DEPARTMENT OF
ECOLOGY
State of Washington

Quality Assurance Project Plan

Inland Empire Paper Company
Nutrients and Common Ions
Source Water Study

May 2012

Publication No. 12-03-101

Publication Information

Each study conducted by the Washington State Department of Ecology (Ecology) must have an approved Quality Assurance Project Plan. The plan describes the objectives of the study and the procedures to be followed to achieve those objectives. After completing the study, Ecology will post the final report of the study to the Internet.

The plan for this study is available on Ecology's website at www.ecy.wa.gov/biblio/1203101.html.

Data for this project will be available on Ecology's Environmental Information Management (EIM) website at www.ecy.wa.gov/eim/index.htm. Search User Study ID, JROS0022.

Ecology's Activity Tracker Code for this study is 13-008.

Waterbody Number: WA-57-1010.

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Quality Assurance Project Plan

Inland Empire Paper Company Nutrients and Common Ions Source Water Study

May 2012

Approved by:

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Signatures are not available on the Internet version.
ERO: Eastern Regional Office
EAP: Environmental Assessment Program
EIM: Environmental Information Management database

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Abstract

The Washington State Department of Ecology (Ecology) will sample and analyze water from the Spokane River and the Inland Empire Paper Company's (IEP's) supply well to determine if an allowance for phosphorus from the well water is merited.

The purpose of this study is to determine whether the cooling water extracted by the IEP supply well is chemically similar to Spokane River water in the vicinity of IEP. To accomplish this task, Ecology will:

- Collect and analyze water samples from the IEP supply well, Spokane River, and instream piezometers for one year.
- Characterize the direction and magnitude of the hydraulic connection between the Spokane River and underlying aquifer at the IEP facility.
- Perform an evaluation of the study water quality results based on the river/aquifer interactions.

Samples will be analyzed for pH, dissolved oxygen, conductivity, temperature, alkalinity, anions, and cations.

Ecology's Water Quality Program, Eastern Regional Office, asked Ecology's Environmental Assessment Program to conduct this sampling and analysis.

Background and Project Description

In May 2010, the U.S. Environmental Protection Agency (EPA) approved a dissolved oxygen (DO) total maximum dissolved load (TMDL) assessment for Lake Spokane[1] and the Spokane River. Both the lake and river have a history of DO problems, particularly during April to October when streamflow is typically lowest. These problems originate from nutrient inputs, especially phosphorus, which cause excessive aquatic plant growth that contributes to depressed DO concentrations in the lake (Cusimano, 2004).

To support implementation of the Spokane River TMDL, Ecology has issued discharge permits with wasteload allocations for five permitted facilities (Figure 1) that discharge to the Spokane River between Lake Spokane and the Washington-Idaho border:

- The City of Spokane Advanced Wastewater Treatment Plant (AWWTP)
- The Liberty Lake Sewer and Water District (LLSWD).
- The Kaiser Aluminum Industrial Wastewater Treatment Plant (KACC), at Trentwood.
- The new Spokane County Regional Water Reclamation Facility (SCRWRF).
- The Inland Empire Paper (IEP) Company Inland Wastewater Treatment Plant, at Millwood.

[1] Lake Spokane (also known as Long Lake) is a 24-mile long reservoir west of the City of Spokane that was created when a hydroelectric dam was constructed at river mile (RM) 33.9 on the Spokane River.

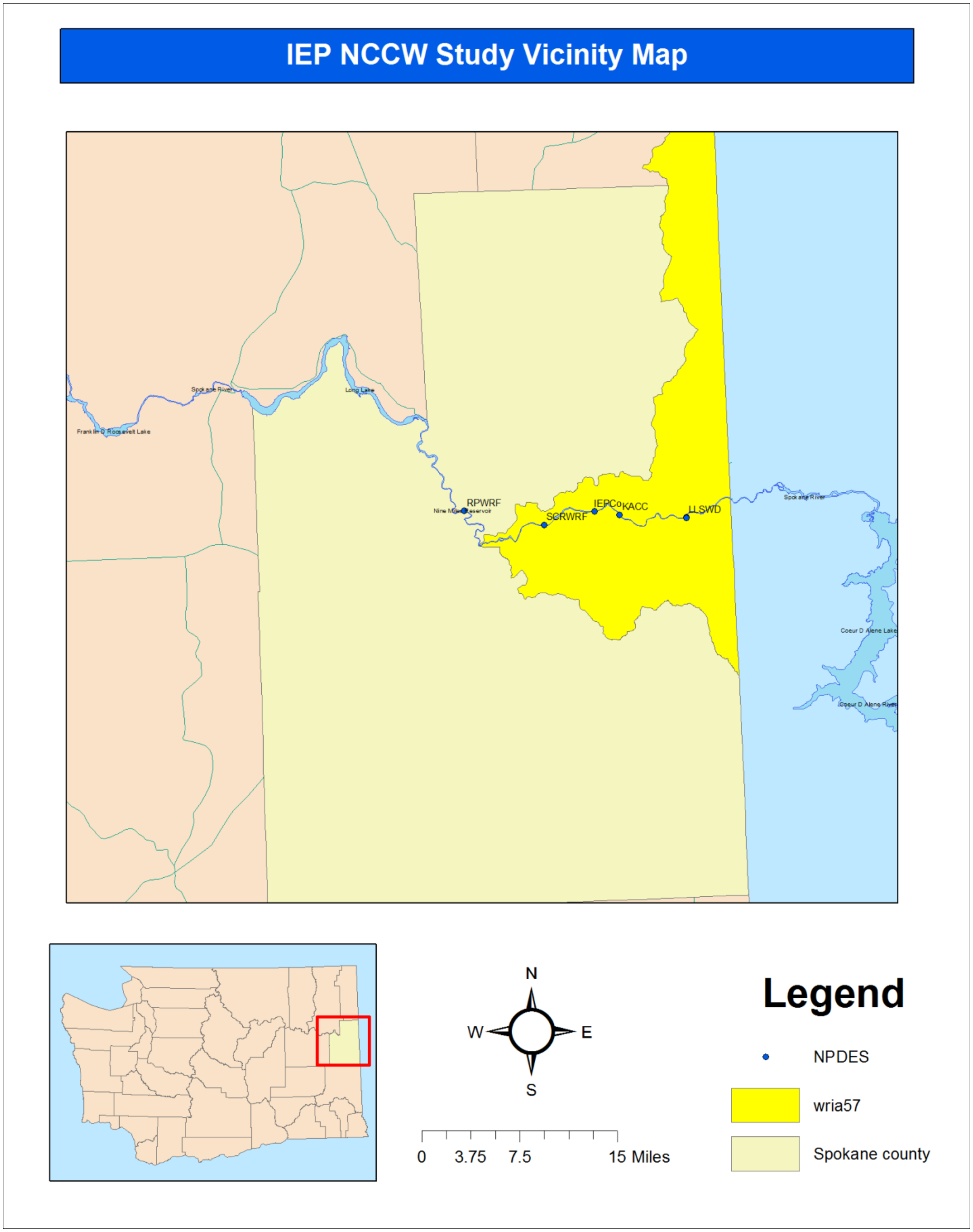

Figure 1. Inland Empire Paper NCCW study vicinity map.

During the comment period for their most recent permit revision, IEP requested that their non-contact-cooling water (NCCW) be exempted from (not count against) their phosphorus discharge limits. IEP based its request on the following factors:

- A significant portion of IEP's total discharge volume is NCCW comprised of groundwater that is pumped from a well located within a few hundred feet of the Spokane River.
- Past studies of the Spokane River suggest that IEP's facility is likely located along a losing reach where the river naturally recharges the underlying aquifer (Kahle and Bartolino, 2007; Kahle and others, 2005).
- The Spokane River likely contributes a natural phosphorus load to the groundwater that IEP uses for its NCCW.
- Since the river and aquifer are thought to be hydraulically connected, IEP should not be responsible for mitigating the phosphorus contained in its NCCW.

In response to the above request, Ecology agreed to work with IEP to formally evaluate the relationship between the river and underlying aquifer at the IEP facility during at least one critical season (February to October). Based on the results of this evaluation, Ecology agreed to consider an allowance for nutrient concentrations in the facility's NCCW to the extent that nutrient concentrations in groundwater at the IEP site are equivalent to those in the river upstream of the site. Full details of the final permit for IEP and responses to comments can be found at the following Ecology web page:
https://fortress.wa.gov/ecy/wqreports/public/f?p=110:1000:2356864689260732::NO:RP:P1000_FACILITY_ID,P1000_FACILITY_NAME:81484342,INLAND%20EMPIRE%20PAPER%20CO

This Quality Assurance (QA) Project Plan was developed to document and support the study methods and data quality objectives that Ecology will use as it performs this evaluation. The purpose of this study is to determine whether the cooling water extracted by the IEP supply well is chemically similar to Spokane River water in the vicinity of the plant. The specific objectives of this study are to:

- Characterize the direction and magnitude of the hydraulic connection between the Spokane River and underlying aquifer at the IEP facility.
- Collect monthly water quality samples from the IEP supply well and the Spokane River for one year[2].
- Perform an evaluation of the study water quality results based on the river/aquifer interactions determined in the first objective, above.

The results of this evaluation will be used by the Water Quality Program to calculate potential nutrient allowance(s) during future revisions to IEP's NPDES permit.

[2] As part of this assessment Ecology is planning to install a small network of shallow instream piezometers along the IEP shoreline to assess local scale surface water/groundwater interactions at the IEP site. One or more of these piezometers may be sampled during this effort to determine if nutrient concentrations are naturally attenuated as river water (or groundwater) passes through the streambed sediments.

Organization and Schedule

Table 1 lists the key people involved in this project and their responsibilities. Additional Ecology staff will be involved with field support, QA Project Plan and report reviews, and technical assistance as needed. The proposed project schedule is detailed in Table 2.

Table 1. Organization of project staff and responsibilities.

Staff	Title	Responsibilities
Pat Hallinan Water Quality program Eastern Regional Office Phone: 509-329-3500	EAP Client	Clarifies scopes of the project. Provides internal review of the QAPP and approves the final QAPP.
Jim Ross EOS, EAP Eastern Regional Office Phone: 509-329-3425	Project Manager Principal Investigator	Writes the QAPP. Oversees field sampling and transportation of samples to the laboratory. Conducts QA review of data, analyzes/helps interpret data, and enters data into EIM. Writes the draft and final report.
Scott Tarbutton EOS, EAP Eastern Regional Office Phone: 509-329-3453	Field Lead	Conducts scheduled field visits to collect river and groundwater quality samples, measure hydraulic gradients in piezometers, and download thermistors.
Kirk Sinclair GFF/EAP Headquarters Phone: 306-459-7469	Hydrogeologist	Provides hydrogeologic support for QAPP development, piezometer installation, periodic field visits, and data interpretation/report preparation.
Gary Arnold EOS, EAP Phone: 509-454-4244	Section Manager for the Project Manager	Provides internal review of the QAPP, approves the budget, and approves the final QAPP. Reviews the project scope and budget, tracks progress, reviews the draft QAPP, and approves the final QAPP.
Dean Momohara Manchester Environmental Laboratory, EAP Phone: 360-871-8801	Director	Approves the final QAPP.
William R. Kammin EAP Phone: 360-407-6964	Ecology Quality Assurance Officer	Reviews the draft QAPP and approves the final QAPP.
Doug Krapas Inland Empire Paper Phone: 509-924-1941 x 363	Environmental Manager	Point of contact with IEP. Reviews draft QAPP, grants access to sampling sites on IEP property, tracks progress.

EOS: Eastern Operations Section
GFF: Groundwater/Forests & Fish Unit
EAP: Environmental Assessment Program
EIM: Environmental Information Management database
QAPP: Quality Assurance Project Plan

Table 2. Proposed schedule for field and laboratory work, data entry, and reports.

Field and laboratory work	Due date	Lead staff
Field work completed	October 2013	Jim Ross
Laboratory analyses completed	November 2013	
Environmental Information System (EIM) database		
EIM user study ID	JROS0022	
Product	Due date	Lead staff
EIM data loaded	December 2013	Jim Ross
EIM quality assurance	January 2014	ERO staff
EIM complete	January 2014	Jim Ross
Final report		
Author lead / Supporting staff	Jim Ross / Scott Tarbutton, Kirk Sinclair	
Schedule		
Draft due to supervisor	June 2014	
Draft due to client/peer reviewer	July 2014	
Draft due to external reviewer(s)	July 2014	
Final (all reviews done) due to publications coordinator	September 2014	
Final report due on web	October 2014	

ERO: Eastern Regional Office.

Data Quality Objectives

One of the primary objectives of this study is to collect data that are representative of local conditions at the IEP facility. To accomplish this, a number of field and laboratory quality-control steps will be taken to minimize and assess error in the project data. Ecology's standard Environmental Assessment Program (EAP) protocols will be followed when measuring water quality parameters in the field or when collecting and handling samples that will be submitted for later laboratory analysis.

Table 3 describes the project data quality objectives (equivalent to the laboratory measurement quality objectives). Standard laboratory quality control procedures will be used to estimate the accuracy, precision, and bias introduced by laboratory procedures and will be provided to the project lead as part of the formal laboratory data package for each sample event. (MEL, 2006).

Field parameters measured include pH, dissolved oxygen, conductivity, and temperature. Table 4 describes the data quality objectives for the field measurements.

Table 3. Data quality objectives.

Parameter	Method	Accuracy	Precision RSD	Bias	Reporting Limits
Field Measurements					
pH (s.u.*)	Hydrolab®	0.05	0.05	0.10	1-14
Temperature (°C)	Hydrolab®	0.1	0.025	0.05	1 to 40
Dissolved Oxygen	Hydrolab®	15%	<15%	±15%	0.1 to 15 mg/L
Specific Conductivity	Hydrolab®	10%	<15%	±15%	1 umhos/cm
Laboratory Analyses					
Orthophosphate-P[1]	SM 4500-P G	10%	<20%	±20%	3 ug/L
Total Phosphorus	SM 4500-P F	10%	<20%	±20%	5 ug/L
Total Dissolved Phosphorus[1]	SM 4500-P-F	10%	<20%	±20%	5 ug/L
Total Alkalinity	SM 2320B	10%	<20%	±20%	1 mg/L
Chloride[1]	EPA 300	10%	<20%	±20%	0.1 mg/L
Sulfate[1]	EPA 300	10%	<20%	±20%	0.1 mg/L
Nitrate[1]	EPA 300	10%	<20%	±20%	0.1 mg/L
Calcium[1]	EPA 200.7	10%	<20%	±20%	0.05 mg/L
Magnesium[1]	EPA 200.7	10%	<20%	±20%	0.05 mg/L
Sodium[1]	EPA 200.7	10%	<20%	±20%	0.05 mg/L
Potassium[1]	EPA 200.7	10%	<20%	±20%	0.5 mg/L
Iron[1]	EPA 200.7	10%	<20%	±20%	0.05 mg/L
Silicon[1]	EPA 200.7	10%	<20%	±20%	0.05 mg/L

*s.u.: Standard units
[1] Dissolved sample fraction

Table 4. Measurement quality objectives for Hydrolab post-deployment checks

Parameter	Units	Accept	Qualify	Reject
pH	standard units	≤ ± 0.2	± 0.2 to ±0.5	> ± 0.5
Conductivity*	uS/cm	≤ ± 5%	±5% to ±15%	> ± 15%
Temperature	° C	≤ ± 0.2	± 0.2 to ±0.5	> ±0.5
Dissolved Oxygen**	% saturation	≤ ± 5%	± 5% to ± 10%	> ±10%

* Criteria expressed as a percentage of readings.
**When Winkler data is available, it will be used to evaluate acceptability of data in lieu of % saturation criteria.

Study Design

For this evaluation Ecology will use a combination of field-based measurements and water quality evaluations to determine whether the cooling water extracted by the IEP supply well is chemically similar to and hydraulically connected with the Spokane River in the vicinity of the IEP facility. Water quality samples will be collected at two locations on the Spokane River (Figure 2). Groundwater samples will be collected at the IEP NCCW supply well and from a small network of shallow instream piezometers that will be installed at selected sites along the IEP shoreline (Figure 3). The piezometers will also be used to assess local scale surface water and groundwater interactions and streambed water temperatures.

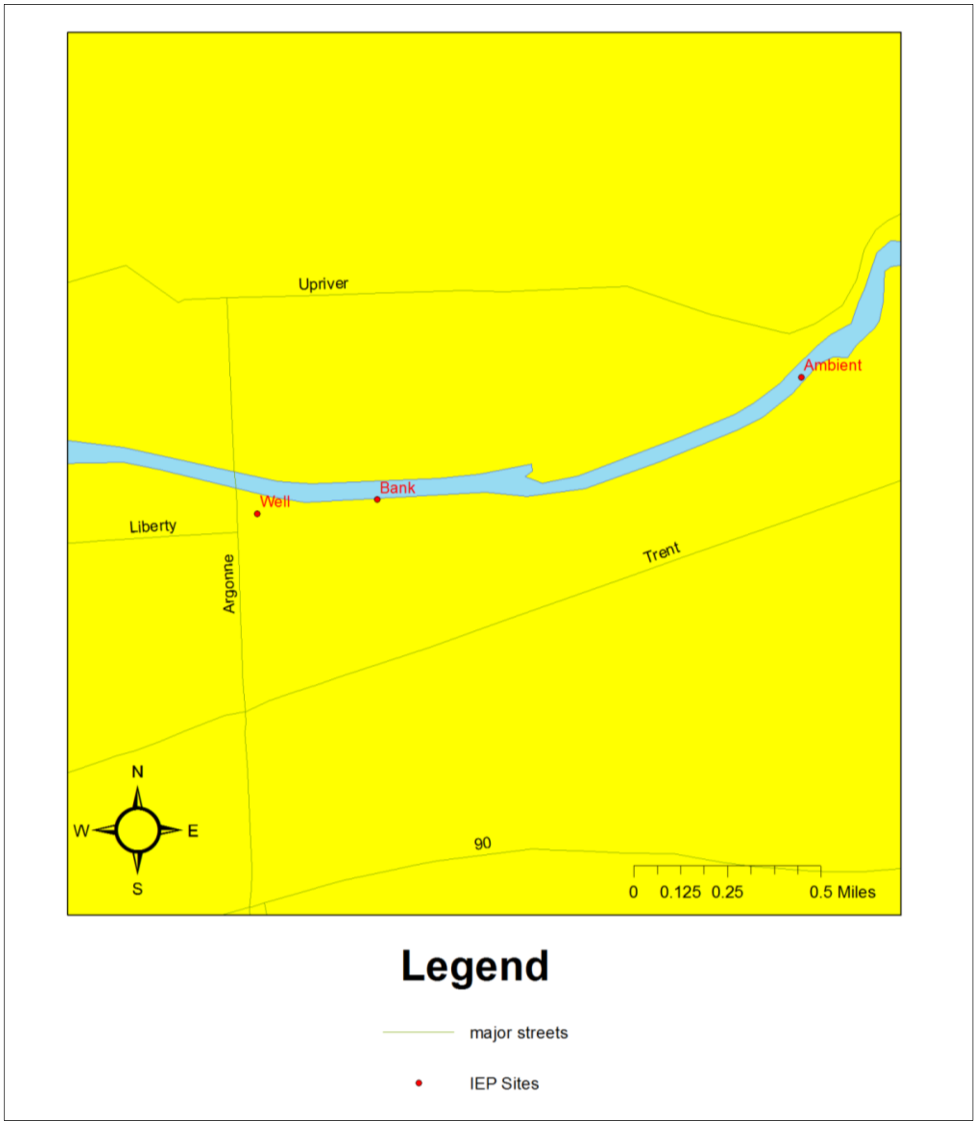

Figure 2. IEP NCCW study project area.

Figure 3. Orthophoto view of IEP facility showing NCCW supply well and upstream river sampling location.

River flow is from right to left in the photo.
Rectangle indicates piezometer installation vicinity.

Groundwater/Surface Water Interactions

Groundwater and surface-water interactions at the IEP site will be evaluated using a combination of common field techniques. If site conditions permit, hand-driven instream piezometers will be installed along the Spokane River in July, 2012 at 3 to 5 sites along the IEP shoreline. The piezometers will be installed in accordance with standard EAP methodology (Sinclair and Pitz, 2010). The piezometers will be used to monitor surface-water and groundwater head relationships, streambed water temperatures, and near-stream groundwater quality.

The piezometers will consist of 5-foot by 1.5-inch galvanized pipes that are crimped and perforated at the bottom. The upper end of each piezometer will be fitted with a standard pipe coupler to provide a robust strike surface for installation and capping between sampling events. The piezometers will be driven into the streambed, within a few feet of the shoreline, to a maximum depth of approximately 5 feet. Keeping the top of the piezometer underwater and as close to the streambed as possible will reduce the influence of heat conductance from the exposed portion of the pipe. Following installation, the piezometers will be developed using standard surge and pump techniques to assure a good hydraulic connection with the streambed sediments.

Each piezometer will be instrumented with up to 3 thermistors for continuous monitoring of streambed water temperatures (Figure 4). In a typical installation, 1 thermistor will be located near the bottom of the piezometer, 1 at a depth of approximately 0.5 feet below the streambed, and 1 roughly equidistant between the upper and lower thermistors. The piezometers will be accessed at least monthly (when flows permit) to download thermistors and to make spot measurements of stream and groundwater temperatures for later comparison against and validation of the thermistor data. The monthly spot measurements will be made with properly maintained and calibrated field meters in accordance with standard EAP methodology (Ward, 2007, Sinclair and Pitz, 2010).

During site visits, surface-water stage and instream piezometer water levels will be measured using a calibrated electric well probe, a steel tape, or a manometer board (as appropriate) in accordance with standard EAP methodology (Sinclair and Pitz, 2010). The water level (head) difference between the piezometer and the creek provides an indication of the vertical hydraulic gradient and the direction of flow between the creek and groundwater. When the piezometer head exceeds the creek stage, groundwater discharge into the creek can be inferred. Similarly, when the creek stage exceeds the head in the piezometer, loss of water from the creek to groundwater storage can be inferred.

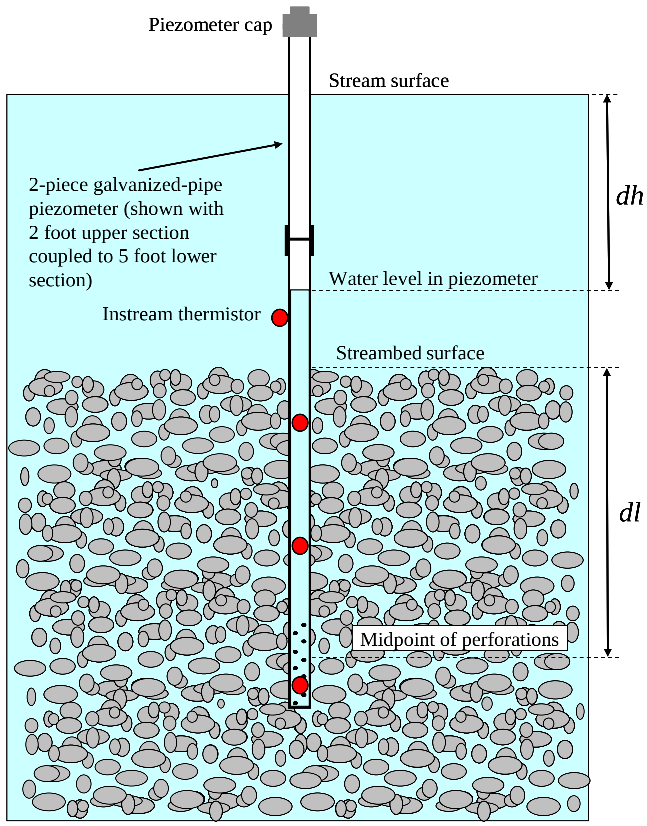

Figure 4. Instream piezometer conceptual diagram
Diagram not to scale.

Water Quality Surveys

For this assessment Ecology will conduct monthly water quality sampling at 2 sites on the Spokane River from April 2012 through October 2013. One site will be near the firehouse intake at the eastern end of the IEP property. The second site will be approximately 1.2 miles up-river of IEP at the Ecology ambient monitoring station at the centennial trail bridge downstream of Plantes Ferry Park.

Backwater effects from the up-river dam (located downstream of IEP) may make it difficult to collect representative surface-water samples from the river bank at IEP during low flows. To assess potential backwater effects we will initially sample both river sites (IEP and the ambient station) to ensure the IEP bank samples are reasonable and representative of local conditions and thus usable for this evaluation.

Groundwater samples will be collected during the monthly surveys from the IEP NCCW supply well. If conditions allow, water quality samples will also be collected from up to 3 of the project instream piezometers to assess the quality of near-stream groundwater as it enters or leaves the river.

Samples will be analyzed for the parameters listed in Table 3. Sampling will occur once a month according to the schedule described in table 5. Dates are subject to change due to IEP facility considerations. The estimated project analytical costs are summarized in Table 6.

Table 5. Sampling schedule.

Date	Prod Well	River Sites	Piezometers
Apr 3, 2012	X	X	
May 1, 2012	X	X	
Jun 5, 2012	X	X	
July 14,2012	X	X	X
Aug 7, 2012	X	X	X
Sept 4, 2012	X	X	X
Oct 2, 2012	X	X	X
Nov 6, 2012	X	X	X
Dec 4, 2012	X	X	X
Jan 8, 2013	X	X	X
Feb 5, 2013	X	X	X
Mar 5, 2013	X	X	X
Apr 2, 2013	X	X	X
May 7, 2013	X	X	
June 4, 2013	X	X	
July 2, 2013	X	X	X
Aug 6, 2013	X	X	X
Sept 3, 2013	X	X	X
Oct 1, 2013	X	X	X

Table 6. Project cost estimate.

	Anions	Cations	Alkalinity	Misc.	Total
Per sample	$75	$98	$18	$6	$197
Project total	$8925	$11662	$2142	$714	$23443

Costs include 50% discount for Manchester Laboratory.
Project total includes 10 field blanks and 10 field duplicates.
Misc. includes filtration supplies cost.

Field Measurements and Sampling Procedures

Each of the project monitoring sites will be field located via handheld GPS units (where possible) and on paper orthophotos for subsequent analysis and plotting of locations using GIS software (Janisch, 2006). The paper orthophoto locations will be used as a secondary in-office confirmation of GPS-derived site coordinates. All monitoring locations will be described and documented in the field data sheets for each site.

Surface Water

Surface water samples will be collected from the river bank at IEP using a peristaltic pump and laboratory grade ¼-inch inside diameter (ID) polyethylene tubing. To facilitate deployment, the polyethylene tubing will be temporarily inserted into a piece of rigid PVC pipe to enable the intake end of the tubing to be safely extended several feet beyond the river bank and into the river. Samples at the ambient station will be collected from the bridge midstream using a rope and standard ambient sampling protocols (Joy, 2006; Ward, 2007). A Hydrolab DataSonde® ® will be used at both sites to measure the river water temperature, pH, conductivity, and DO concentrations (Swanson, 2007).

Groundwater

If conditions permit, groundwater levels will be measured at the IEP study well and project piezometers prior to purging and sampling. Water levels will be measured using a calibrated electric well probe or a steel tape (Marti, 2011). The piezometers will be measured using Ecology's standard operating procedures (Sinclair and Pitz, 2010).

To sample the IEP NCCW supply well, a clean plastic Y-splitter will be attached to a hose bib that is located ahead of any water treatment or filtration that could potentially influence the water quality parameters of interest. One channel of the Y-splitter will be used to direct water to a Hydrolab DataSonde® ® with attached closed-atmosphere low cell (Figure 5). The water temperature, pH, DO concentration, and specific conductance will be measured while the well and hose bib supply lines are purged of standing water. Field parameters will be measured and recorded at approximately 3-minute intervals during purging. Purging will continue until field parameters have stabilized[3]. When purging is complete, the second channel of the Y-splitter will be used to collect water either directly into analyte-specific sample containers in the case of unfiltered samples or to route water through an in-line filter for collection of dissolved analytes (Figure 5). Sampling personnel will follow Ecology's standard operating procedures for sampling water supply wells when conducting this work (Marti, 2011).

[3] Stabilization is defined as less than a 10% difference between successive 3-minute measurement periods for all field parameters.

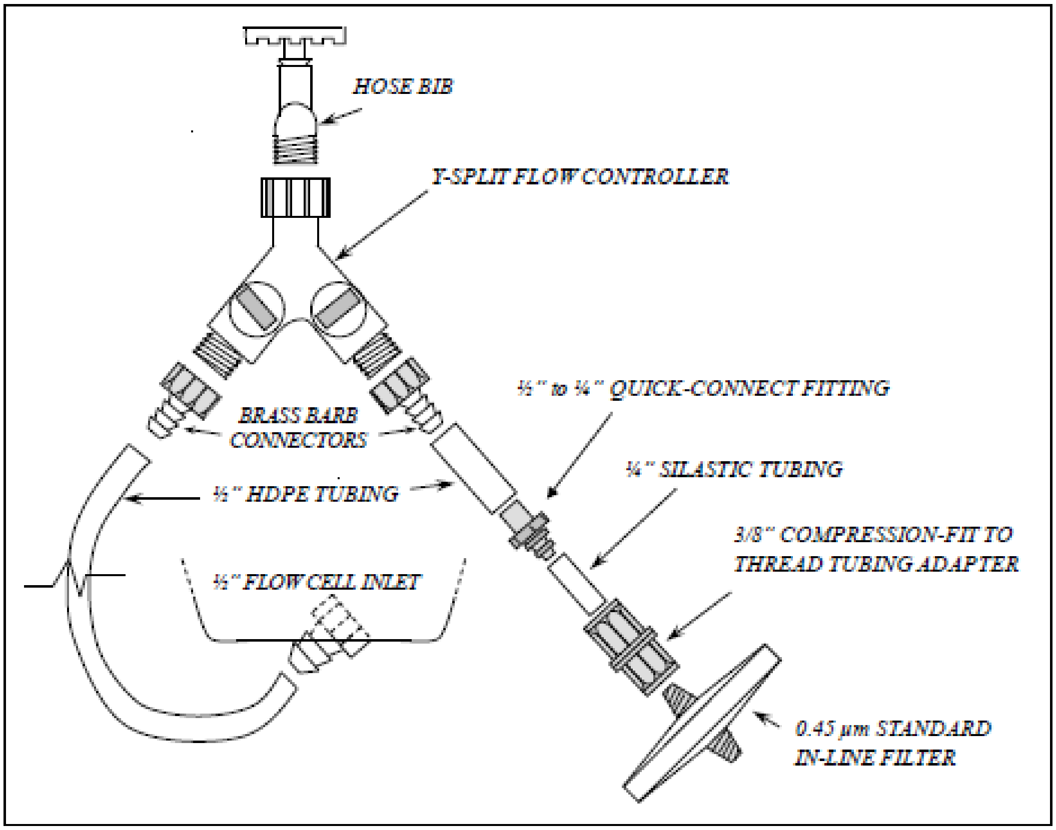

Figure 5. Schematic of the apparatus typically used for supply well purging and sample collection (after Marti, 2011).

The instream piezometers will be sampled using a peristaltic pump and a length of ¼-inch ID laboratory-grade HDPE tubing. The tubing will be lowered into the piezometer until the tubing intake lies adjacent to the piezometer perforations. The piezometers will be pumped at low flow rates (< 0.5 liter/minute) during purging and sampling to minimize drawdown and the potential for downward annular leakage of river water into the piezometer. During pre-sample purging, water temperature, specific conductance, pH, and DO concentrations will be measured at 3-minute intervals using a Hydrolab DataSonde® and flow-cell. Purging will continue until field parameters have stabilized.

All water samples (both surface water and groundwater) will be collected in pre-cleaned bottles supplied by Manchester Laboratory. Table 7 summarizes the container requirements, sample volume, method of preservation, and maximum permissible holding time for the various target analytes. All laboratory-bound samples with the exception of total phosphorus and total alkalinity will be field filtered using QED™ 0.45 um inline capsule filters. A minimum of 200 ml of sample water will be purged through the filter and discarded before the first sample bottle is filled.

The river samples at the ambient site will initially be collected in clean poly bottles and then transferred or filtered into analyte-specific sample containers as appropriate (Table 7). The river samples at the IEP site and all groundwater samples will be collected or filtered directly into analyte-specific containers. Once filled, the sample containers will be labeled and placed in ice- filled coolers for short term storage. At the end of each field day, the day's samples will be transferred to another cooler where they will be packaged with blue ice and shipped by air to Manchester Laboratory for analysis. Standard chain-of-custody procedures will be followed throughout sample collection, transport, and processing. All sampling equipment will be thoroughly cleaned and rinsed with deionized water and secured in a clean location between sampling events.

Table 7. Sample containers, preservation, and holding times.

Parameter	Container [2]	Preparation	Holding time
Total Alkalinity	500 mL poly	Completely fill bottle, cool to $4^{o}C$	14 days
Chloride[1,4]	500 mL poly	Filter, cool to $4^{o}C$	28 days
Sulfate[1,4]	500 mL poly	Filter, cool to $4^{o}C$	28 days
Nitrate/nitrite[1]	125 mL poly	Filter, H_2SO_4 to pH <2, cool to $4^{o}C$	28 days
Total Phosphorus	60 mL poly[3]	1:1 HCl to pH < 2, $4^{o}C$	28 days
Total Dissolved Phosphorus[1]	60 mL poly[3]	Filter, 1:1 HCl to pH <2 $4^{o}C$	28 days
Ortho-Phosphate[1]	125 ml amber poly	Filter, cool to $4^{o}C$	48 hours
Total Reactive Phosphorus	125 ml amber poly	Cool to $4^{o}C$	48 hours
Cations[1] (Ca, Mg, Na, K, Si, Fe)	500 mL HDPE bottle[3]	Filter, HNO_3 to pH<2, cool to $4^{o}C$	6 months

[1] Dissolved sample fraction
[2] Sample containers will be supplied by Manchester Laboratory.
[3] Bottles are pre-acidified by Manchester Laboratory before shipping to field lead.
[4] These analytes may be collected in a single bottle.
Note: IEP may elect to split samples for analysis they require for their own purposes.

Quality Control Procedures

Field Quality Control

All field meters used during this project will be calibrated in accordance with the manufacturer's instructions prior to the start of each sampling event (Swanson, 2007) Meters will be rechecked using certified reference standards at the end of each sampling event to confirm they haven't drifted unacceptably since the pre-sampling calibration.

Blind field replicate samples[4], comprising at least 5% of total samples, will be submitted to the laboratory to assess random error. Replicate locations will be selected on the basis of existing information for the first sampling round and on the initial analytical results for later rounds. An equipment/filtration blank will be submitted to the laboratory during the first sampling event (for all laboratory parameters) to confirm the project sampling and filtration procedures are not contributing contamination or bias to the analytical results. During subsequent sampling rounds, filtration blanks will be collected at the same frequency as replicates and analyzed for all parameters that were evaluated during that sampling event (Table 7).

Representativeness

To minimize the potential for leakage of river water along the outside of piezometer casing, all sampled instream piezometers will be driven to a minimum depth of at least 3 feet. Additionally, low flow sampling techniques (< 0.5 liters/minute) will be used to minimize drawdown within the piezometer during purging and sampling. Where necessary, clean fine-grained silica sand (or local fine-grained streambed sediments) may be packed around the piezometer casing after installation to create a low permeability seal between the piezometer pipe and adjacent sediments. Prior to sampling each piezometer the adjacent surface water will be measured to establish the temperature, pH, conductivity and DO levels of the river. These values will be compared to the groundwater values measured during piezometer purging to provide secondary confirmation of the piezometer seal effectiveness.

Completeness

To maximize the amount of usable data collected during this study, we will follow accepted protocols for water quality data acquisition (Ward, 2007; Ward and Mathieu, 2011). Only appropriately calibrated and maintained field equipment will be used. All samples will be packaged and managed to minimize the potential for sample damage, delay, or loss during their transit to the laboratory.

[4] Replicates consist of two samples taken at the same location and time. Field blanks consist of laboratory-supplied deionized water that is processed as a sample (filtered, preserved, cooled) and returned to Manchester Lab for analysis.

Comparability

To help ensure data comparability, between this project and other sampling conducted by Ecology's ambient monitoring program, the sampling, handling, and analysis techniques for the target analytes will follow standardized procedures to match those being employed by other investigators.

Laboratory Quality Control

Manchester Laboratory will follow their standard operating procedures (MEL, 2008). Alternate analytical methods may be substituted as long as they are comparable to the laboratory's standard method and meet the reporting limits specified in Table 3. Laboratory quality control will consist of lab control samples, method blanks, analytical duplicates, and matrix spikes (Table 8).

Table 8. Field and laboratory quality control samples.

Parameter	Field		Laboratory			
	Blanks	Replicates	Check Standards	Method Blanks	Analytical Duplicates	Matrix Spikes
Hydrolab (pH, DO, T Cond)	N/A	1/trip	N/A	N/A	N/A	N/A
Nutrients, cations	5%	5%	1/batch	1/batch	1/batch	1/batch
Total Suspended Solids (TSS), alkalinity and turbidity	5%	5%	1/batch	1/batch	1/batch	N/A

Data Management Procedures

All field measurements and water quality results will be recorded in a field notebook or on site-specific data sheets at the time of sampling. The field lead will review and verify that all measurements are made and appropriately recorded before leaving each sampling site. Verified field measurements will later be input in the Environmental Information Management (EIM) data repository (as appropriate).

Data generated by Manchester Laboratory will be managed by the Laboratory Information Management System (LIMS) and sent to the project lead in both electronic and hard copy format. The case narratives included with the data package from Manchester Laboratory will be reviewed for any problems that may have been encountered during sample analysis and to understand any corrective action taken, or for changes that may have been made to the requested analytical method. Laboratory data and quality control results will be reviewed against the project data quality objectives to evaluate data quality.

The final verified and qualified results will be input into the EIM system.

Audits and Reports

Manchester Laboratory participates in performance and system audits of their routine procedures. The audit results are available upon request.

Data Verification and Validation

Verification of laboratory results is normally performed by a Manchester Laboratory unit supervisor or an analyst experienced with the analytical method. Verification involves a detailed examination of each data package to determine whether method data quality objectives have been met. Manchester Laboratory's standard operating procedures and EPA's functional guidelines are followed when performing the data assessment. Manchester Laboratory staff will provide a written report of their data review detailing whether:

- Measurement quality objectives were met.
- Proper analytical methods and protocols were followed.
- Calibrations and control were within limits.
- Data were consistent, correct, and complete. (MEL, 2008)

After receiving each laboratory-verified data package, the project lead will compare the quality assurance and analysis performance information against the project data quality objectives. Data will be assessed for completeness and for indications of bias introduced by field procedures. If necessary the sampling approach, quality control steps, or analytical procedures will be modified for future sampling rounds to address identified problems.

Precision

The percent relative standard deviation (%RSD) will be calculated for duplicate sample results to define the degree of random variability introduced by sampling and analytical procedures. The resulting values will be compared to the project data quality objectives (Table 3).

Bias

The laboratory's reported results for spike recoveries, blanks, instrument calibration, and control samples will be evaluated to determine the extent of any analytical bias in the sampling results. The evaluation results will be compared to the project data quality objectives (Table 3).

Completeness

The precision and bias assessments will be used to identify those analytical results that fail to meet the data quality objectives of the project. In addition, the required versus actual holding times prior to analysis for each sample will be evaluated to confirm the reported values are valid. Based on the assessments described above, the data will be accepted, accepted with qualifications, or rejected as unusable. The project manager will decide on final acceptance of the project data.

Data Quality (Usability) Assessment

After the final round of analytical results is received from the laboratory, the overall project data set will be evaluated for representativeness and completeness by the project manager. Data error(s) will be assessed against the initial project goals and the project manager will determine whether the data are of sufficient quality to meet the project objectives.

Reporting

A draft report will be prepared and forwarded to the internal reviewers in EAP and Ecology's Eastern Regional Office within six months of receiving the final round of sample results from Manchester Laboratory. The report will include the following elements:

- A description of the project purpose, goals, and objectives.
- Map(s) of the study area and sampling sites.
- Descriptions of field and laboratory methods.
- A discussion of data quality and the significance of any problems encountered in the analyses.
- Summary tables of field and laboratory chemical data.
- Observations about significant or potentially significant findings.
- Possible recommendations related to the project goals.

The final data report should be ready for publication within three months of receiving review comments on the draft report.

References

Cusimano, B., 2004. Spokane River and Lake Spokane (Long Lake) Pollutant Loading Assessment for Protecting Dissolved Oxygen. Washington State Department of Ecology, Publication No. 04-03-006. 101 p. plus appendices. www.ecy.wa.gov/biblio/0403006.html

Janisch, J., 2006. Standard Operating Procedure for Determining Global Position System Coordinates, Version 1.0. Washington State Department of Ecology, Olympia, WA. SOP Number EAP013. www.ecy.wa.gov/programs/eap/quality.html

Joy, J., 2006. Standard Operating Procedure for Manually Obtaining Surface Water Samples, Version 1.0. Washington State Department of Ecology, Olympia, WA. SOP Number EAP015. www.ecy.wa.gov/programs/eap/quality.html

Kahle, S.C., Caldwell, R.R., and Bartolino, J.R., 2005. Compilation of geologic, hydrologic, and ground-water flow modeling information for the Spokane Valley-Rathdrum Prairie aquifer, Spokane County, Washington, and Bonner and Kootenai Counties, Idaho. U.S. Geological Survey Scientific Investigations Report 2005-5227, 64 p. plus 2 plates.

Kahle, S.C., and Bartolino, J.R., 2007. Hydrogeologic framework and ground-water budget of the Spokane Valley-Rathdrum Prairie Aquifer, Spokane County, Washington, and Bonner and Kootenai Counties, Idaho. U.S. Geological Survey Scientific Investigations Report 2007-5041. 50 p. plus 2 plates.

Marti, P.B., 2011, Standard Operating Procedure for Purging and Sampling Water Supply Wells. Washington State Department of Ecology, Olympia, WA. SOP Number EAP077, Version 1.0. www.ecy.wa.gov/programs/eap/quality.html

MEL, 2006. Manchester Environmental Laboratory Quality Assurance Manual. Manchester Environmental Laboratory, Washington State Department of Ecology, Manchester, WA.

MEL, 2008. Manchester Environmental Laboratory Lab Users Manual, Ninth Edition. Manchester Environmental Laboratory, Washington State Department of Ecology, Manchester, WA.

Sinclair, K. and Pitz, C., 2010, Standard Operating Procedure for installing, measuring, and decommissioning hand-driven in-water piezometers. Washington State Department of Ecology, Olympia, WA. SOP Number EAP061. Version 1.1. www.ecy.wa.gov/programs/eap/quality.html

Swanson, T., 2007. Standard Operating Procedure for Hydrolab® DataSonde® ® and MiniSonde® Multiprobes, Version 1.0. Washington State Department of Ecology, Olympia, WA. SOP Number EAP033. www.ecy.wa.gov/programs/eap/quality.html

Ward, W.J., 2007. Collection, Processing, and Analysis of Stream Samples, Version 1.3. Washington State Department of Ecology, Olympia, WA. SOP Number EAP034. www.ecy.wa.gov/programs/eap/quality.html

Ward, W.J., and N. Mathieu, 2011. Standard Operating Procedures for the Collection and Analysis of Dissolved Oxygen (Winkler method), Version 2.1. Washington State Department of Ecology, Olympia, WA. SOP Number EAP023. www.ecy.wa.gov/programs/eap/quality.html

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APPENDIX D2 - RESPONSE TO COMMENTS FOR AMENDMENT TO PROPOSED NPDES PERMIT WA-0000825
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Appendix. Glossary, Acronyms, and Abbreviations

Glossary

Ambient: Background or away from point sources of contamination.

Conductivity: A measure of water's ability to conduct an electrical current. Conductivity is related to the concentration and charge of dissolved ions in water.

Dissolved oxygen (DO): A measure of the amount of oxygen dissolved in water.

National Pollutant Discharge Elimination System (NPDES): National program for issuing, modifying, revoking and reissuing, terminating, monitoring, and enforcing permits, and imposing and enforcing pretreatment requirements under the Clean Water Act. The NPDES program regulates discharges from wastewater treatment plants, large factories, and other facilities that use, process, and discharge water back into lakes, streams, rivers, bays, and oceans.

Nutrient: Substance such as carbon, nitrogen, and phosphorus used by organisms to live and grow. Too many nutrients in the water can promote algal blooms and rob the water of oxygen vital to aquatic organisms.

Parameter: A physical chemical or biological property whose values determine environmental characteristics or behavior.

pH: A measure of the acidity or alkalinity of water. A low pH value (0 to 7) indicates that an acidic condition is present, while a high pH (7 to 14) indicates a basic or alkaline condition. A pH of 7 is considered to be neutral. Since the pH scale is logarithmic, a water sample with a pH of 8 is ten times more basic than one with a pH of 7.

Point source: Sources of pollution that discharge at a specific location from pipes, outfalls, and conveyance channels to a surface water. Examples of point source discharges include municipal wastewater treatment plants, municipal stormwater systems, industrial waste treatment facilities, and construction sites that clear more than 5 acres of land.

Total Maximum Daily Load (TMDL): A distribution of a substance in a waterbody designed to protect it from not meeting (exceeding) water quality standards. A TMDL is equal to the sum of all of the following: (1) individual wasteload allocations for point sources, (2) the load allocations for nonpoint sources, (3) the contribution of natural sources, and (4) a margin of safety to allow for uncertainty in the wasteload determination. A reserve for future growth is also generally provided.

Total Suspended Solids (TSS): The portion of total solids retained by a glass fiber filter and dried at 103-105^{o}C

Acronyms and Abbreviations

DO	(See Glossary above)
Ecology	Washington State Department of Ecology
EAP	Environmental Assessment Program
EPA	U.S. Environmental Protection Agency
EIM	Environmental Information Management database
GPS	Global Positioning System
IEP	Inland Empire Paper
NCCW	Non-contact-cooling water
NPDES	(See Glossary above)
QA	Quality assurance
RSD	Relative standard deviation
SOP	Standard operating procedure
TMDL	(See Glossary above)
TSS	(See Glossary above)
WRIA	Waster Resource Inventory Area

Units of Measurement

°C	degrees centigrade
s.u.	standard units
mg/L	milligrams per liter
ug/L	micrograms per liter (parts per billion)
umhos/cm	micromhos per centimeter, a unit of conductivity