UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
901 NORTH 5TH STREET
KANSAS CITY, KANSAS 66101

FEB 09 2012

MEMORANDUM

SUBJECT: Evaluation of Indoor Dust Data
Proposed Strecker Forest Subdivision
Wildwood, Missouri

FROM: Mike Beringer
Branch Chief
ENSV/EAMB

TO: Gene Gunn
Branch Chief
SUPR/SPEB

As requested, potential health risks to workers involved in the demolition of three abandoned structures located on the proposed Strecker Forest subdivision (Strecker Forest) in Wildwood, Missouri, were evaluated. The levels of dioxins and furans in six indoor dust samples collected from the former Primm residence and former Dozier residence and garage were reviewed. Based on the indoor dust data, demolition of these three structures would not present significant health risks from exposure to dioxins and furans. Please contact me if you have questions or need further assistance.

Site Background

The former Primm residence and the former Dozier residence and garage are abandoned structures that are anticipated to be demolished. These three uninhabited structures are located on the proposed Strecker Forest subdivision on a tract of land adjacent to the Ellisville Superfund Site, located in Wildwood, Missouri. There have been concerns expressed that dioxins and furans inside the structures could pose significant health risks to workers during demolition activities. On September 22, 2011, six indoor dust samples, including one field duplicate, were collected from interior surfaces within the structures. Each sample was analyzed for dioxins and furans using high resolution gas chromatography/mass spectrometry. The objective of this document is to use the dust data to determine whether the demolition of the former Primm residence and former Dozier residence and garage would present significant health risks to the workers from exposure to dioxins and furans.

Sample Results

At the former Primm residence, the U.S. Environmental Protection Agency (EPA) collected dust samples from the 1st floor kitchen/dining area (one sample and one field duplicate) and the 2nd floor foyer/den area (one sample). At the former Dozier residence, the EPA collected dust samples from the

1st floor kitchen/dining area (one sample), the 2nd floor foyer/den area (one sample), and the detached garage (one sample). The five samples obtained from the former homes were collected from the floors, while the sample obtained from the garage was collected from the window sills, shelves, and ledges.

Each of the samples was analyzed for the 17 types of dioxins and furans that may present a potential health concern. The dioxin Toxic Equivalent (TEQ) concentration was then calculated from the results of the dioxin and furan analyses in accordance with Agency protocol (USEPA, 2010). Table 1 provides the results of the dioxin and furan analyses for the six samples and the corresponding dioxin TEQ concentration for each sample.

The TEQ concentrations detected in the six dust samples range from 10.3 to 84.4 parts per trillion (ppt), or picograms of dioxin per gram of soil. The practical quantification limits (PQLs) achieved by the laboratory were below the EPA's health-based screening levels, demonstrating that analytical detection limits were capable of measuring concentrations that could present a concern for human health.

Evaluation of Potential Health Risks to Demolition Workers

This evaluation considered whether adult workers involved in demolition of the three abandoned structures would be exposed to levels of dioxins and furans that could pose significant health risks. Although the structures are located in a residential area, nearby residents are located a substantial distance away from where the demolition would occur, and as a result, their potential exposure would be far less than the potential worker exposure. Both non-cancer and cancer health risks were examined by comparing levels of concern with concentrations of dioxins and furans measured in indoor dust samples. These levels were calculated using the equations found in Section 4 of the User's Guide for the EPA's Regional Screening Levels (RSLs) (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/usersguide.htm), along with the exposure variables and toxicity values discussed below.

The routes of exposure evaluated were incidental ingestion and dermal contact with contaminated dust. In general, the inhalation or breathing of contaminated dust is not a significant contributor to overall exposure. It was assumed that heavy equipment would be used to raze the two houses and one garage and remove the debris from the site. Although it is likely that demolition and removal could be accomplished in one or two days, the reasonable maximum duration of the project was conservatively estimated to be 10 days. Demolition work was assumed to continue throughout the weekend. Therefore, an averaging time of 10 days was used to examine potential non-cancer risks over the duration of the project. In accordance with Agency guidance, potential cancer risks from a 10 day exposure were evaluated over a typical lifetime of 70 years (USEPA, 2002).

For many of the variables, the EPA's standard exposure parameters for a construction worker were used (Exhibit 1-2 of USEPA, 2002). Even though the demolition workers at Strecker Forest might wear work clothes and gloves to protect themselves from flying debris or might work within an enclosed cab during demolition activities, high dust contact rates for a typical construction worker were assumed so as to be protective of worker health.

A cancer slope factor (CSF) was used to estimate the increased risk of developing cancer from exposure to potentially carcinogenic chemicals. To examine potential cancer risks at Strecker Forest, the CSF for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) of 1.56×10^5 $(mg/kg\text{-}day)^{-1}$ from the EPA's Office of Health and Environmental Assessment (USEPA, 1984) was used. A level of concern was derived based on a target cancer risk of 1 in 10,000 (USEPA, 1991).

When evaluating potential non-cancer health risks, the EPA assumes that a dose or exposure level exists below which adverse non-cancer health effects are unlikely to occur (USEPA, 1989). This analysis of potential non-cancer health risks from exposure to dioxins and furans by demolition workers at Strecker Forest used the acute Minimal Risk Level of 0.0002 µg/kg-day, which is available from the Agency for Toxic Substances and Disease Registry (ATSDR) at http://www.atsdr.cdc.gov/mrls/index.asp. This value is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health effects over 1 to 14 days of exposure.

Levels of concern for cancer and non-cancer adverse health effects were calculated by applying the exposure and toxicity values discussed above into the equations found at http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/usersguide.htm. For cancer risks, the level of concern for demolition workers is a dioxin TEQ concentration in dust of 318,700 ppt. For non-cancer health effects, the level of concern for demolition workers is a dioxin TEQ concentration in dust of 38,900 ppt. The highest dioxin TEQ concentration measured in the six indoor dust samples collected from Strecker Forest is 84.4 ppt. Because the concentrations of dioxins and furans in the three abandoned residences are far below the levels of concern for a worker involved in demolishing these structures, cancer and non-cancer risks are negligible. To conclude, the former Primm residence and former Dozier residence and garage could be demolished safely, without presenting significant health risks to the workers or residents from exposure to dioxins and furans. Based on these findings, no special precautions or additional protective gear would be required to conduct demolition of abandoned structures at Strecker Forest.

References

U.S. EPA. 1984. *Health Effects Assessment for 2,3,7,8-Tetrachlorodibenzo-p-Dioxin*. U.S. Environmental Protection Agency, Washington, D.C. EPA/540/1-86/044.

U.S. EPA. 1989. *Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual - Part A.* Office of Emergency and Remedial Response, Washington, D.C. EPA/540/1-89/002.

U.S. EPA. 1991. *Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions.* Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9355.0-30.

U.S. EPA. 2002. *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites.* Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Publication 9355.4-2

U.S. EPA. 2010. *Recommended Toxicity Equivalence Factors (TEFs) for Human Health Risk Assessments of 2,3,7,8-Tetrachlorodibenzo-p-dioxin and Dioxin-Like Compounds.* Risk Assessment Forum, Washington, D.C. EPA/600/R-10/005.

Table 1. Concentrations of Dioxins and Furans Detected in Indoor Dust Samples Collected at Strecker Forest.

CAS No.	Compound	Former Primm 1st Floor (ppt)	Former Primm 1st Floor Dup. (ppt)	Former Primm 2nd Floor (ppt)	Former Dozier 1st Floor (ppt)	Former Dozier 2nd Floor (ppt)	Former Dozier Garage (ppt)
1746-01-6	2,3,7,8-TCDD	1.33 J	1.50 J	1.48 J	3.53	1.09 J	9.73
40321-76-4	1,2,3,7,8-PeCDD	1.83 J	2.33 J	2.30 J	3.11 J	1.73 J	14.4
39227-28-6	1,2,3,4,7,8-HxCDD	3.38 J	4.40 J	4.33 J	9.24 J	3.46 J	13.0
57653-85-7	1,2,3,6,7,8-HxCDD	7.66 J	9.61 J	9.09 J	37.7	16.3	36.8
19408-74-3	1,2,3,7,8,9-HxCDD	8.45 J	8.50 J	9.71 J	17.0	6.41 J	18.0
35822-46-9	1,2,3,4,6,7,8-HpCDD	227	283	291	3260	611	745
3268-87-9	1,2,3,4,6,7,8,9-OCDD	2300	3500	3470	75800 E	11700 E	6840
51207-31-9	2,3,7,8-TCDF	2.10	2.34	1.40 J	14.3	3.31	7.97
57117-41-6	1,2,3,7,8-PeCDF	1.77 J	1.63 J	0.771 J	6.55 J	1.33 J	13.4
57117-31-4	2,3,4,7,8-PeCDF	2.01 J	2.61 J	0.990 J	12.6	2.02 J	38.1
70648-26-9	1,2,3,4,7,8-HxCDF	2.56 J	3.18 J	2.03 J	12.3	6.16 J	37.9
57117-44-9	1,2,3,6,7,8-HxCDF	2.73 J	3.95 J	2.05 J	14.2	3.95 J	35.6
60851-34-5	2,3,4,6,7,8-HxCDF	3.18 J	4.49 J	3.16 J	19.9	6.03 J	39.3
72918-21-9	1,2,3,7,8,9-HxCDF	0.788 J	0.739 J	0.364 J	2.32 J	0.749 J	10.1
67562-39-4	1,2,3,4,6,7,8-HpCDF	36.2	45.8	48.3	532	108	306
55673-89-7	1,2,3,4,7,8,9-HpCDF	2.47 J	2.45 J	3.05 J	19.7	14.8	16.2
39001-02-0	1,2,3,4,6,7,8,9-OCDF	80.8 J	110	131	809	289	523
Dioxin Toxic Equivalent (TEQ)		**10.3 J**	**12.8 J**	**11.8 J**	**84.4**	**19.0 J**	**68.7**

Comments:

E: Value is estimated. Concentration of the target analyte exceeds the instrument calibration range.

J: Value is estimated.

ppt: parts per trillion