Missouri
Department of
Natural Resources

MISSISSIPPI RIVER TMDL
EPA COMMENTS

TMDL submitted to EPA
Nov. 4, 2010

Mississippi River
WBID # 1707

Jefferson County, Mo.

Missouri Department of Natural Resources
Water Protection Program
PO Box 176
Jefferson City, MO 65102-0176
800-361-4827 / 573-751-1300

Hoke, John

From: Adkins.Tabatha@epamail.epa.gov
Sent: Monday, November 08, 2010 5:01 PM
To: Hoke, John
Subject: MS River - Comments

John,

Comments on Mississippi River. Thanks.

TJ

Review Comments for MO Mississippi River TMDL (Lead & Zinc)
General comments

- Page 1, Hydrologic Unit Code – Please verify if 150005 is correct.

- Page 11, Table 4 – Instream total Zn concentration (5 µg/l) on 3/17/2005 is less than the dissolved concentration (15 µg/l). Please verify the data.

- Page 13 – The expressions of equations 2 and 3 appear to be incorrect. (1.46203-(ln(Hardness)*0.14512)) and 0.986 should not be included in the exponential form.

- Page 14, line 6 – The conversion factor for Pb should be 0.695 [1.46203-(ln(193)*0.14512)]. Please verify the calculation.

- Page 14, 3.6 Flow Estimates – Please include flow range (e.g., 1990-2010) to the flow data.

- Page 18, last paragraph, line 2 – "…values for the outlets of Mississippi River and Joachim...." Please indicate the outlet location for the Mississippi River. Verify if it is refereed to the end of the impaired reach (5 miles) or the end of the entire impaired segment (195.5 miles).

- Tables 6 and 7 – TMDL loads were calculated based on an equation; Flow *5.1 (or 186.8 for Zn) µg/l*5.394. However, the results of this equation do not provide the same values listed in the tables. For example, @50 percentile flow, lead TMDL load =168000*5.1*5.394/1000 = 4622 lbs/day. However, Table 6 lists 4922 lbs/day. (Please verify if the flow value is a rounded number. If so, then indicate in the text.) Please verify the calculation for Tables 6 and 7 as well as the values calculated in Appendix C. Likewise, please verify the calculated values in Tables 8 and 9.

- Page 29, 1st bullet point – Sediment samples were collected from Joachim Creek in 2000 and 2001 (see Table 3). However, the statement indicates otherwise. Please clarify.

- These references were sited in the reference section but not used within the document
  1. ATSDR. 2005. Public Health Assessment for Madison County Mines Site, Madison County, Missouri; EPA Facility ID MOD098633415. December 2005.
  2. Environmental Strategies Corporation. 2000, Characterization Summary Madison County Mines Site – Operable Unit 1, Fredericktown, Missouri. November 2000.

3. Hansen D.J., et al. 2005. Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: Metal Mixtures (Cd, Cu, Pb, Ni, Ag, Zn). USEPA Office of Research and Development. EPA 600/R-02/011.

4. Ingersoll, C.G., S.S. MacDonald, N. Wang, et al. 2000. Prediction of Sediment Toxicity using Consensus-Based Freshwater Sediment Quality Guidelines. EPA 905/R-00/007. June 2000, 33 p.

5. Jacobs Engineering Group. 1995. Final expanded site inspection report for Madison Mine Site, Fredericktown, Missouri. July 1995.

- This reference, Cleland (2000) appears on Page 18 but was not cited in the reference section.

Technical comments

- Page 27, Table 10 – Please indicate how Pb (1.89 lbs/day) and Zn (9.7 lb/day) WLAs were calculated. The design flow of Outfall #1 is 1.897 cfs. Pb WLA should be 1.897 (design flow)* 5.1 (WQS)*5.394/1000 (conversion factor). The value would be 0.052 lbs/day. Likewise, Zn WLA whould be 1.91 lbs/day. These WLAs should be a fixed value and not be varied with the flow conditions of Mississippi River or Joachim Creek. In addition, there should be Pb and Zn WLAs for Outfall #3 (see a table below).

Outfall	Design Flow	95 percentile (Maximum) Concentration (µg/L)		Current Loading (lb/day)		WLA (lb/day)	
	cfs	Pb	Zn	Pb	Zn	Pb	Zn
001	1.897	131.31	1553.94	1.34	15.9	0.05	1.92
003	3.610	139.22	39.44	2.71	0.77	0.10	3.64

It is very important to note that the allowable WLAs have been calculated for all potential point sources at various flow conditions, which may include any unpermitted abandoned mines or tailings piles (or future permits). Any WLA, however, does not reflect an authorization to discharge from an unpermitted point source. Discharging Pb and Zn to waters of the Missouri without a permit is considered a violation of both state and federal Clean Water Law. Should it become necessary to permit currently unpermitted point sources, those areas must follow MDNR's permit application and antidegradation processes and will be subject to a thorough evaluation in light of this TMDL. (Some statement that Herculaneum is not getting the full calculated WLA. Some is being held in reserve? considering current permit limits and anti-backsliding).

Line 7 (Page 27) indicates the calculation of proposed state operating permit loading (and its reductions) listed in Section 5.3, Step 8. However, there is no information about calculating proposed state operating permit in Step 8. Please indicate if the permit loading is for TMDL (LC). Or should it be WLA, instead. Please include WLA calculation in the text and change TMDL to WLA in the table.

Tabatha Adkins, TMDL Coordinator
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USEPA Region 7

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EPA comments for the Mississippi River TMDL and Department response

General Comments

1. *Page 1, Hydrologic Unit Code – Please verify if 150005 is correct.*

The correct 14-digit hydrologic unit code is 07140101-150005. No changes have been made as a result of the comment.

2. *Page 11, Table 4 – Instream total Zn concentration (5 µg/l) on 3/17/2005 is less than the dissolved concentration (15 µg/l). Please verify the data.*

The data are correct. Details from water quality staff at Illinois EPA where these data originated follows. The Illinois EPA monitoring location J-36 is equivalent to Missouri DNR monitoring location 1707/162.5.

"For the Illinois EPA metals samples collected at station J-36 on 03/17/2005, the reported values of zinc are logical when considered in light of allowable levels of analytical imprecision.

Based on results reported on 07/12/2007 in the electronic-data deliverable file from the lab, dissolved zinc is reported as 15 ug/l and total zinc is reported as 6.5 ug/l with a "J" qualifier (i.e., "J" means "*Estimated value: Analyte was detected between the specified reporting limit and the method detection limit*"). For these zinc results, the reported method detection limit is 2 ug/l and the reporting limit is 10 ug/l.

The average imprecision of a reported zinc result should be no greater than 20% (i.e., $\leq$20% precision is the stated data-quality objective for most metals analytes). Therefore, the actual concentration of dissolved zinc is 15 $\pm$ 20% = 15 $\pm$ 3 ug/l. In other words, dissolved zinc may be as low as 12 ug/l in this sample. Disregarding allowable imprecision, the actual concentration of total zinc in this sample can range from 2 to 10 ug/l. If one also considers an allowable amount of imprecision (up to 20%) in the total-zinc value, then the reported value of 6.5 ug/l (J qualified) can represent an actual concentration as high as 10 + 20% = 10 + 2 = 12 ug/l, which barely overlaps with the (im)precision interval for the reported 15 ug/l. Considering the allowable imprecision in each analytical result and the qualifier on the total-zinc result, the reported values for dissolved and total zinc are logical." [Mr. Roy Smogor, Personal Communication, 11/23/10].

3. *Page 13 – The expressions of equations 2 and 3 appear to be incorrect. (1.46203-(ln(Hardness)*0.14512)) and 0.986 should not be included in the exponential form.*

Equations 2 and 3 have been corrected. The portions of these equations noted in the comment are no longer included in the exponential form.

4. *Page 14, line 6 – The conversion factor for Pb should be 0.695 [1.46203-(ln(193)*0.14512)]. Please verify the calculation.*

The conversion factor for Pb has been corrected in the document. Appendix A has been updated to reflect estimated dissolved lead concentrations using the updated conversion factor.

5. *Page 14, 3.6 Flow Estimates – Please include flow range (e.g., 1990-2010) to the flow data.*

Table 5 (Summary Information for USGS Gages Used For Flow Duration Curves) contains the flow ranges used to generate flow estimates (i.e., flow duration curves) for Mississippi River and Joachim Creek. Table 5 has been moved from Section 5.3 to Section 3.6 to more clearly provide the information requested in the comment.

6. *Page 18, last paragraph, line 2 – "…values for the outlets of Mississippi River and Joachim...." Please indicate the outlet location for the Mississippi River. Verify if it is refereed to the end of the impaired reach (5 miles) or the end of the entire impaired segment (195.5 miles).*

The outlet location for the Mississippi River is the end of the impaired reach (5 miles). Additional clarification has been provided in the referenced location.

7. *Tables 6 and 7 – TMDL loads were calculated based on an equation; Flow*5.1 (or 186.8 for Zn) µg/l*5.394. However, the results of this equation do not provide the same values listed in the tables. For example, @50 percentile flow, lead TMDL load =168000*5.1 *5.394/1000 = 4622 lbs/day. However, Table 6 lists 4922 lbs/day. (Please verify if the flow value is a rounded number. If so, then indicate in the text.) Please verify the calculation for Tables 6 and 7 as well as the values calculated in Appendix C. Likewise, please verify the calculated values in Tables 8 and 9.*

Flow values for the Mississippi River found in Tables 6 and 7 are rounded values and clarification has been added to Section 6.2 of the document. The rounding of Mississippi River flow values for presentation in Tables 6 and 7 results in the difference noted in the comment. Department staff have verified the TMDL and WLA values in Tables 6 – 9 with the TMDL results table in Appendix C and have found the values to be consistent.

8. *Page 29, 1st bullet point – Sediment samples were collected from Joachim Creek in 2000 and 2001 (see Table 3). However, the statement indicates otherwise. Please clarify.*

The bullet point regarding lack of sediment samples from Joachim Creek is inaccurate and has been removed from the document.

9. *These references were sited in the reference section but not used within the document*

1. *ATSDR. 2005. Public Health Assessment for Madison County Mines Site, Madison County, Missouri; EPA Facility ID MOD098633415. December 2005.*
2. *Environmental Strategies Corporation. 2000, Characterization Summary Madison County Mines Site – Operable Unit 1, Fredericktown, Missouri. November 2000.*
3. *Hansen D.J., et al. 2005. Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: Metal Mixtures (Cd, Cu, Pb, Ni, Ag, Zn). USEPA Office of Research and Development. EPA 600/R-02/011.*
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5. *Jacobs Engineering Group. 1995. Final expanded site inspection report for Madison Mine Site, Fredericktown, Missouri. July 1995.*

The references listed above have been removed from the "References" section of the document.

10. *This reference, Cleland (2000) appears on Page 18 but was not cited in the reference section.*

Reference information for Cleland 2002 has been added to the "References" section of the document.

Technical Comments

11. *Page 27, Table 10 – Please indicate how Pb (1.89 lbs/day) and Zn (9.7 lb/day) WLAs were calculated. The design flow of Outfall #1 is 1.897 cfs. Pb WLA should be 1.897 (design flow)* 5.1(WQS)*5.394/1000 (conversion factor). The value would be 0.052 lbs/day. Likewise, Zn WLA whould be 1.91 lbs/day. These WLAs should be a fixed value and not be varied with the flow conditions of Mississippi River or Joachim Creek. In addition, there should be Pb and Zn WLAs for Outfall #3 (see a table below).*

Outfall	Design Flow	95 percentile (Maximum) Concentration (µg/L)		Current Loading (lb/day)		WLA (lb/day)	
	cfs	Pb	Zn	Pb	Zn	Pb	Zn
001	1.897	131.31	1553.94	1.34	15.9	0.05	1.92

003	3.610	139.22	39.44	2.71	0.77	0.10	3.64

The proposed permit loads found in Table 10 were calculated using the more protective of either technology-based (i.e., categorical) or water quality-based effluent limitations at the facility outfall design flow. EPA calculations in the above comment do not account for the large amount of assimilative capacity available in the Mississippi River for mixing. For the Herculaneum Smelter facility, technology-based loading values for lead and zinc were more protective than water quality-based loading values. Therefore, proposed technology-based loading values for lead and zinc were used in the percent reduction analyses. The proposed permit loading values found in Table 10 are fixed values and would not be varied with flow conditions of the Mississippi River or Joachim Creek. Because Herculaneum Smelter Outfall #003 does not have proposed effluent limitations for lead and zinc, proposed outfall loading and associated percent reductions could not be calculated.

However, due to the uncertainty associated with proposed state operating permit limits, all analyses that used proposed technology-based (i.e., categorical) or water quality-based effluent limitations for percent reduction calculations have been removed from the document. As a result, Table 10 has been updated and now contains estimated lead and zinc load reductions based upon current pollutant loading from the Herculaneum Smelter facility.

12. *It is very important to note that the allowable WLAs have been calculated for all potential point sources at various flow conditions, which may include any unpermitted abandoned mines or tailings piles (or future permits). Any WLA, however, does not reflect an authorization to discharge from an unpermitted point source. Discharging Pb and Zn to waters of the Missouri without a permit is considered a violation of both state and federal Clean Water Law. Should it become necessary to permit currently unpermitted point sources, those areas must follow MDNR's permit application and antidegradation processes and will be subject to a thorough evaluation in light of this TMDL. (Some statement that Herculaneum is not getting the full calculated WLA. Some is being held in reserve? considering current permit limits and anti-backsliding).*

Language similar to that proposed in the above comment has been added to Section 6.2 of the document. Additional language has also been added to clarify that the Herculaneum Smelter facility will be not be receiving the entire calculated WLAs for lead and zinc, and that the remainder of the lead and zinc WLAs will be held in reserve for future point sources of these pollutants.

13. *Line 7 (Page 27) indicates the calculation of proposed state operating permit loading (and its reductions) listed in Section 5.3, Step 8. However, there is no information about calculating proposed state operating permit in Step 8. Please indicate if the permit loading is for TMDL (LC). Or should it be WLA, instead. Please include WLA calculation in the text and change TMDL to WLA in the table.*

Although reference to calculating percent reductions in Section 5.3, Step 8 is correct, the text in that subsection has been revised to clarify that the TMDL wasteload allocation is

subtracted from the current point source loading to arrive at the point source load reduction estimates. Due to the uncertainty associated with proposed state operating permit limits, all analyses that used proposed technology-based (i.e., categorical) or water quality-based effluent limitations for percent reduction calculations have been removed from the document. As a result, Table 10 has been updated and now contains estimated lead and zinc load reductions based upon current pollutant loading from the Herculaneum Smelter facility.

Hoke, John

From: Adkins.Tabatha@epamail.epa.gov
Sent: Friday, December 03, 2010 5:46 PM
To: Hoke, John
Cc: Wang.Steven@epamail.epa.gov
Subject: MS River

Attachments: pic08103.gif

pic08103.gif (73 KB)

John,

From the call I received from you today and from the call that occurred between MDNR and EPA staff earlier, it appears the concern was for Table 10 of the MS river TMDL appearing misleading. If you look at the column labeled TMDL load, it looks like both outfall 001 and outfall 003 are
allowed the full 2156 pb and 77800 zn. I believe this summarizes the
phone calls. If you could edit Table 10 slightly, I believe that would work to fix this. Thanks.

TJ

(Embedded image moved to file: pic08103.gif) Tabatha Adkins, TMDL Coordinator Water Quality Management Branch-WWPD, USEPA Region 7
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source areas of lead and zinc (i.e., Herculaneum slag pile), nonpoint source loading is expected to be minor. Therefore, the LA components of the Mississippi River and Joachim Creek TMDLs for dissolved lead and zinc are set at zero.

6.4 Point Source Load Reduction

Based on the prior assessment of sources and the distribution of excursions from water quality standards at monitoring locations, the loading of dissolved lead and zinc originates from the Herculaneum Smelter and historic source areas (i.e., Herculaneum slag pile). Miscellaneous land uses and natural background sources contribute a relatively small fraction of the overall pollutant source loading. This is generally supported by water quality data collected from water bodies not likely to be affected by the Herculaneum Smelter and associated areas (i.e. Station 1707/162.5, Mississippi River 1 mile above Meramec River). Therefore, the load reductions necessary to achieve water quality standards will be obtained from the Herculaneum Smelter and historic source areas of lead and zinc.

Effluent concentrations from the Herculaneum Smelter Outfalls #001 and #003, as well as estimated point source loading from these outfalls, can be found in Appendix A. The estimated point source loading for Outfalls #001 and #003 were calculated using methods and equations contained in Section 5.3, Step 4. The 95th percentile concentrations for lead and zinc for each outfall and an estimate of outfall WLA reductions can be found in Table 10. Design flow for Herculaneum Smelter Outfall #001 is 1.224 million gallons per day, or 1.897 cfs. The design flow for Outfall #003 at the facility is 2.33 million gallons per day, or 3.61 cfs.

Due to the absence of contemporaneous effluent and instream data for total recoverable metals, dissolved metals, hardness, and total suspended solids with which to calculate metals translators, partitioning between the dissolved and absorbed phases was assumed to be minimal (Section 5.7.3, EPA/505/2-90-001). Freshwater criteria conversion factors for dissolved metals were used as the metals translator as recommended in guidance (Section 1.3, 1.5.3, and Table 1, EPA 823-B-96-007). All concentrations and loads in Table 10 were calculated in terms of dissolved, rather than total recoverable, lead and zinc concentrations to be comparable with the Mississippi River TMDL.

Table 10. Estimated Herculaneum Smelter Outfall Percent Reductions

Outfall	95th Percentile Effluent Conc. (µg/L)		Current Loading (lb/day)		TMDL Load[1] (lb/day)		Percent Reduction	
	Lead	Zinc	Lead	Zinc	Lead	Zinc	Lead	Zinc
001	131.31	1553.94	1.34	15.9	2156	77800	-99%	-99%
003	139.22	39.44	2.71	0.77	2156	77800	-99%	-99%

1 = Mississippi River TMDL load at the 95th percentile flow exceedance

As shown in Table 10, the current lead and zinc loading from the Doe Run, Herculaneum Smelter facility are below the TMDL wasteload allocations for these pollutants to the Mississippi River. Based upon these calculations, no further reductions should be necessary from facility Outfall #001 to meet the lead and zinc loading requirements of the TMDL to the Mississippi River. Future effluent limitations for the facility operating permit should be based upon the more protective of either technology or water quality-based limitations as per state and federal rule and guidance.