



Klamath Settlement Process



Secretarial Determination

Summary of Klamath Secretarial Determination preliminary dioxin findings

August 12, 2010

Tables 1 and 2 present draft Toxicity Equivalency Quotients (TEQs) calculated for dioxin and furans from Klamath Reservoir sediments. These values are measured in picograms per gram (pg/g) or parts-per-trillion (pptr).

Table 1. Summary of TEQs calculated from dioxin and furan concentrations in samples from Klamath Reservoir and Estuary sediments, 2009-2010.

[Toxicity Equivalency Factors (TEFs) for individual dioxin and furan congeners used to calculate TEQs are from the World Health Organization (Van den Berg and others, 1998 and 2006) for human and mammalian toxicity, fish, and birds. Where concentrations for individual congeners were reported as a non-detection, a concentration of ½ of the detection limit for that congener was used in the calculation of TEQ]

Location	Site Code	TEQ (parts per trillion)		
		Humans & Mammals	Fish	Avian Species
JC Boyle Reservoir	CDH-S-007	7.09	5.04	6.23
JC Boyle Reservoir	CDH-S-008	6.17	4.28	5.51
Copco1 Reservoir	CDH-S-014	8.04	5.83	7.51
Copco1 Reservoir	CDH-S-015A	7.93	5.86	7.16
Iron Gate Reservoir	CDH-S-029	3.05	2.10	3.16
Iron Gate Reservoir	CDH-S-031	3.08	2.29	2.76
Iron Gate Reservoir	CDH-S-046	3.11	2.21	2.98
Lower Klamath Estuary	CHA-S-001	0.11	0.10	0.15
Upper Klamath Estuary	CHA-S-002	0.06	0.06	0.08

Table 2. Recalculated TEQs for dioxin and furan concentrations reported by Shannon and Wilson for samples from Klamath Reservoir-sediments taken in 2006.

[Toxicity Equivalency Factors (TEFs) for individual dioxin and furan congeners used to calculate TEQs are from the World Health Organization (Van den Berg and others, 1998 and 2006) for human and mammalian toxicity, fish, and birds. Where concentrations for individual congeners were reported as a non-detection, a concentration of ½ of the detection limit for that congener was used in the calculation of TEQ]

Location	Original from Shannon & Wilson (2006)	Recalculated from Shannon & Wilson (2006) Samples		
		Humans and Mammals	Fish	Avian Species
JC Boyle Reservoir	4.13	3.44	2.26	2.41
Copco1 Reservoir	4.83	4.47	3.14	4.45
Iron Gate Reservoir	2.48	2.27	1.68	1.96

Preliminary Observations:

- Calculated TEQ concentrations are somewhat higher in J.C. Boyle and Copco 1 reservoirs than in Iron Gate Reservoir (Table 1). These results are consistent with data from 2006 (Shannon and Wilson, 2006) and suggest a possible local or upstream source in addition to atmospheric deposition.
- Original TEQ calculations from the 2006 study indicated that dioxin in all the reservoir sediments was within available National and western United States background values, which are around 4-5 ppb or less (U. S. EPA Memorandum on Dioxin Values, January 13, 2010).
- Recalculation of TEQs from the 2006 study (Table 2), using updated TEFs, caused the 2006 TEQ values to decrease a small amount. The updated TEF values come from the World Health Organization and are widely accepted as reflecting the most recent literature on toxicity of dioxins and furans.
- Based on the same updated TEFs, the TEQs from the 2009-2010 study (Table 1) are somewhat higher than those from the 2006 study by Shannon and Wilson (Table 2).
- Samples from the estuary are not directly comparable with the reservoir samples because estuary samples contained primarily coarse sand and inorganic material rather than the very fine-grained, highly organic material that predominates in the reservoir sediments. Organic contaminants, like dioxins, are typically most associated with fine grained organic sediments.
- Based on an initial screening of the data, dioxin appears to be present at levels above the most protective of the various screening levels for sediment disposal, and in the two upstream

reservoirs (JC Boyle and Copco 1) it is slightly above available National and western United States background values. These dioxin levels, however, indicate no current public health concerns from direct human exposure to reservoir sediments. A more thorough evaluation of Klamath Reservoir sediments will be completed as part of an Environmental Impact Statement/Environmental Impact Report for the Secretarial Determination on Klamath Dam removal.

References:

Shannon and Wilson Inc, 2006, Sediment Sampling, Geotechnical Testing, and Data Review Report, Segment of Klamath River, Oregon and California: Shannon & Wilson, Inc., 145 p.

Van den Berg, M, L Birnbaum, A T Bosveld, B Brunström, P Cook, M Feeley, J P Giesy, A Hanberg, R Hasegawa, S W Kennedy, T Kubiak, J C Larsen, F X van Leeuwen, A K Liem, C Nolt, R E Peterson, L Poellinger, S Safe, D Schrenk, D Tillitt, M Tysklind, M Younes, F Waern, and T Zacharewski, 1998, Toxic equivalency factors (TEFs) for PCBs, PCDDs, PCDFs for humans and wildlife: Environmental Health Perspectives, vol 106, n. 12, pp 775-792.

Van den Berg, M., L.S. Birnbaum, M. Denison, M De Vito, W. Farland, M. Feeley, H. Fiedler, H. Hakansson, A. Hanberg, L. Haws, M. Rose, S. Safe, D. Schrenk, C. Tohyama, A. Tritscher, J. Tuomisto, M. Tysklind, N. Walker, R. E. Peterson, 2006: The 2005 World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds, Toxicological Sciences, Vol. 93, n. 2, 223–241