Evaluation of 2007 Surface Water and Sediment Data

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Introduction

A Comprehensive Risk Assessment (CRA) was prepared for the Rocky Flats Environmental Technology Site (RFETS) as part of the Resource Conservation and Recovery Act (RCRA) Facility Investigation – Remedial Investigation (RI) process (DOE 2006a). Included in the CRA was an Ecological Risk Assessment for seven aquatic exposure units (AEUs) (i.e., drainages within the RFETS boundaries). The conclusion of the CRA for the AEUs was that significant risks from exposure to ecological chemicals of potential concern (ECOPCs) in surface water and sediment are not expected. However, because of uncertainties due to limitations in the data (e.g., temporal and spatial limitations), further monitoring was recommended in order to determine whether ECOPCs with somewhat uncertain risks may be of greater ecological concern than indicated by the limited data available.

Through the consultative process with the U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), and the Colorado Department of Public Health and Environment (CDPHE), an ecological sampling strategy was developed to address the uncertainties identified in the CRA for the AEUs. Table 5 in the Rocky Flats Legacy Management Agreement (RFLMA), summarizes the ecological sampling requirements that were agreed to by the parties listed above. These sampling requirements included the following:

- Sampling of surface water and sediment for ammonia, cyanide, and radium-228
- Surface water and sediment samples to be collected from Ponds A4 (North Walnut Creek AEU), B5 (South Walnut Creek AEU), and C2 (Woman Creek AEU)
- Surface water sampling to be conducted quarterly for a minimum of three quarters; sediment sampling to be conducted once

Results

The attached Table 1 and Table 2 summarize the results from the surface water samples and sediment samples, respectively, that were collected in 2007. Details for each ECOPC are provided below for surface water and sediment.

Ammonia

Ammonia was only detected in two surface water samples (one sample collected in the South Walnut Creek AEU [Pond B-5] in February 2007 and one sample collected in the Woman Creek AEU [Pond C-2] in February 2007). The ecological screening levels (ESLs) for ammonia that were presented in the CRA were based on un-ionized ammonia. The current CDPHE water quality standards for ammonia are based on total ammonia (5 CCR 1002-31.11). Table 1 shows a comparison of the detected results for ammonia and the detection limits for the nondetect samples to the ESLs based on un-ionized ammonia and total ammonia. The un-ionized fraction of ammonia in the surface water samples was calculated using the methods described in the CRA (DOE 2006a). The total ammonia ESLs and acute criteria were calculated using formulas provided in 5 CCR 1002-31.11. The AEU-specific pH and temperature values shown on Table A5.1 of Volume 15B2 of the CRA were used in the calculations. None of the detected results or detection limits for ammonia exceeded the ESLs or acute criteria.

Sediment samples were collected in each of the three ponds for ammonia. Results for ammonia in sediment ranged from 116 to 434 milligrams per kilogram (mg/kg). An ESL was not presented in the CRA for ammonia in sediments so a comparison value was not available for these results. However, the low levels and infrequent detections of ammonia in surface water indicate the sediments are not a continuing source of ammonia to the surface water bodies.

The data from the additional samples indicate that ammonia does not pose a greater ecological concern than indicated by the risk results reported in the CRA that were considered uncertain because of the limitations in the data then available. Therefore, no further sampling for ammonia is needed.

Cyanide

Cyanide was not detected in any of the surface water samples and all of the detection limits were less than the acute criterion. The acute criterion is a CDPHE standard and is based on free cyanide. The detection limits were all greater than the chronic ESL ranging from 0.0015 to 0.0024 milligrams per liter (mg/L). The chronic ESL, which is not a CDPHE standard, is 0.0005 mg/L.

Sediment samples were collected in each of three ponds for total cyanide. Results for total cyanide in sediment ranged from 0.159 to 1.12 mg/kg. An ESL was not presented in the CRA for cyanide in sediments so a comparison value was not available for these results. However, the lack of detections of cyanide in surface water indicate the sediments are not a continuing source of cyanide to the surface water bodies.

The data from the additional samples indicate that cyanide does not pose a greater ecological concern than indicated by the risk results reported in the CRA that were considered uncertain because of the limitations in the data then available. Therefore, no further sampling for cyanide is needed.

Radium-228

Radium-228 was detected in three surface water samples (two samples from North Walnut Creek AEU [Pond A-4] and one sample from Woman Creek AEU [Pond C-2]). As shown on Table 1, the detected levels of radium-228 and the detection limits for the nondetect samples do not exceed the chronic ESL for surface water. The chronic ESL shown on Table 1 (3.4 picocuries per liter [pCi/L]) is a revised value from the CRA (CRA ESL = 0.849 pCi/L) and is based on a more current version of RESRAD BIOTA (DOE 2006b) than the version used to develop the ESL for the CRA.

Sediment samples were collected in each of the three ponds for radium-228. Radium-228 was detected in the sediment samples from Pond A-4 (1.53 picocuries per gram [pCi/g]) and Pond C-2 (1.59 pCi/g). These detected levels and the detection limit for the sample for Pond B-5 (0.696 pCi/g) are less than the sediment ESL presented in the CRA (87.8 pCi/g).

The data from the additional samples indicate that radium-228 does not pose a greater ecological concern than indicated by the risk results reported in the CRA that were considered uncertain because of the limitations in the data then available. Therefore, no further sampling for radium-228 is needed.

Summary

The results of the surface water and sediment sampling conducted in 2007 support the conclusions of the CRA. Uncertainties related to the ammonia, cyanide, and radium-228 data have been addressed and no further sampling is needed.

References

U.S. Department of Energy (DOE). 2006a. RCRA Facility Investigation-Remedial Investigation/Corrective Measures Study-Feasibility Study Report for the Rocky Flats Envirnomental Technology Site; Appendix A – Comprehensive Risk Assessment. June.

U.S. Department of Energy (DOE). 2006b. RESRAD Family of Codes. Argonne National Laboratory. http://web.ead.anl.gov/resrad.

U.S. Department of Energy (DOE). 2005. Final Comprehensive Risk Assessment Work Plan and Methodology. September. Revision 1.