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MEMORANDUM

DATE: May 18, 2011

FROM: David Dilks, Joseph Helfand

PROJECT: IEP

TO: Doug Krapas

CC:

SUBJECT: **Documentation of Alternate Spokane River TMDL Scenario – with Alternate Seasonal Limits for Inland Empire Paper**

Summary

The Spokane River Stewardship Partners (SRSP) are considering alternate loadings scenarios to determine if they will comply with the Lake Spokane TMDL. LimnoTech (2011) had recently conducted a CE-QUAL-W2 simulation for the SRSP dischargers, using alternate limits for the Idaho point sources and Spokane County. This memorandum documents a new simulation that amends the previous alternative by including alternate seasonal phosphorus limits for Inland Empire Paper. Results of this model simulation generally indicate compliance, aside from exceptions noted below, with the draft tests for "Compliance with Washington Water Quality Standards" as currently proposed by EPA.

Background

U.S. EPA and Washington Department of Ecology (Ecology, 2010) developed a Total Maximum Daily Load for nutrients and oxygen demanding materials designed to minimize the anthropogenic affects on dissolved oxygen in Lake Spokane. The Spokane River Stewardship Partners (SRSP) are considering alternate loadings scenarios to determine if they will comply with the Lake Spokane TMDL. LimnoTech (2011) had recently conducted a CE-QUAL-W2 simulation for the SRSP dischargers, using alternate limits for the Idaho point sources and Spokane County. This memorandum evaluates a new simulation that amends the previous alternative by including alternate seasonal phosphorus limits for Inland Empire Paper.

On October 27, 2010, EPA issued for discussion purposes a draft test for "Compliance with Washington Water Quality Standards", which would allow the results of a given CE-QUAL-W2 simulation to be assessed in terms of whether its results were consistent with the TMDL. This draft test for compliance had three criteria, all of which must be met:

1. The alternate scenario must not increase the spatial or temporal extent of Avista responsibilities, after results are rounded to 0.1 mg/l.
2. The alternate scenario must not decrease the dissolved oxygen concentration averaged across all Avista-affected segments and times.
3. The alternate scenario must not increase Avista's responsibility in any segment or time, after results are rounded to 0.1 mg/l.

The description of these compliance tests was modified slightly in an April 20, 2011 draft memorandum, which combined the first and third criteria above into a single description. The specific calculations conducted to determine equivalence remain the same between the October, 2010 and April, 2011 draft descriptions. These compliance criteria have not been finalized, and are used here for illustrative comparison purposes only.

The purpose of this memorandum is to document the new scenario being simulated in CE-QUAL-W2 and present its results. The memorandum is divided into sections discussing:

- Scenario Under Evaluation
- Interpretation of Results with Respect to Dissolved Oxygen Equivalency
- Total Phosphorus Loading to Lake Spokane across Alternatives

Scenario under Evaluation

This section describes the specific scenario being evaluated. Changes in effluent concentrations from those specified in the TMDL were specified for Post Falls, HARSB, Coeur d'Alene, Inland Empire Paper Company, and Spokane County. Effluent concentrations for Post Falls and HARSB were based on the concentrations that they requested during the TMDL Dispute Resolution process, with the primary changes being that more rigorous treatment begins in February. Concentrations specified to the model for these discharges are shown in Table 1. Effluent concentrations for Coeur d'Alene vary over time and are shown in Table 2. For the Spokane County discharge, rigorous CBOD treatment was initiated in February instead of March at a WLA of 2.0 mg/L CBOD5; TP was given a WLA of 50 ug/L March through October; and ammonia-nitrogen was given WLA levels of 16 mg/L in March (as a maximum daily limit), 1.0 mg/L in April and May, 0.25 mg/L June through September, and 1.0 mg/L in October. These concentrations are shown in Table 3. For the Inland Empire Paper discharge, TP was given a WLA of 70 ug/L for February through October, as shown in Table 4. Pollutant loads for the discharges specified in Tables 1 – 4 for time periods not provided in those tables were left unchanged from the model inputs used for the final TMDL. Likewise, model inputs for all other discharges were left unchanged from their TMDL values.

Table 1.

February – October Pollutant Concentrations for HARSB and Post Falls

	TP (ug/l)		**Ammonia (mg/l)**		**CBOD5 (mg/l)**	
	WLA	Permit	WLA	Permit	WLA	Permit
HARSB	50	70	2.9	4.0	2.9	4.0
Post Falls (desired conc.)*	50	70	4.0	5.6	4.0	5.6
Post Falls (model input)*	76.5	-	6.1	-	6.1	-

* Post Falls concentrations were entered into the model at 1.53x specified concentrations to reflect increase in discharge flow to 7.65 MGD, compared to 5 MGD assumed in TMDL.

Table 2.
Pollutant Concentrations for Coeur d'Alene for Periods of Rigorous Treatment

	Feb. – Oct. TP (ug/l)		**Mar.-Oct. Ammonia (mg/l)**		**Feb.-Mar. CBOD5 (mg/l)**		**Apr. – Oct. CBOD5 (mg/l)**	
	WLA	Permit	WLA	Permit	WLA	Permit	WLA	Permit
Coeur d'Alene	50	70	4.29	6	3.56	5	3.2	4.5

Table 3.
Pollutant Concentrations for Spokane County for Periods of Rigorous Treatment

	Mar. – Oct. TP (ug/l)		**March Ammonia (mg/l)**		**Apr. – May Ammonia (mg/l)**		**Jun. – Sep. Ammonia (mg/l)**	
	WLA	Permit	Max Daily Limit		WLA	Permit	WLA	Permit
Spokane County	50	60	16		1.0	1.2	0.25	0.3
	October NH3 (mg/l)		**Feb. – Oct. CBOD (mg/l)**					
	WLA	Permit	WLA	Permit				
Spokane County	1.0	1.2	2.0	2.4				

Table 4.

February – October Pollutant Concentrations for Inland Empire Paper

	TP (ug/l)	
	WLA	Permit
Inland Empire Paper	70	98

Interpretation of Model Results with Respect to Dissolved Oxygen Equivalency

The results of the new scenario generally comply, with exceptions noted below, with all three draft tests for "Compliance with Washington Water Quality Standards" as proposed by EPA:

1. It does not increase the spatial or temporal extent of Avista responsibilities, after results are rounded to 0.1 mg/l.
2. It improves the dissolved oxygen by 0.006 mg/l (relative to the TMDL) when averaged over all segments and times of Avista responsibility.
3. With 3 exceptions it does not increase Avista's responsibility in any segment or time, after results are rounded to 0.1 mg/l. Each of the three exceptions is characterized by a markedly low tolerance for any downward deviation from the TMDL before an increase in Avista's responsibility occurs. In addition, Avista's responsibility under this alternative would actually decrease in five instances. The three exceptions and five counter-balancing segments/periods are shown in Table 5.

Table 5.
Increases and Decreases in Avista Responsibility

Segment	Time Period	Tolerance (mg/L)	Result
188	July 1-15	0.0008	Increase
188	September 1-15	0.0001	Increase
186	September 16-30	0.0014	Increase
172	August 1-15	0.0992	Decrease
177	September 1-15	0.0824	Decrease
185	September 1-15	0.0994	Decrease
175	September 16-30	0.0989	Decrease
180	September 16-30	0.0983	Decrease

Total Phosphorus Loading to Lake Spokane across Alternatives

Interest was expressed by the SRSP regarding the total amount of phosphorus delivered to Lake Spokane across the range of loading scenarios that have been evaluated. Total phosphorus loads are generated by the CE-QUAL-W2 model for the linkage point between the Washington portion of the river model and the lake model. These loads were calculated on a monthly basis for the existing TMDL simulation and the scenario currently under consideration.

Results are tabulated in Table 6, and provided graphically in Figure 1. The scenario under consideration results in a 1% reduction in annual total phosphorus loading to the lake (115,585 kg vs. 116,783 kg) compared to the TMDL.

Table 6. Total Phosphorus Loading to Lake Spokane by Month for Scenarios Simulated

Month	TP Load (kg) from TMDL	TP Load (kg) from Current Run
Jan	23585	23585
Feb	21847	20598
Mar	6533	6334
Apr	5016	5079
May	8430	8466
Jun	2886	2892
Jul	1289	1313
Aug	789	804
Sep	1021	1050
Oct	2053	2102
Nov	20503	20533
Dec	22830	22830
Total	**116783**	**115585**

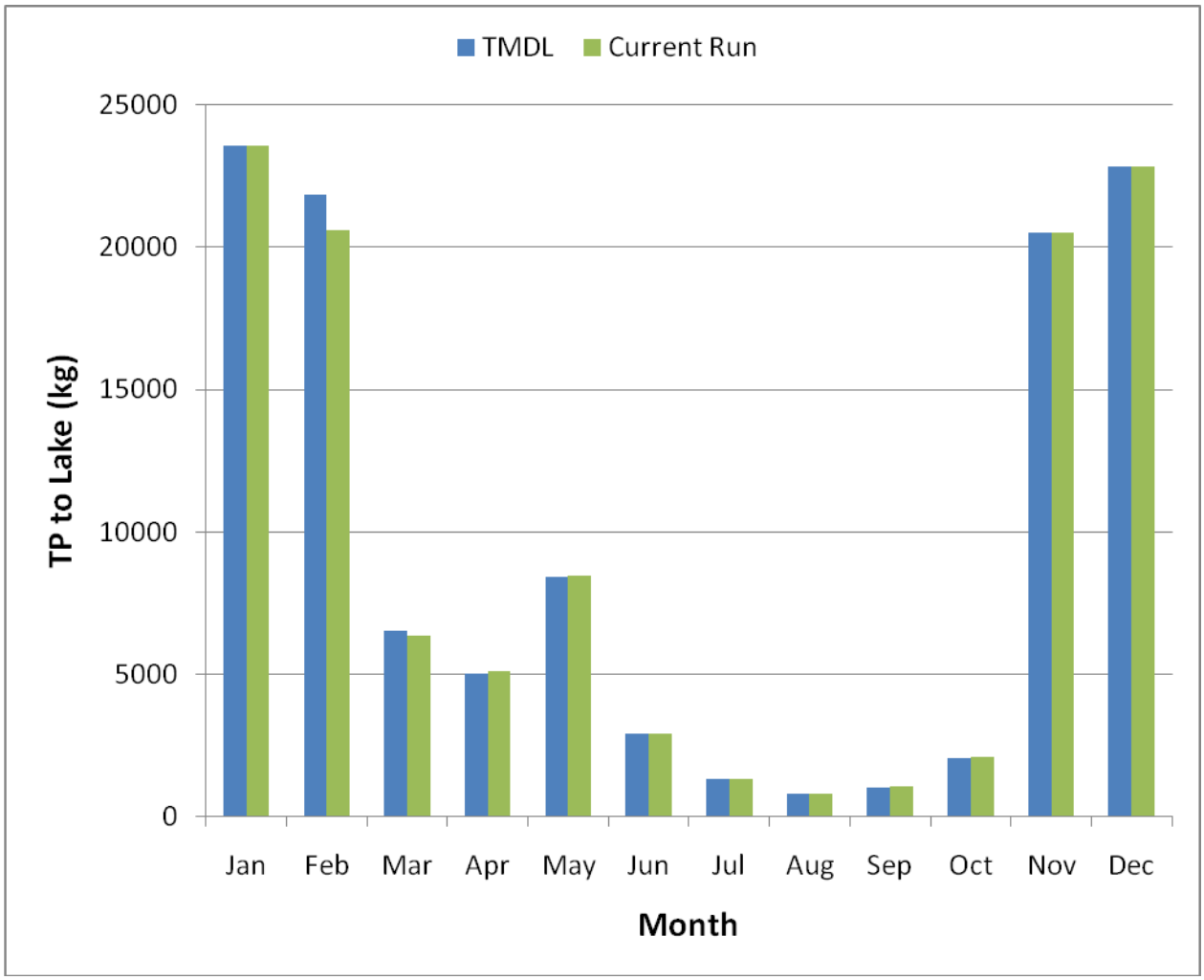

Figure 1. Total Phosphorus Loading to Lake Spokane by Month

References

LimnoTech, 2011. Documentation of Spokane River Stewardship Partners Alternate TMDL Scenario. May 4, 2011 draft.

Washington Department of Ecology, 2010. Spokane River and Lake Spokane Dissolved Oxygen Total Maximum Daily Load, Water Quality Improvement Report. Publication No. 07-10-073. Revised February 2010.