

**APPLICATION FOR RENEWAL OF NPDES PERMIT NO. WA-002515-1**

Attachment B

Page 1 of 8

Attachment B – Schedule of Compliance Final Report  
(7 pages)

## **SCHEDULE OF COMPLIANCE FINAL REPORT**

Columbia Generating Station (CGS)  
October 2010

In accordance with National Pollutant Discharge Elimination System (NPDES) Wastewater Discharge Permit No. WA-002515-1, Special Condition S11.C, the following is the Schedule of Compliance Final Report. Discrete tasks required by the permit Schedule of Compliance are summarized herein. The permit Schedule of Compliance requires the Permittee to submit a series of reports for discharges to surface and ground water. The results of these reports are summarized herein.

### **A. Discharges to Surface Water**

#### **1.0 Outfall Evaluation**

Special Condition S11.A.1 required Energy Northwest to perform an integrity inspection of the exposed portion of the discharge structure and to assess sediment deposition in the vicinity of the outfall. The Special Condition also required photographic verification.

An inspection of the CGS Outfall 001 was performed on October 5, 2006 by Energy Northwest and Shuksan Fisheries Consulting personnel utilizing a power boat and underwater video recording equipment. Video recording was conducted from approximately 1130 hours to 1200 hours. Video capture techniques were also used to produce still photos of the discharge structure.

Subsequent review of the video recording indicated that the discharge structure's integrity is sound and that sediment deposition is minimal if not non-existent. There is no evidence of damage to the exposed portion of the discharge structure nor is there any indication of discharge water escaping prior to exiting the outfall opening (port). There are no structures (rocks/debris) blocking or impacting the flow from the discharge opening. Steel cable, possibly used during the installation process, and clamp/rope assemblies from the discontinued benthic monitoring program, are evident at the west and south ends of the discharge structure.

Video recordings, photos, and field observations by inspection personnel indicated that the Outfall 001 discharge structure is in its original configuration and functioning as designed to provide rapid vertical mixing of CGS discharge (blowdown) water.

#### **2.0 Effluent Mixing Study**

Special Condition S11.A.2 required Energy Northwest to perform an Effluent Mixing Study for Outfall 001 to determine the degree of effluent and receiving water mixing which occurs within the mixing zone. The primary objective of this study was to establish new dilution factors of the effluent within the authorized regulatory mixing zone (RMZ) under critical ambient flow conditions using updated modeling methodologies.

The revised dilution factors were used to calculate new effluent limits for copper and to assess other components of the effluent for compliance with the water quality standards. In addition, the new dilution factors determined in this study will be used to re-characterize the discharge for whole effluent toxicity.

The study was comprised of two major components including application of a steady-state mixing zone model to determine new dilution factors (Energy Northwest Dilution Modeling Analysis), and performance of an in-situ tracer study for model validation (Field Monitoring Dilution Study).

### **2.1 Model Selection and Modeling Results**

The CORMIX Hydrodynamic Mixing Zone Model, specifically CORMIXI - Version 5.0, was selected for use in the dilution modeling analysis. Dilution modeling was performed on 9 case studies. Case 1 and 2 represent the critical condition: 7Q10 low ambient summer flow, maximum ambient temperature, 95<sup>th</sup> percentile discharge temperature, highest daily maximum discharge flow (acute), and highest monthly average discharge flow (chronic). Per Ecology guidance, dilution results for cases 1 and 2 were evaluated for use in assessing the discharge during critical condition periods for compliance with the water quality standards and to develop new discharge limits. Dilution factors derived for Case 2 are more conservative and thus were selected for use in performing reasonable potential calculations and in determining effluent limits. Dilution factors of 9 and 93 were applied to the acute and chronic boundaries, respectively.

### **2.2 Discussion and Results**

Ambient water quality field studies were performed to establish an adequate database for modeling. Sampling was conducted immediately upstream of the discharge structure and mixing zone from December, 2006 to March, 2008 and included increased sampling frequency during the low ambient flows experienced in September and October. Concentrations were low and near the detection limit for a majority of the parameters.

Effluent pollutants data was collected to assess the discharge for compliance with water quality standards. This data was used in conjunction with the ambient "background" data to calculate the maximum expected effluent concentration and reasonable potential determinations for certain parameters. Sampling of the effluent was performed from July, 2006 to June, 2008. Results of effluent monitoring indicated that a majority of the constituents in the discharge had concentrations below the water quality standards applicable to this outfall. Several parameters were in compliance in 100 percent discharge water. All of the listed parameters were in compliance with the human health based criteria when applying the 50<sup>th</sup> percentile and chronic dilution factor (93).

Copper and zinc concentrations in the effluent warranted reasonable potential determination calculations for these parameters to assess compliance with the surface water quality standards. Results for zinc indicate that the concentration at the edge of the acute and chronic mixing zones is substantially below the water quality criteria. For

copper, the concentration at the edge of the acute and chronic mixing zones is also below the criteria, with the acute prediction being just slightly under the water quality limit.

### **2.3 Model Validation – Field Monitoring Dilution Study**

The CORMIX1 model was validated by performance of the in-situ tracer study (Field Monitoring Dilution Study). MixZon, Inc. performed an assessment of the mixing zone using a remote sensing water quality monitoring platform. Results of the in-situ tracer study, including field observations and associated modeling, were in good agreement with the results of the modeling performed for the various case studies. Field monitoring results indicated a dilution of greater than 68 at the edge of the RMZ while modeling predicted a dilution of approximately 66 for an ambient flow of 40.9 kcfs. This result lines up well with the results for the case studies with ambient flows bracketing the field study conditions. 7Q10 low flow (52.7 kcfs) modeling at effluent discharge rates and conditions similar to the effluent flows observed in the field study (Case 2, acute) predicted a dilution at the RMZ of 93. The predicted dilution for an ambient flow of 36 kcfs and conditions similar to those observed in the field study (Case 4, acute) was 58. Modeling used to produce the dilution factors utilized in the development of the effluent limits proposed for copper in this study appears to be appropriate for this task.

### **2.4 Effluent Limit Calculations and Conclusions**

Final effluent limits were established using a waste load allocation (WLA) process that includes acute and chronic dilution factors from critical condition modeling, water quality criteria, receiving water chemical characteristics, and effluent chemical characteristics. Effluent limits for copper were calculated per ecology guidance using the input values utilized in the reasonable potential determination calculation. The acute long term average (LTA) value is the most limiting and was therefore used to develop the maximum daily effluent limit and the monthly average effluent limit. The proposed effluent limits for copper are 89 µg/L maximum daily and 67 µg/L average monthly. These proposed water quality-based limits for copper were not modified utilizing a water effect ratio (WER). Use of the 7Q10 low flow condition in the absence of a WER is a conservative approach which will continue to be protective of the aquatic environment in the Columbia River.

### **3.0 Whole Effluent Toxicity (WET) Testing**

Special Condition S11.A.3 requires Energy Northwest to conduct WET Testing for Outfall 001 discharge. Since the CGS main condenser will be replaced during the 2011 refueling outage (R-20), Energy Northwest petitioned the Energy Facility Site Evaluation Council (EFSEC) to suspend the WET testing requirement and related schedule of compliance. In a letter dated January 15, 2009 EFSEC approved delay of WET Testing until after replacement of the main condenser modules in 2011.

## **B. Discharges to Ground Water**

### **1.0 Scope of Work**

Special Condition S11.B.1 required Energy Northwest to submit a scope of work for the ground water quality study to the EFSEC for review and approval by {one year after the effective date}. The scope of work document was provided in a letter dated 6/28/07 (GO2-07-102). The scope of work document provided a description of Outfall 002 and 003, an updated summary of the hydrogeology at the CGS site including an evaluation of the existing monitoring well network, and a general outline of the proposed monitoring program designated for implementation during the third year of the permit cycle.

The proposed monitoring program was based on the findings and recommendations presented in the current hydrogeology/well evaluation study,<sup>(1)</sup> previous water quality data associated with the two outfalls, current NPDES permit requirements, Department of Ecology guidance,<sup>(2)</sup> and the groundwater criteria contained in WAC 173-200.<sup>(3)</sup> The plan also incorporates, where appropriate, protocol established during the development and performance of the groundwater quality study performed in 1998.<sup>(4,5,6)</sup>

### **2.0 Quality Assurance Project Plan**

Special Condition S11.B.2 required Energy Northwest to submit a quality assurance project plan (QAPP) for the ground water quality study to the EFSEC for review and approval by {two years after the effective date}. The QAPP was provided in a letter dated 9/28/07 (GO2-07-138). The QAPP was a follow-up to the scope of work and proposed details of the ground water monitoring plan. The QAPP described the monitoring well network, frequency and duration of sampling, monitoring parameters, sampling protocols, quality assurance program, and reporting requirements. The QAPP also included a complete listing of monitoring parameters for each well.

### **3.0 Ground Water Quality Study**

In accordance with Special Condition S11.B.3, the ground water quality study was conducted during the third year of the permit cycle. Monitoring commenced in July of 2008 and continued on a quarterly basis through July 2010. Sampling of ground water was conducted up-gradient and down-gradient of Outfalls 002 and 003.

### **4.0 Ground Water Quality Study Report**

Special Condition S11.B.4 requires Energy Northwest to submit the Ground Water Quality Study Report as part of the Schedule of Compliance Final Report (with the next application for permit renewal). The complete Ground Water Quality Study Report was provided as an attachment to the NPDES application for permit renewal.

The Ground Water Quality Study Report provides results of the two year monitoring program. Monitoring results for groundwater elevations, pH, conductivity, temperature, metals, cations, anions, total dissolved solids, total alkalinity, total phosphorus, volatile organic compounds, and semivolatile compounds are provided and discussed in the report.

#### 4.1 Conclusions

Results of the two year study indicate that groundwater in the unconfined aquifer in the vicinity of CGS is influenced by plant operations, namely from effluent discharges at the outfalls and infiltration from the large volume water systems, specifically the circulating cooling water system. Additionally, several of the chemical constituents measured in this study may be indicative of bulk water and potable water treatment practices and techniques. Measurements for arsenic, chromium, iron, manganese, mercury, nickel, sodium, nitrate, total dissolved solids, and bromoform had reported concentrations from at least one sample that was in excess of the respective water quality criterion.

Measured concentrations of several parameters were higher at MW3, located adjacent to the cooling towers, than at up-gradient MW5. The presence of chloroform and bromoform, and potentially arsenic, in well samples associated with Outfall 002 are indicative of potable water treatment practices. In addition, the false positive tests for selenium (with a known interference from bromine), at several of the wells may also indicate the presence of potable water treatment chemicals.

Well depth measurements at each well generally showed a declining trend throughout the course of the study with the exception of high discharge periods at Outfall 002.

The results of the Ground Water Quality Study appear to corroborate the findings presented in the 2007 hydrogeology study.

#### 4.2 Recommendations

Energy Northwest recommends the continuation of ground water monitoring on a quarterly basis. Energy Northwest also recommends an increase of monitoring of surface water discharges at Outfall 002 from bi-annually to quarterly of the same parameters as ground water monitoring. Additionally, we recommend monthly grab sampling of Outfall 002 discharges for pH, conductivity, TDS, metals and anions.

#### C. NPDES Permit No. WA-002515-01 Submittals

The following table is a summary of report submittals required by the current permit. References are provided with the submittal date and Energy Northwest letter number.

Permit Condition	Submittal Description	References
S2.A.1.b	Characterization of Blowdown for Asbestos Fibers-Outfall 001	Asbestos sample collected 4/28/10; results included in permit renewal application (Form 2C, item V.D)
S3.A.1	Discharge Monitoring Report-Outfall 001	Monthly reports to EFSEC; copies to Washington Department of Ecology (WDOE)

<b>Permit Condition</b>	<b>Submittal Description</b>	<b>References</b>
S3.A.2	Discharge Monitoring Reports-Outfalls 002 and 003	Annual reports to EFSEC; copies to WDOE; letters dated 2/15/07 (GO2-07-032), 2/29/08 (GO2-08-023), 2/19/09 (GO2-09-038), and 2/18/10 (GO2-10-030)
S3.E	Noncompliance Notification	One noncompliance notification on 12/4/08; letters dated 12/9/08 (GO2-08-160), 12/23/08 (GO2-08-165)
S4.B	Reporting Bypasses	No instances of bypass during this permit period
S5.	Application for Permit Renewal	November 2010 Application for Renewal of NPDES Permit No. WA-002515-1
S6.C	Solid Waste Control Plan	Update included with permit renewal application (Attachment C)
S7.	Best Management Practices Plan	Update included with permit renewal application (Attachment D)
S8.C	Mixing Zone Plan of Study	Letter dated 8/07/07 (GO2-07-113)
S8.C and S11.A.2	Effluent Mixing Report	Letters dated 7/1/08 (GO2-08-096), and 11/26/08 (GI2-08-173)
S9.B.9, S9.B.10, and S11.A.3	Acute Toxicity Characterization Data, Summary Report	Whole Effluent Toxicity (WET) study delayed until after condenser replacement; letters dated 1/5/09 (GO2-09-003), and 1/15/09 (GI2-09-005)
S10.B.9, S10.B.10, and S11.A.3	Chronic Toxicity Characterization Data, Summary Report	WET study delayed until after condenser replacement; letters dated 1/5/09 (GO2-09-003), and 1/15/09 (GI2-09-005)
S11.A.1	Outfall 001 Evaluation	Letters dated 6/14/07 (GO2-07-090), and 11/26/08 (GI2-08-173)
S11.B.1	Ground Water Quality Study Scope of Work	Letter dated 6/28/07 (GO2-07-102)
S11.B.2	Ground Water Quality Study Quality Assurance Project Plan	Letter dated 9/28/07 (GO2-07-138)
S11.B.4	Ground Water Quality Study Report	Update included with permit renewal application (Attachment E)

Permit Condition	Submittal Description	References
S11.C	Schedule of Compliance Final Report	Update included with permit renewal application (Attachment B)
S11.D	Request of Extension of the Schedule of Compliance	WET study delayed until after condenser replacement; letters dated 1/5/09 (GO2-09-003), and 1/15/09 (GI2-09-005)

**References**

1. *Summary of Hydrogeology and Evaluation of Existing Groundwater Monitoring Wells for Outfalls 002 and 003 at the Columbia Generating Station, Battelle, PNWD-3845, June 2007*
2. *Implementation Guidance for the Ground Water Quality Standards, Washington State Department of Ecology, Pub. No. 96-02, Revised October 2005*
3. *Water Quality Standards for Ground Waters of the State of Washington, WAC 173-200*
4. *Hydrogeologic Study Plan for WNP-2 Effluent Discharge Sources, Hanford Site, Washington, Golder Associates, Inc. October 1996*
5. *Preliminary Monitoring Report, WNP-2 Outfalls 002 and 003, Hanford Site, Washington, Golder Associates, Inc. September 1997*
6. *Supply System Nuclear Plant No. 2 (mvP-2), Final Report on Groundwater Monitoring Program, Chasse, J.P. and T.A. Borak, Washington Public Power Supply System, April 1999*