 cm or less, in order to minimize the volume of water entering the pipe (the more water that enters, the higher the likelihood the sample will not be restricted to the 12 cm depth only). Specific standpipe locales will be selected based on the apparent attractiveness for redd building (moderate size gravels, minimum fines, pool tailout upwelling area, etc.). Once the standpipe is pounded in place, the water that fills inside the pipe will be drawn out using a manually operated hand pump and, then, the standpipe will be allowed to refill with intergravel water. A YSI probe will be lowered to the depth where the perforations are located and the DO concentration and temperature of the refilled water will be measured (Bernard and McBain, 1994).

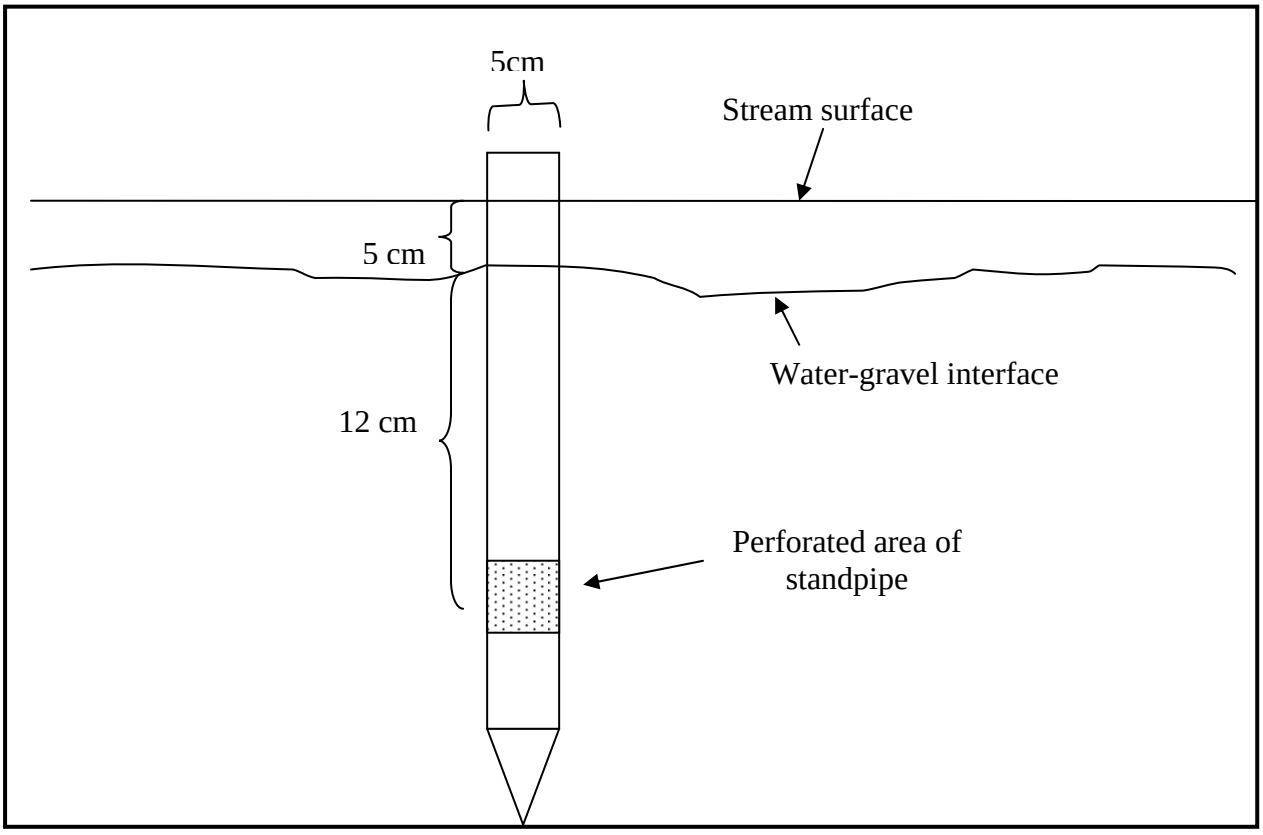

Figure 2. Profile view of the standpipe placed in the stream bottom. The standpipe will be drained of water and allowed to refill before water quality measurements are taken.

3.3 Other Data Collection

Photographs will be taken using a digital camera at the sites where the standpipes have been installed. A hand-held GPS unit will used to identify the lat and long of the coordinates of each site, as well as the elevation.

4.0 Sample Handling Procedures

Only real-time samples will be collected. Standard DEQ Water Quality Planning Bureau site visit/chain of custody forms will be used to document the sampling events.

5.0 Laboratory Analytical Measurements

Not applicable.

6.0 Quality Assurance and Quality Control Requirements

All QA/QC requirements followed by MT DEQ will be instituted for this project. The QA/QC requirements are described in MT DEQ (2005) and, specific to field instruments, shown in Appendix A. All calibrations will be undertaken as outlined in this SAP.

To assure high-quality data from the YSI 6600 sonde, the barometer inside a hand-held YSI 650 (device which connects to and exhibits the measurements being made by the sonde) will be checked against the National Weather Service station at the airport in Helena, MT, prior to departure to the field, and re-calibrated as needed (YSI, 2006). The barometer in the 650 will be checked monthly thereafter to assure accuracy, and recalibrated as needed. Conductivity calibration of the sonde will be undertaken in laboratory conditions and checked monthly thereafter, and updated as needed. The sonde pH will be calibrated in the laboratory using the two-point method, using pH standards of 7.0 and 10.0 (YSI, 2006). In the field, the YSI sonde will be calibrated to the local barometric pressure using the YSI 650, just prior to sampling in the tailrace pool or in any of the standpipes, per the manufacturer's instructions (YSI, 2006). The pH will be checked prior to making measurements using a field-use only bottle of pH 7.0 calibration buffer.

Calibration of the TDG analyzer will proceed per the manufacturer's instructions (Common Sensing, 2008).

7.0 Data Analysis, Record Keeping, and Reporting Requirements

Data generated during this project will be stored on the MT DEQ site visit/Chain of Custody field forms. Site Visit/Chain of Custody forms will be properly completed for all measurements. Written field notes, field forms (photo log, site information), and digital photos will be processed by DEQ staff following QA/QC procedures to screen for data entry errors. Data will be processed with Excel and with Minitab release 15. ArcView version 9 ArcMap will be used for GIS applications. All data will be made available to Gibson Dam Hydroelectric Co., LLC. The GPS coordinate system datum will be NAD 1983 State Plane Montana, in decimal degrees, to at least the third decimal. All data generated during this project will be available to the public. A brief final report describing the outcome of the project will be prepared by Gibson Dam Hydroelectric Co., LLC aand submitted to MT DEQ as part of the 401 certification application.

8.0 Schedule

Sampling will begin late July, 2008. Coordination will occur between Gibson Dam Hydroelectric Co., LLC, MT DEQ, and the onsite operator of Gibson Dam to assure admittance to the tailrace pool (admittance to remainder of the Sun River is public). After the initial sampling, during which Michael Suplee (MT DEQ) will work with MT DEQ monitoring staff (Al Nixon) on site selection and sampling details, sampling will proceed at approximately 30 day intervals and be carried out by MT DEQ monitoring staff (overseen by Rosie Sada). Data collection should be completed no later than October 2008, and reporting will be completed when all QC checks are complete in late Fall 2008.

The contact person for Gibson Dam Hydroelectric Co. is Steve Marmon, at (360) 738-9999, ext. 122. The Gibson Dam tender who is onsite at the reservoir is Paul, at (406)562-3603.

9.0 Project Team and Responsibilities

This project will be carried out by a MT DEQ field crew which will be overseen by Rosie Sada (Head, Monitoring Section). Initial training and interagency/company coordination will be carried out by Michael Suplee (Water Quality Standards Section). Individuals directly involved in this project are presented in Table 9.1.

Table 9.1. Project Personnel and Their Roles.

Name	Organization	Project Responsibilities
Michael Suplee	MT Dept. of Environmental Quality	Project management & training
Rosie Sada	MT Dept. of Environmental Quality	Oversite of field crew
Al Nixon	MT Dept. of Environmental Quality	Collection of samples/field work
Paul Kusnierz	MT Dept. of Environmental Quality	Collection of samples/field work
Steve Marmon	Gibson Dam Hydroelectric Co., LLC	In-kind support, coordination

10.0 References

Barnard, K., and S. McBain, 1994. Standpipe to Determine Permeability, Dissolved Oxygen, and Vertical Particle Size Distibution in Salmonid Spawning Gravels. U.S. Forest Service, Fish Habitat Relationships Technical Bulletin No. 15, Eureka, CA.

Common Sensing, Inc., 2008. Dissolved Gas & Oxygen Meter/Logger Model TBO-DL6 Instruction Manual. Clark Fork, ID.

Devries, P., 1997. Riverine Salmonid Egg Burial Depths: Review of Published Data and Implications for Scour Studies. Can. J. Fish. Aquat. Sci. 54: 1685-1698.

Gibson Dam Hydro (Gibson Dam Hydroelectric Co., LLC), 2008. Gibson Dam Hydroelectric Project FERC Project No. 12478-001: Draft License Application, Preliminary Draft Environmental Assessment, and Project Participant Mailing List. Bellingham, WA.

MT DEQ (MT Department of Environmental Quality), 2005. Quality Assurance Project Plan (QAPP) Sampling and Water Quality Assessment of Streams and Rivers in Montana, 2005. *Available at* http://www.deq.state.mt.us/wqinfo/QAProgram/WQPBQAP-02.pdf.

Terhune, L.D.B., 1958. The Mark VI Groundwater Standpipe for Measuring Seepage through Salmon Spawning Gravel. Canadian Fisheries Research Board Journal 15: 1027-1063.

YSI (Yellow Springs Instruments, Incorporated), 2006. YSI 6-Series Manual Supplement: Configuration and Deployment Instructions for YSI Model 6600EDS Sondes. Item No. 655467.

Appendix A

1. Instrument/Equipment Testing, Inspection, and Maintenance

1.1. Field Equipment - Pre season Maintenance and Initial Calibration

DEQ will prepare all field equipment for the 2005 field season prior to the field training sessions. Equipment will undergo routine maintenance, initial calibration and subsequently field tested at the training day.

1.2. Analytical Laboratories and Biological Contractors

Contractors are responsible for the routine maintenance of their equipment per manufacturers instructions. Procedures and frequency for equipment inspection and maintenance must be described in the laboratories Laboratory Quality Assurance Plan (LQAP). A copy of the LQAPs for Energy Laboratories and the Department of Public Health and Human Services laboratory are on file with the QA officer.

2. Instrument/Equipment Calibration and Frequency

2.1. Calibration - Laboratory

Analytical method calibration criteria are specified in the reference analytical method from EPA, APHA, or USGS. Calibrations can include initial and continuing calibrations as well as internally calibrated methods such as the Method of Standard Additions (MSA). The reporting of a result under a referenced method is a statement by the laboratory that the calibration criteria for that method have been performed, examined and pass the control limits established in the method. Results reported under a reference method without the calibrations and control limits specified in the method will not be accepted by DEQ.

2.2. Calibration – Field Instruments

Initial calibration of field instruments will be performed prior to the field season. Continuing calibration will occur according to the frequency prescribed in the instrument manufacturers instructions (reiterated in the DEQ Field Procedures Manual (SOP WQPBWQM-020)). All calibrations will be documented in calibration logs stored with the instrument by indicating date and operator.

Corrective actions for failed calibrations are detailed in the instrument manufacturers operating manual. Failure to perform and record calibration of field instrument will result in resampling the field site for the field parameters.

Quality Control Checklist

___Condition of samples upon receipt
- __Cooler/sample temperature
- __Proper collection containers
- __All containers intact
- __Sample pH of acidified samples <2

___All field documentation complete. If incomplete areas cannot be completed, document the issue.

___Holding times met

___Field duplicates collected at the proper frequency (specified in SAP)

___Field blanks collected at the proper frequency (specified in SAP)

___All sample IDs match those provided in the SAP. Field duplicates are clearly marked on samples and noted as such in lab results.

___Analyses carried out as described within the SAP (e.g. analytical methods, photo documentation, field protocols)

___Reporting detection limit met the project-required detection limit

___All blanks were less than the project-required detection limit

___If any blanks exceeded the project-required detection limit, associated data is flagged

___Laboratory blanks/duplicates/matrix spikes/lab control samples were analyzed at a 10% frequency

___Laboratory blanks/duplicates/matrix spikes/lab control samples were all within the required control limits defined within the SAP

___Project DQOs and DQIs were met (as described in SAP)

___Summary of results of QC analysis, issues encountered, and how issues were addressed (corrective action)

___Completed QC checklist before STORET upload

Data Qualifiers and Their Descriptions.

Result Qualifier	Result Qualifier Description
B	Detection in field and/or trip blank
D	Reporting limit (RL) increased due to sample matrix interference (sample dilution)
H	EPA Holding Time Exceeded
J	Estimated: The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
R	Rejected: The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in the sample.
U	Not Detected: The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted Contract Required Quantitation Limit (CRQL) for sample and method.
UJ	Not Detected/Estimated: The analyte was not detected at a level greater than or equal to the adjusted CRQL or the reported adjusted CRQL is approximate and may be inaccurate or imprecise.