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August 26, 2009

Ligia Mora-Applegate
Bureau of Waste Cleanup
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Evaluation of potential ecological risks for Cabot Carbon/Koppers site

Dear Ms. Mora-Applegate:

At your request we have reviewed the *Evaluation of Potential Ecological Risks, Cabot Carbon/Koppers Superfund Site, Gainesville, Florida*. This document was prepared by AMEC Earth & Environmental and is dated August 17, 2009. This document is an evaluation of the potential risk posed to the benthic community by PAHs in sediment downstream of the Koppers site. It was written in response to a study by the Alachua County Environmental Protection Department, which detected a maximum concentration of 57 mg/kg PAH in surface sediment downstream from the Koppers site. The evaluation by AMEC combines sediment toxicity data from three other sites contaminated exclusively with creosote PAHs to derive a creosote PAH not-to-exceed benchmark of 250 mg/kg. The document concludes that the maximum concentration of creosote detected downstream of the site (57 mg/kg) is less than the proposed benchmark (250 mg/kg) and therefore no adverse effects to the benthic community are expected. We disagree with the derivation of the alternative PAH sediment benchmark and have the following comments on the document:

1. The FDEP utilizes sediment quality assessment guidelines (MacDonald et al., 2003) to assess the risk of chemical exposure to benthic invertebrates. For PAHs, the average site-wide concentration should not exceed the TEC of 1.6 mg/kg and the maximum concentration should not exceed the PEC of 23 mg/kg. If there is reason to believe that these criteria are not applicable to the Koppers site, then site-specific values can be derived from chronic toxicity tests that examine the mortality, growth, and reproduction of benthic invertebrates. Utilizing data from other creosote sites is not suitable for deriving criteria applicable to the Koppers site. Creosote from different sites will be under different stages of weathering. The difference in weathering of the material will change the chemical profile of the PAHs and could increase the more toxic fractions of PAH present in sediment at a site. Therefore, it is difficult to transpose toxicity from one site to another and all sediment toxicity testing should be site-specific.

2. Table 1 of the evaluation lists the sediment benchmarks as the EC_{20}, EC_{25}, and EC_{50} for the mortality endpoint. The effect concentration (EC) usually includes adverse endpoints such as inhibition of growth or reproduction and is not typically used for mortality. Mortality endpoints are better expressed as the lethal concentration (LC).

A report titled, "Update of revised analysis of the interpretation of PAH toxicity data at five wood treating sites based on USEPA Region V's March 27, 2006 comments" was appended to the evaluation. We have the following technical comments on this appended report:

3. The LC data for this analysis were derived from acute sediment toxicity tests (10-day *Hyalella* tests). Acute data should not be utilized to derive chronic toxicity criteria. Organisms often tolerate higher chemical concentrations for short-term periods that would cause toxicity if exposure occurred over a longer timeframe. Using acute sediment data to derive chronic criteria likely underestimates the chronic toxicity of chemical concentrations present in the sediment. An interoffice memorandum from David Whiting regarding the preferred FDEP toxicity test methods is attached (FDEP, 2004).

4. Instead of using an LC_{20} concentration to define the absence of adverse effects from sediment contamination, the chronic no observable adverse effect level (NOAEL)/lowest observed adverse effect level (LOAEL) method should be used. This method utilizes the highest concentration with no significantly increased mortality in a chronic toxicity test (e.g. 42-day *Hyalella* test) as the sediment criterion. If a benchmark method of defining toxicity is preferred, the criterion should be chosen as the value on the lower 95% confidence limit curve that is 10% above the control response in a chronic toxicity test (US EPA, 2000).

5. In the section *Toxicity Data – Growth*, statistically significant reductions in *Hyalella* growth at PAH concentrations as low as 308 mg/kg were disregarded. Instead of comparing site *Hyalella* growth to the laboratory control, *Hyalella* growth from tests utilizing the site data were compared to growth using reference sediment representative of anthropogenic background. The purpose of this comparison is unclear. Normally, information on anthropogenic background is collected to assess the contribution of ubiquitous, low-level contamination resulting from human activities. However, the PAH contaminated sites presented in the analysis were stated to have no or few other chemical stressors. In this situation, comparison with laboratory controls is arguably more informative.

6. The evaluation of the benthic metrics on a site-by-site basis concludes there is no relationship between PAH concentration in sediments and health of the benthic community. Therefore, "using laboratory toxicity data to establish clean-up goals is conservative and could lead to remedial actions that are not necessary" (page 10). However, data from sediment toxicity tests show a clear relationship between PAH concentration and invertebrate mortality. The lack of relationship between PAH concentration and community composition suggests additional stressors in the environment have a greater influence on the community structure than the PAH concentrations. This does not indicate that the PAHs are not toxic to benthic invertebrates. Despite the conclusion that grain size and organic carbon content are more indicative of community structure than

PAH concentration (page 11), sediment toxicity tests imply toxicity from PAH in sediment at all three creosote sites.

7. In Figures 1-14 it is unclear how the dose-response curves were derived. The curves do not appear to match the data since they do not include the low- and high-end concentrations of PAH in the sediment. In fact, the curves do not have the traditional S-shape of a dose-response curve at all and instead appear as vertical lines, which is unlikely.

Please let us know if you have any questions regarding this review.

Sincerely,

Stephen M. Roberts, Ph.D.

Leah D. Stuchal, Ph.D.

Reference:

FDEP (2004) *Interoffice Memorandum regarding toxicity test methods.* June 24, 2004.

MacDonald, D.D., Ingersoll, C.G., Smorong, D.E., Lindskoog, R.A., Sloane, G. and T. Biernacki (2003) *Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters, Technical Report.* MacDonald Environmental Sciences Ltd.

US EPA (2000) *Benchmark Dose Technical Guidance Document*. Risk Assessment Forum, Washington, DC.

State of Florida
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Interoffice Memorandum

TO: Ms. Ligia Mora-Applegate

THROUGH: Dr. William Coppenger

FROM: David Whiting

SUBJECT: Toxicity Test Methods

DATE: June 24, 2004

Attached you will find a revised list of EPA and/or ASTM toxicity test methods for the various media which may need to be tested at a hazardous waste site. I have updated the list to include the most recent versions of EPA methods. In addition, the recommended tests (those tests in bold) have been updated to include the chronic tests when available. Given that the toxicity testing associate with a hazardous waste site does not typically get repeated over and over again, it makes sense to try to obtain as much information as possible in the initial toxicity tests. The chronic tests, while more expensive, will provide both acute and chronic effect level data which can be used in determining the size of the contaminated area which must be remediated and the level to which it must be remediated to reduce the potential for effects below either acute or chronic levels.

Let me know if you have any questions or need further assistance.

DDW/fm

Available Methods for Hazardous Waste Site Toxicity Testing (Recommended Methods in Bold) Revised 4/17/2004

Test Sample Type	Sample Salinity	Test Species	Test Type	Test Method
Soil		**Earthworm, Eisenia foetida**	**Acute, survival**	**EPA/600/3-88/029; A.8.5, ASTM E1676-97**
		Earthworm, Eisenia foetida	**Chronic, reproduction**	**ISO 11268-2:1998**
		White Worm, Enchytraeus sp.	**Chronic, reproduction**	**ISO/CD 16387**
		Springtail, Folsomia candida	**Chronic, reproduction**	**ISO 11267:1999**
		Nematode, Caenorhabditis elegans	**Acute, survival**	**ASTM E2172-01**
		Lettuce seed, Lactuca sativa	Acute, germination	EPA/600/3-88/029; A.8.6
		Lettuc root, Lactuca sativa	Chronic, elongation	EPA/600/3-88/029; A.8.7
		Corn root, Zea mays	Chronic, elongation	Sunderland et al. 1991
Whole Sediment w/overlying culture water	Freshwater	Amphipod, Hyalella azteca	Acute, survival	EPA/600/R-99/064; 100.1
		Amphipod, Hyalella azteca	**Chronic, survival, growth, reproduction**	**EPA/600/R-99/064 (42-day); 100.4**
		Midge, Chironomus tentens	Acute, survival	EPA/600/R-99/064; 100.2
		Midge, Chironomus tentens	**Life-Cycle**	**EPA/600/R-99/064: 100.5**
	Salt water	Amphipod, Ampelisca abdita	Acute, survival	EPA/600/R-94/025; 100.4
		Amphipod, Leptochirus plumulosus	Acute, survival	EPA/600/R-94/025; 100.4
		Amphipod, Leptochirus plumulosus	**Chronic, growth, reproduction**	**EPA-600-R-01-020**
		Amphipod, Euhaustorius estuarius	Acute, survival	EPA/600/R-94/025; 100.4
		Amphipod, Rhepoxynius abronius	Acute, survival	EPA/600/R-94/025; 100.4
		Amphipod, Hyalella azteca (1-15 ppt)	Acute, survival	EPA/600/R-99/064; 100.1
		Amphipod, Hyalella azteca (1-15 ppt)	**Chronic, survival, growth, reproduction**	**EPA/600/R-99/064 (42-day); 100.4**
		Coot Clam, Mulinia lateralis	Chronic, development	EPA ERL-N
Elutriate and Pore Water	Freshwater	Bannerfin Shiner, Cyprinella leedsi	Acute, survival	EPA-821-R-02-012*
		Fathead Minnow, Pimephales promelas	Acute, survival	EPA-821-R-02-012*
		Fathead Minnow, Pimephales promelas	**Chronic, growth**	**EPA-821-R-02-013*; 1000.0**
		Water Flea, Daphnia pulex	Acute, survival	EPA-821-R-02-012*
		Water Flea, Daphnia magna	Acute, survival	EPA-821-R-02-012*
		Water Flea, Ceriodaphnia dubia	Acute, survival	EPA-821-R-02-012*
		Water Flea, Ceriodaphnia dubia**	**Chronic, reproduction**	**EPA-821-R-02-013*; 1002.0**
		Green Alga, Selenastrum capricornutum	**Chronic, growth**	**EPA-821-R-02-013*; 1003.0**
	Salt water	Inland Silverside, Menidia beryllina	Acute survival	EPA-821-R-02-012*
		Inland Silverside, Menidia beryllina	**Chronic, growth**	**EPA-821-R-02-014*; 1006.0**
		Opossum Shrimp, Americamysis bahia	Acute, survival	EPA-821-R-02-012*
		Opossum Shrimp, Americamysis bahia	**Chronic, growth**	**EPA-821-R-02-014*; 1007.0**
		Coot Clam, Mulinia lateralis	Chronic, reporduction	EPA ERL-N
		Sea Urchin, Arbacia punctulata	**Chronic, fertilization**	**EPA-821-R-02-014*; 1008.0**
Water	Freshwater	Bannerfin Shiner, Cyprinella leedsi	Acute, survival	EPA-821-R-02-012
		Fathead Minnow, Pimephales promelas	Acute, survival	EPA-821-R-02-012
		Fathead Minnow, Pimephales promelas	**Chronic, growth**	**EPA-821-R-02-13; 1000.0**
		Water Flea, Daphnia pulex	Acute, survival	EPA-821-R-02-012
		Water Flea, Daphnia magna	Acute, survival	EPA-821-R-02-012
		Water Flea, Ceriodaphnia dubia	Acute, survival	EPA-821-R-02-012
		Water Flea, Ceriodaphnia dubia**	**Chronic, reproduction**	**EPA-821-R-02-13; 1002.0**
		Green Alga, Selenastrum capricornutum	**Chronic, growth**	**EPA-821-R-02-13: 1003.0**

Test Sample Type	Sample Salinity	Test Species	Test Type	Test Method
	Salt water	Inland Silverside, Menidia beryllina	Acute, survival	EPA-821-R-02-012
		Inland Silverside, Menidia beryllina	**Chronic, growth**	**EPA-821-R-02-014; 1006.0**
		Opossum Shrimp, Americamysis bahia	Acute, survival	EPA-821-R-02-012
		Opossum Shrimp, Americamysis bahia	**Chronic, growth**	**EPA-821-R-02-014; 1007.0**
		Coot Clam, Mulinia lateralis	Acute and Chronic	EPA ERL-N
		Sea Urchin, Arbacia punctulata	**Chronic, fertilization**	**EPA-821-R-02-014: 1008.0**

*Use EPA/600/3-88/029 for preparing elutriates fro soils. Use EPA-823-B-98-004 for preparing elutriates from sediments

** Not suitable for use with some groundwater.

ASTM E1676-97. Standard Guide for Conducting Laboratory SoilToxicity or Bioaccumulation Tests With the Lumbricid Earthworm Eisenia Fetida

ASTM E2172-01. Standard Guide for Conducting Laboratory Soil Toxicity Tests with the Nematode Caenorhabditis elegans.

EPA/600/3-88/029 Protocols for short-term toxicity screening of hazardous waste sites.

EPA-823-B-98-004 Evaluation of dredge material proposed for discharge in waters of the U.S. - Testing manual.

EPA/600/R-99/064 Methods for measuring the toxicity and bioaccumulation of sediment-associated contaminants with freshwater invertebrates, 2nd ed.

EPA/600/R-94/025 Methods for measure the toxicity and bioaccumulation of sediment-associated contaminants with estuarine and marine amphipods

EPA-821-R-02-013 Short-term methods for estimating the chronic toxicity of effluents and receiving waters to freshwater organisms, 2nd Edition.

EPA-821-R-02-014 Short-term methods for estimating the chronic toxicity of effluents ad receiving waters to marine and estuarine organisms, 2nd Edition.

EPA-821-R-02-012 Methods for measuring the acute toxicity of effluents and receiving waters to freshwater and marine organisms, 5th Ed.

EPA ERL-N Embryo-larval test using the bivalve Mulinia lateralis - SOP Rev. 0, March 1993. Narragansett ERL.

ISO 11268-2:1998. 1998. Soil Quality – Effects of Pollutants on Earthworms (Eisenia fetida) – Part 2: Determination of Effects on Reproduction.

ISO/CD 16387. Soil Quality – Effects of Pollutants on Enchytraeidae (Enchytraeus sp.) – Determinations of effects on reproduction and survival.

ISO 11267:1999. Soil Quality – Inhibition of Reproduction of Collembola (Folsomia candida) by Soil.

Sutherland, S.L., P.W. Santelmann, and T.A. Baughman. 1991. A rapid, sensitive soil bioassay for sulfonylurea herbicides. Weed Science 39, 296-298.