Knight, David T. (ERO) (ECY)

From: Larry Esvelt [Larry@Esvelt.com]
Sent: Wednesday, November 14, 2007 12:02 AM
To: Knight, David T. (ERO) (ECY)
Cc: Lars Hendron; Lee Mellish; Wayne Andresen; Dale Arnold; Mark Esvelt; Jim Kimball
Subject: Spokanen River TMDL - comments

Attachments: Comments 2007 Draft TMDL.doc

Comments 2007 Draft TMDL.doc (...

Dave:

Attached is a commets memo on the TMDL.

Thank you for your consideration.

Larry Esvelt
Larry A. Esvelt PhD PE DEE
Esvelt Environmental Engineering
7605 East Hodin Drive
Spokane WA 99212-1816

Ph 509-926-3049
Fax 509-922-3073
email Larry@Esvelt.com

Water Quality & Treatment / Wastewater Treatment: Studies, Design, Operation / Industrial Wastewater Management
ESVELT ENVIRONMENTAL ENGINEERING
7605 EAST HODIN DRIVE, SPOKANE, WA 99212-1816
Phone: 509-926-3049
Fax: 509-922-3073
www.esvelt.com

Review and Comments by Larry A. Esvelt PhD PE DEE

DRAFT Spokane River and Lake Spokane
Dissolved Oxygen Total Maximum Daily Load
Water Quality Improvement Report, September 2007
Washington Department of Ecology Publication No. 07-10-073

Please accept the following comments.

1. A Preliminary Draft of this document was released on September 2004. Comments were submitted at that time, which questioned the input parameters to the model, including assumptions regarding the following:

   a. Proportion of total phosphorus assumed as reactive (soluble ortho) phosphorus for model calibration, and extrapolation to the results of implementation of recommended treatment technology.

   b. Assumptions regarding Sediment Oxygen Demand (SOD).

   c. Algae chemical composition, settling rates, decomposition rates.

   The Department of Ecology and affected parties appear to agree that data regarding these factors that affect the simulation modeling of the river and Lake Spokane is essential for adequate evaluation of the effectiveness of remedial actions toward improvements in water quality resulting from actions called for in the TMDL Report. Determination of these factors should be a combined effort of Ecology and all affected parties.

2. Goals and objectives of the TMDL list clean water. Establishment of a management plan to reduce nutrients in the Spokane River and Lake Spokane to prevent low dissolved oxygen, excessive algae blooms and degradation of downstream water quality is the listed accomplishment toward meeting the goals and objectives.

   a. The TMDL appears to address only point source discharge of nutrients as in control strategies toward meeting water quality requirements.

   b. All potential impacts on the water quality should be addressed, including:

      1) Nutrients from other sources such as septic tanks, fertilizer use, runoff from various land uses.

      2) Nutrients from tributaries and land uses within the tributary areas that make contributions.

      3) Operation of the flow regime of the Spokane River due to upstream flow control operations, and operation of Long Lake Dam.

c. The TMDL assumes, based on an assumption in the Managed Implementation Plan, that other constituents potentially affecting dissolved oxygen, CBOD, NH3, will be controlled if phosphorus removal technology is adequate to reduce phosphorus to objective levels. This may not be an assumption that can be supported, since mechanisms for removal of CBOD and NH3 are not necessarily enhanced by technology for removal of phosphorus

3. The discussion in the Executive Summary indicates that Spokane Tribe water quality standard for dissolved oxygen may be violated in the river downstream of Long Lake Dam. It is not apparent in the TMDL report that this issue will be adequately addressed by the implementation plan.

4. The "Allocations Summary" for the TMDL report indicates that discharge quantities for phosphorus, ammonia and CBOD that must be achieved to meet the "Standard" of "load allocations _ _ _ that would not cause an oxygen depletion to exceed 0.2 mg/l from the natural condition." It is not explained that meeting this definition of the dissolved oxygen "standard" will not meet the needed water quality for fish habitat in the hypolimnion of Lake Spokane, and would expand the current habitable area (volume) relatively insignificantly. This is evidenced by graphs included in Figure 2 showing dissolved oxygen profiles for Lake Spokane, where complete removal of point source discharges from the river result in nearly imperceptible improvements in dissolved oxygen (according to the model – model depiction and actual data do not necessarily match, but are similar for the 2001 calibration and projection year).

   There is not mention of the improvements in water quality in the Spokane River and Lake Spokane resulting from actions taken by dischargers since 1977, when anoxic conditions existed in the hypolimnion of Lake Spokane during summer months. Dischargers in Washington have reduced discharges to the river by the approximate amounts as follows since that time:

   CBOD: Over 60,000 lb/day (biological "secondary" treatment by all WA and ID dischargers)

   Ammonia N: Over 4,000 lb/day (Nitrification by all WA and ID municipal dischargers)

   Phosphorus: Over 1,500 lb/day (85% removal by all WA and ID dischargers)

   These reductions, to meet "secondary" treatment and Best Practicable Treatment requirements along with the TP reductions in the 1989 phosphorus TMDL are currently in place. They are significant and deserve comparison with the reductions envisioned by the DO TMDL currently in review.

5. Quantities for the Wasteload Allocations (WLAs) for each of the 4 dischargers is presented. Based on the projected flows (projections through 2027) for each of the dischargers (except Kaiser) the constituent WLAs amount to concentrations of 0.010 mg P/l, 0.25 mg NH3/l, and 1.1 mg CBOD/l. None of the concentrations projected for these constituents have been demonstrated as achievable on a consistent basis.

a. Phosphorus removal to the concentration indicated has been demonstrated at a few locations, based on 50%ile performance, but the arithmetic average has not been demonstrated to be achieved. Success at those locations cannot be assured to be achievable for discharges to the Spokane River due to the differing conditions (diurnal flow variations (dischargers elsewhere frequently treated only a portion of the wastewater flow at a constant rate), processing of biosolids on the site for Spokane River dischargers). Analysis for phosphorus in water, and wastewater has been enhanced by improved analytical instrumentation, but most treatment plant laboratories are not yet equipped to perform analyses to the level expected for the effluents complying with the TMDL objectives. It appears that it is the responsibility of the Department of Ecology to assist in training and equipping laboratories to perform at the expected level.

b. NH3 removal to the concentration indicated is currently frequently achieved by dischargers, but removal inconsistencies due to temperature variations, upsets, etc., may result in the average concentration not being achievable even though the concentration is achieved up to 90% of the time.

c. The minimum detectable level (MDL) for CBOD is based on the sample (diluted sample) size and method of analysis. Traditionally oxygen depletion of 2.0 mg/l or greater has been considered necessary for determination of BOD during routine laboratory testing. This means that a BOD of 2.0 mg/l or greater can be determined, but that BOD (including CBOD) values less than that quantity would not be reliably measured. Since Dissolved Oxygen can be determined to greater precision than 2.0 mg/l, it appears that additional testing training and technique will be required of laboratory personnel and equipment than has been the case traditionally. It appears that it is the responsibility of the Department of Ecology to "raise the bar" for BOD testing to allow determination to the required levels.

6. It is estimated that compliance with the first stage of the Managed Implementation Plan by dischargers (achievement of 50 µg/l TP) will result in expenditures in excess of $100,000,000. An expenditure of this magnitude would appear to require an Environmental and Economic Impact Assessment to establish the most cost effective method of achieving the desired goals. Since this expenditure is not assured to improve aquatic habitat significantly (as shown in the TMDL report (again reference Figure 2.), consideration of other means to improve aquatic habitat should be considered and the cost effectiveness of alternatives compared.

7. Experience elsewhere with hypolimnion oxygenation has been shown to improve dissolved oxygen in the hypolimnion of reservoirs. Presentations to those involved in the collaboration leading to the Managed Implementation Plan indicated success at various locations. Liberty Lake has a pure oxygen diffuser system installed that improves the dissolved oxygen significantly. Application of oxygenation of the hypolimnion in Lake Spokane, if successful, has the potential for significantly improving the aquatic habitat of the reservoir, as well as improving the dissolved oxygen concentration downstream of Long Lake Dam, which now is not in compliance with dissolved oxygen standards according to reports by the Spokane Tribe. A demonstration study of oxygenation of the hypolimnion in Lake Spokane should begin immediately.

Implementation of oxygenation of the Lake Spokane hypolimnion may be much more cost effective than implementation of technology to achieve 10 µg/l of TP in the various wastewater effluents.

8. Based on observations of treatment systems most consistently meeting very low TP concentrations, in the vicinity of 10 µg/l, indicate that three phosphorus removal processes in series may be required.

   a. The initial phosphorus removal process is expected to consist of biological phosphorus removal or chemical addition to a biological process, with chemical coagulant dosage of approximately a mole ratio to phosphorus of 1.5- 2:1. This stage has been demonstrated to achieve about 0.5 mg/l (500 µg/l) of effluent phosphorus concentration.

   b. The second process, chemical precipitation, is expected to require a chemical coagulant mole ratio dose of about 5-10:1 to phosphorus, and is expected to achieve approximately 50 µg/l effluent TP concentration.

   c. A third chemical precipitation process, consisting of coagulant addition ahead of a filtration system is expected to require a dose of approximately 50-100:1 to achieve an additional reduction of one order of magnitude to 5 to 20 µg/l TP.

   Chemical costs for this treatment intensity will be significant, and will additionally result in sludge generation in significant quantities. Additional drawbacks are requirement of significant quantities of alkalinity and energy.

9. The construction cost requirements would appear to justify an economic impact analysis of the TMDL.

10. The chemical and power usage expected would appear to require that an environmental impact analysis be performed for the TMDL.