Proposed Sediment Targets for Indian Creek

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This memorandum is intended to briefly describe the development and selection of sediment targets that would be protective of aquatic life in Indian Creek.

Background

A preliminary suspended sediment target of 22 milligrams per liter (mg/L) was initially proposed by the Idaho Department of Environmental Quality (DEQ) for the Indian Creek TMDL, in part because it was believed to be protective of macroinvertebrates. However, a more extensive review of available literature did not reveal a consensus regarding a suspended sediment concentration that is protective of those organisms. Since the literature did not point to a clear conclusion, it was agreed that the same targets used for the Lower Boise River mainstem TMDL, which are protective of the most sensitive aquatic life use (juvenile salmonids such as rainbow trout), would also be appropriate for protection of Indian Creek.

New Proposed Basis

Newcombe and Jensen (1996) developed an effects-based model that could predict suspended sediment concentrations that would adversely affect various types and life stages of fish over a specified duration of exposure. The Newcombe and Jensen model was used to establish the following effects-based targets for the mainstem Boise River sediment TMDL: 80 mg/L over 14 days and 50 mg/L over 60 days.

The Newcombe and Jensen model established 14-day and 60-day targets, but other methods were required to transform those values into concentrations that would provide protection over other potentially important durations (daily, weekly, 30-day, and annual). The *Technical Support Document for Water Quality-Based Toxics Control* (United States Environmental Protection Agency [EPA], 1991), commonly referred to as the TSD, and *Options for Expressing Daily Loads in TMDLs* (EPA, 2007), were used to perform statistical transformations of the Newcombe and Jensen targets. First, both the 14-day criterion (analogous to the acute criterion) and 60-day criterion (analogous to the chronic criterion) were converted to the long term average (LTA), which was assumed to be equivalent to the annual target. The lower (more conservative) LTA was used as the "controlling" value. This controlling LTA was then used to calculate the daily value. This is consistent with the TSD method where the lower (controlling) LTA from the acute and chronic criteria is used to calculate daily limits.

One key variable in the EPA statistical transformations is the coefficient of variation (CV). In this case the CV was based on Indian Creek data collected upstream of the City of Nampa wastewater treatment facility from 2003 to 2009. These data are more reflective of a less-impacted stream system than the data at the mouth of Indian Creek. The data at the mouth are also strongly influenced by diverted Boise River water. The CV from data at the mouth were also examined but resulted in a less conservative (higher) LTA target.

Another key assumption in the transformation of these values is the number of samples that would be taken each month ("n"), and a value of one per month, or 12 per year, was assumed as a reasonable expectation for post-TMDL monitoring of the creek. The TSD also suggests that lower sampling frequency values should not be used. Using higher values of "n" would result in higher (less conservative) LTAs.

As noted above, the 60-day criterion yielded a lower (more conservative) annual value (LTA), so it was selected as the proposed annual target (presented in Exhibit 1) and was used for the next transformation to a maximum daily target. Statistical transformations of the 60-day criterion to weekly and 30-day targets were also evaluated, but the calculated values were not consistent with (too high) the Newcombe and Jensen criteria. Rather than force-fit the weekly and 30-day targets to statistical transformations, a more conservative approach was taken by linearly interpolating between the bounding values. This approach results in more conservative (lower) targets for those durations than is provided by the statistical transformation, will be protective of aquatic life, and leads to a more logical decrease in concentration with increase in duration, as presented in Exhibit 1. In addition, the EPA methods cited, particularly the 2007 guidance, provide clear guidance for transformations between daily and annual values.

EXHIBIT 1
Proposed Indian Creek Sediment Targets

Duration	Target Suspended Sediment Concentration (mg/L)	Approach
Daily	135	Statistical
Weekly	110	Linear interpolation
14-day	80	Effects-based
30-day	70	Linear interpolation
60-day	50	Effects-based
Annual	29	Statistical

References

EPA. 2007. Options for Expressing Daily Loads in TMDLs. Draft.

EPA. 1991. Technical Support Document for Water-Quality Based Toxics Control.

Newcombe, C.P, and J.O. Jensen. 1996. Channel Suspended Sediment and Fisheries: A Synthesis for Quantitative Assessment of Risk and Impact. North American Journal of Fisheries Management. Volume 16, Number 4.