King Hill – C.J. Strike (Hydrologic Unit Code 17050101) Subbasin Assessment and Total Maximum Daily Load

ADDENDUM

March 8, 2006
June 1, 2006 (typographical corrections)

This addendum provides additional information to the King Hill - C.J. Strike Reservoir Subbasin Assessment and Total Maximum Daily Load, hereafter referred to as the King Hill-C.J. Strike TMDL. Its purpose is to explain the conditions used in the water quality and hydrodynamic model, CE-QUAL-W2, specifically to highlight that the TMDL assumes macrophytes and other organic matter entering C.J. Strike Reservoir are reduced by the same amount as total phosphorus. Further it is important to acknowledge that macrophyte and other organic matter reductions are as important as TP reductions in achieving water quality standards, and must be considered in implementation planning. This addendum also acknowledges that the reservoir and riverine portions of this TMDL were analyzed separately, and that a "less than or equal to" interpretation of the phosphorus target is only being applied relative to the reservoir.

The King Hill-C.J. Strike TMDL and the ensuing dissolved oxygen load capacity for C.J. Strike Reservoir are based on inflowing loads from the Snake River and the Bruneau River. The available data show that total phosphorus loading to the C.J. Strike Reservoir originates almost entirely from the Snake River and the Bruneau River with the Snake River by far accounting for the largest portion (see Table 47 King Hill - C.J. Strike reservoir SBA and TMDL).

The CE-QUAL-W2 water quality model simulated a water quality response in C.J. Strike Reservoir to the 0.075 mg/L total phosphorus (TP) target and other water quality conditions that are the expected to be achieved upon implementation of the C.J.Strike Reservoir nutrient TMDL.

A key assumption in the final model is that current dissolved, particulate, and coarse particulate organic matter (CPOM) values are reduced at the reservoir boundary (Indian Cove), at a rate equivalent to TP reductions needed to attain the 0.075 mg/L target established by the C.J. Strike Reservoir nutrient TMDL. While the CE-QUAL-W2 model Version 3.1 does not explicitly model macrophytes, simulated incoming CPOM

reductions were partitioned among both labile and refractory particulate organic matter compartments in the model using stoichiometric proportions. Boundary conditions were also adjusted so that the dissolved oxygen concentration would not fall below 6.0 mg/L. They also serve as the appropriate reservoir boundary conditions for modeling purposes. Additionally, sediment oxygen demand (SOD) in the C.J. Strike Reservoir was simulated to reach levels of 0.1 g m^{-2} day^{-1}. (This is a sum of SODD and SEDD in July as discussed in the attached memorandum regarding C.J Strike sediment oxygen demand.) This SOD is more typical of naturally occurring sediment oxygen demand levels.

The response of C.J. Strike Reservoir to full implementation of the less than or equal to 0.075mg/L TP target, CPOM reductions, and achieving a long-term baseline SOD of 0.1 g m^{-2} day^{-1} in C.J. Strike Reservoir, show substantial improvements in the reservoir metalimnetic dissolved oxygen concentrations. However, data shows that there are a small number of violations in the metalimnion even after long-term baseline conditions are achieved. An additional dissolved oxygen load allocation of 2.2 tons/year was assigned to C.J. Strike Reservoir. The intent of the dissolved oxygen allocation is to provide additional reservoir water quality improvements beyond those that would occur by attaining the nutrient target and addressing nuisance macrophytes in the Snake River upstream. The expectation is that Idaho Power Company will meet the 2.2 tons/year dissolved oxygen allocation via the TMDL implementation plan. The TMDL infers that while direct oxygenation of the metalimnion can be used, the installation of upstream BMPs that result in an equivalent 2.2 tons/year DO in the reservoir is acceptable.

Because organic matter was assumed to be reduced by the same amount as phosphorus in modeling CJ Strike Reservoir, this reduction of organic matter (including macrophytes) will need to be recognized and accounted for during implementation planning.

DEQ acknowledges that additional studies are needed to more fully understand the intricate relationships between DO, sediment, nutrients, and organic matter. Future studies will improve our understanding of complexities in reducing macrophytes. (See Section 2.3 Pollutant/Beneficial Use Support Status Relationships for DO; Sediment; Nutrients; Sediment/Nutrient Relationship; Floating, Suspended or Submerged Matter (nuisance Algae); Pesticides; and Total Dissolved Gas.) An updated version (3.5) of CE-QUAL-W2 is planned for release in the near future and will include macrophyte modeling capabilities. The model can be used to simulate primary production and the modification of velocities caused by increased levels of macrophytes. The model can also simulate macrophyte sloughing of leaves that contribute to downstream loading of CPOM. Application of this model to the King Hill reach of the Snake River would increase understanding of the linkage between CPOM and total phosphorus load reductions.