October 10, 2012

Technical Memorandum

To: Troy Smith; Idaho Department of Environmental Quality
From: Brian Hoelscher

Subject: total suspended solids target for Middle Snake River tributaries

Abstract:

There is no general total suspended solids (TSS) target protective of cold water aquatic life for tributaries to the Middle Snake River. Several methods have been used by the Idaho Department of Environmental Quality (IDEQ) to establish targets. Each method has limitations; primary among them knowledge of background conditions. Idaho Power evaluated available data and believes the preponderance of information indicates a TSS target about 20 milligrams per liter (mg/L) likely represents background conditions. A range of about 20─45 mg/L is likely protective of cold water aquatic life. TSS concentrations greater than about 80 mg/L likely would not be protective.

Rationale:

The IDEQ developed TSS targets for 2 tributaries to the Middle Snake River to address sediment impairment. The target for Succor Creek was 22 mg/L and represents background levels measured above the impaired waters. The target for Jump Creek was based on the correlation between turbidity and TSS and a turbidity target of 25 nephelometric turbidity units (NTU). The State has turbidity criteria for the protection of cold water aquatic life (IDAPA 58.01.02.250.02.e.).

> Turbidity, below any applicable mixing zone set by the Department, shall not exceed background turbidity by more than fifty (50) NTU instantaneously or more than twenty-five (25) NTU for more than ten (10) consecutive days.

A challenge with applying the State's turbidity criteria is *a priori* knowledge of background turbidity. Apparently, the IDEQ assumed background to be 0 NTU in establishing a 25 NTU, and therefore, a 65 mg/L TSS target for Jump Creek.

There is a moderate correlation (r^2=0.7914) between turbidity and TSS levels in the agricultural return flows and tributaries to the Middle Snake River sampled in 1995 and 2007 (Figure 1). Data when turbidity was greater than 1000 NTU was excluded from the analysis because 1000 NTU was the maximum level measured by the instrumentation. The corresponding TSS level at 25 NTU is 44 mg/L. Accounting for any background turbidity would increase the TSS target.

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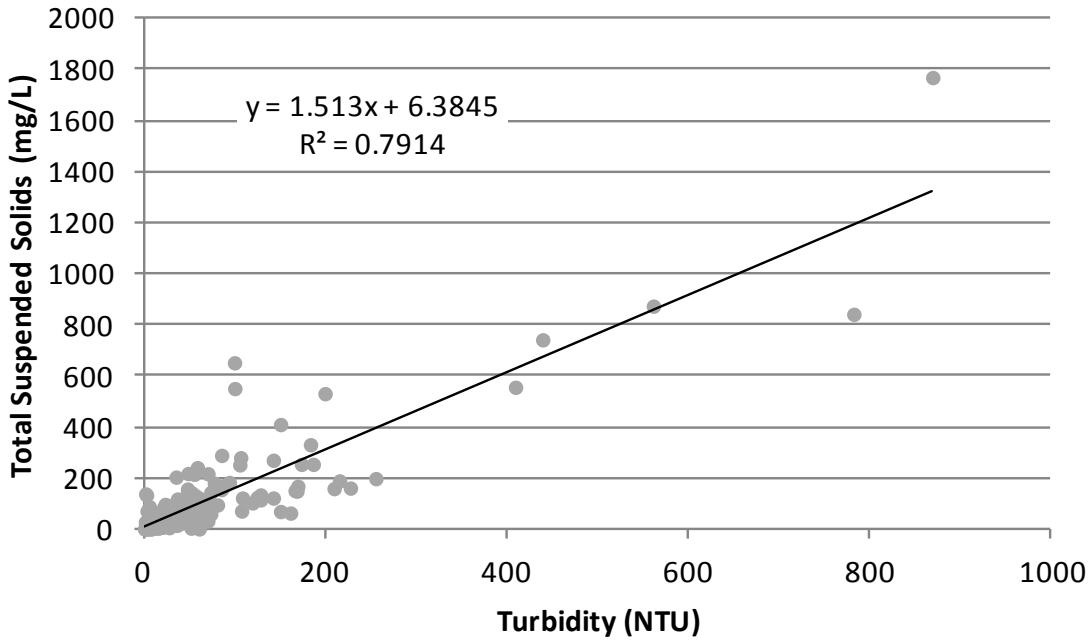

Figure 1
Turbidity in nephelpmetric turbdity units (NTU) and total suspended solids in milligrams per liter (mg/L) measured in select agricultural return flows and tributaries to the Snake River from C.J. Strike Dam to the Owyhee River in 1995 and 2007

A methodology developed by Karr et al. (1986), based on data distributions, has been used extensively for biological measures and may be appropriate for assessing pollutant levels protective of aquatic life uses. The U.S. Environmental Protection Agency recommended this methodology to determine reference conditions and divergent levels, thus beneficial use support, from a random distribution of measures (USEPA 1998). Data from severely impaired sampling locations, or events, can be excluded from this analysis. They stated this methodology was most appropriate if minimal non-anthropogenic reference sites exist or cannot be found. The methodology consists of trisecting the range of the population distribution from the 95th percentile to the minimum possible measure. Values greater than the 95th percentile are considered reference or best attainable condition. Since higher TSS Levels are indicative of lower water quality, the values less than the 5th percentile would be representative of reference or best attainable condition (Table 1). Values less than the 35th percentile represent measures that do not deviate significantly from these conditions, whereas, values from the 35th to the 65th percentile represent those sites that deviate slightly. Values greater than 65th percentile (values greater than the 95th percentile were excluded as it was assumed they represented severely impaired sites) represent those waters that deviate significantly and likely do not support the beneficial uses. A TSS target that would not be expected to deviate significantly from best attainable conditions, that is represents background conditions, was estimated to be 21 mg/L. It is noted the trisection of the data distribution may not accurately reflect desired water quality nor

directly relate to the designated uses. It is an attempt to classify sites by their distribution from suspected reference or best attainable conditions. That being said, a TSS target of about 20─80 mg/L would likely be variably protective of cold water aquatic life. TSS concentrations greater than about 80 mg/L likely would not be protective.

Table 1
Percentile total suspended solid concentrations in milligrams per liter for agricultural return flows and tributaries to the Snake River from C.J. Strike Dam to the Owyhee River in 1995 and 2007

Percentile	Concentration
5th	4
35th	21
65th	84
95th	1689

By contrast, TSS levels in the Snake River are regularly much lower than those measured in agricultural return flows and tributaries. The highest value measured in 2002-2003 immediately below C.J. Strike Dam was 22 mg/L. Knight and Naymik (2009) reported similar values in 2007 and the maximum inflow to Swan Falls Reservoir was 20 mg/L. The 95th percentile TSS level measured immediately below Hells Canyon Dam, assuming this location represents best attainable conditions, from 1991 through 2011 was 19 mg/L.

Literature Cited

Karr, J.R., K.D. Fausch, P.L. Angermeier, P.R. Yant, and I.J. Schlosser. 1986. Assessment of biological integrity in running water: a method and its rationale. Illinois Natural History Survey, Special Publication Number 5, Campaign, IL.

Knight, A. and J. Naymik. 2009. Evaluation of drain and tributary pollutant sources to C.J. Strike─Swan Falls reach, Snake River, Idaho. Idaho Power. Boise, ID. 46 p.

USEPA (U.S. Environmental Protection Agency). 1998 Lake and reservoir bioassessment and biocriteria technical guidance manual. U.S. Environmental Protection Agency, Office of Water, Washington D.C. EPA-841-B-98-007.