LMS/RFS/S11432

Annual Report of Site Surveillance and Maintenance Activities at the Rocky Flats, Colorado, Site

Calendar Year 2013

April 2014

U.S. DEPARTMENT OF ENERGY | Legacy Management

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Available on DVD:

Abbreviations

Ag	silver
Am	americium
ANOVA	Analysis of Variance
AOC	Area of Concern
B	boron
Be	beryllium
BMP	best management practice
Ca	calcium
CAD/ROD	Corrective Action Decision/Record of Decision
Cd	cadmium
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (also known as "Superfund")
CFR	*Code of Federal Regulations*
cfs	cubic feet per second
COU	Central Operable Unit
Cr	chromium
Cu	copper
CY	calendar year
DCB	dichlorobenzene
DCE	dichloroethene
DER	duplicate error ratio
DNAPL	dense nonaqueous-phase liquid
DO	dissolved oxygen
DOC	dissolved organic carbon
DOE	U.S. Department of Energy
DQA	data quality assessment
DUP	duplicate sample
EPA	U.S. Environmental Protection Agency
ERP	*Emergency Response Plan for Rocky Flats Site Dams*
ESL	Environmental Sciences Laboratory
ET	evapotranspiration
ETPTS	East Trenches Plume Treatment System
FC	Functional Channel
FR	*Federal Register*
ft/yr	feet per year
GIS	geographic information system
gpd	gallons per day

gpm	gallons per minute
GWIS	Groundwater Intercept System
HRC	Hydrogen Release Compound
HRT	hydraulic residence time
IA	Industrial Area
IC	institutional control
IHSS	Individual Hazardous Substance Site
IMP	Integrated Monitoring Plan
ITSS	Intercept Trench System Sump
J	For sampling data, a laboratory and/or validation qualifier that indicates an estimated value.
K-H	Kaiser-Hill Company LLC
L	liters
LANL	Los Alamos National Laboratory
LBNL	Lawrence Berkeley National Laboratory
LCS	laboratory control sample
LM	Office of Legacy Management
M&M	monitoring and maintenance
M-K	Mann-Kendall
MCL	maximum contaminant level
µg	micrograms
µg/L	micrograms per liter (sometimes expressed as ug/L)
mg/L	milligrams per liter
MS	matrix spike
MSD	matrix spike duplicate
MSPTS	Mound Site Plume Treatment System
N	nitrogen
Ni	nickel
NOIPD	Notice of Intent for Partial Deletion
NPL	National Priorities List
OBP	Oil Burn Pit
OLF	Original Landfill
OU	Operable Unit
PARCC	precision, accuracy, representativeness, completeness, and comparability
PBA	Programmatic Biological Assessment
PCE	tetrachloroethene
pCi	picocuries
pCi/L	picocuries per liter
PIP	Public Involvement Plan
PLF	Present Landfill

PLFTS	Present Landfill Treatment System
POC	Point of Compliance
POE	Point of Evaluation
POU	Peripheral Operable Unit
PQL	practical quantitation limit
Pu	plutonium
PU&D	Property Utilization and Disposal
QA	quality assurance
QC	quality control
R	For sampling data, a laboratory and/or validation qualifier that indicates a value rejected as unusable.
RCRA	Resource Conservation and Recovery Act
Refuge	Rocky Flats National Wildlife Refuge
RER	relative error ratio
RFCA	*Rocky Flats Cleanup Agreement*
RFETS	Rocky Flats Environmental Technology Site
RFLMA	*Rocky Flats Legacy Management Agreement*
RFSOG	*Rocky Flats, Colorado, Site, Site Operations Guide*
RNS	rinsate sample
RPD	relative percent difference
S-K	Seasonal-Kendall
Se	selenium
SED	Sitewide Ecological Database
SEEPro	Site Environmental Evaluation for Projects
SEP	Solar Evaporation Pond
SID	South Interceptor Ditch
SPP	Solar Ponds Plume
SPPTS	Solar Ponds Plume Treatment System
STP	Sewage Treatment Plant
SVOC	semivolatile organic compound
TCA	trichloroethane
TCB	trichlorobenzene
TCE	trichloroethene
TOC	total organic carbon
U	uranium
U	For sampling data, a laboratory and/or validation qualifier that indicates an analyte not detected at the indicated concentration.
UHSU	upper hydrostratigraphic unit
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

V&V	validation and verification
VC	vinyl chloride
VOC	volatile organic compound
WQP	water quality parameter
WWTP	Wastewater Treatment Plant
Zn	zinc
ZVI	zero-valent iron

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Executive Summary

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) is responsible for implementing the final response action selected in the *Final Corrective Action Decision/Record of Decision for Rocky Flats Plant (USDOE) Peripheral Operable Unit and Central Operable Unit* (CAD/ROD) issued September 29, 2006, for the Rocky Flats, Colorado, Site (Site).

Under the CAD/ROD, two Operable Units were established within the boundaries of the Rocky Flats property: the Peripheral Operable Unit (POU) and the Central Operable Unit (COU). The COU consolidates all areas of the Site that require additional remedial or corrective actions while also considering practicalities of future land management. The POU includes the remaining, generally unimpacted portions of the Site and surrounds the COU. The response action in the Final CAD/ROD is no action for the POU and institutional and physical controls with continued monitoring for the COU. The CAD/ROD determined that conditions in the POU were suitable for unrestricted use. The U.S. Environmental Protection Agency (EPA) subsequently published a Notice of Partial Deletion from the National Priorities List for the POU on May 25, 2007.

DOE, EPA, and the Colorado Department of Public Health and Environment (CDPHE) have chosen to implement the monitoring and maintenance requirements of the CAD/ROD under, and as described in, the *Rocky Flats Legacy Management Agreement* (RFLMA), executed March 14, 2007. RFLMA Attachment 2 defines the COU remedy surveillance and maintenance requirements. The requirements include environmental monitoring; maintenance of the erosion controls, access controls (signs), landfill covers, and groundwater treatment systems; and operation of the groundwater treatment systems.

LM prepared and continually updates the *Rocky Flats, Colorado, Site, Site Operations Guide* (DOE 2013e). It is the primary document to guide work performed to satisfy the requirements of RFLMA and to implement best management practices at the Site.

This report addresses all surveillance and maintenance activities conducted at the Site during calendar year (CY) 2013 (January 1 through December 31, 2013). Highlights of the surveillance and maintenance activities are as follows:

- RFLMA references the use of contact records to document CDPHE approvals of field modifications to implement approved response actions. RFLMA Attachment 2 references the use of contact records to document the outcome of consultation related to addressing any reportable conditions. This report discusses the three RFLMA contact records issued in 2013 and the contact record status as of December 31, 2013.
- Inclinometers were installed at the Original Landfill (OLF) as part of the 2008 geotechnical investigation to address localized slumping and settling of the OLF cover observed in 2007. The localized instability is caused by the weakening of one or more soil layers in the shallow subsurface due to moisture in these layers. To address these conditions, filling and grading to recontour some sideslopes and to minimize and remove subsurface moisture was completed in 2009. This annual report includes the annual review of the inclinometer data by a qualified geotechnical engineer. The data indicate that movement at the OLF is exacerbated by precipitation events and elevated water levels, as seen in September due to the heavy precipitation. While the large-scale, overall OLF slope is stable, localized failures have occurred on the landfill under elevated water level conditions. Continued monitoring

and routine maintenance of the OLF cover are recommended. Localized cracking and subsidence in the northeast portion of the OLF were observed after the September heavy precipitation event. Cracks were filled to minimize infiltration of additional precipitation and a temporary drain was installed to reduce ponding in the new subsidence area. The displaced section of berm 4 will be repaired in summer 2014. Design has been completed for a 2014 project to recontour sideslopes in the East Perimeter Channel to increase slope stability in that area. Berm-height criteria were re-defined based on the observed performance of the berm channels during the September heavy precipitation event.

- Reportable 30-day average uranium concentrations were observed starting on December 18, 2013, in surface water at RFLMA Point of Compliance (POC) monitoring station WALPOC, which is located on Walnut Creek at the eastern COU boundary. Validated results were received on February 3, 2014, and notification to the regulatory agencies and the public—in accordance with RFLMA Attachment 2, Figure 6—was made by e-mail on February 13, 2014. Representatives of the regulatory agencies and DOE met on February 18, 2014, to discuss the observations and develop a path forward.

  RFLMA Contact Record 2014-05, "Reportable condition for evaluation purposes for uranium at point of compliance WALPOC," provides a discussion of the monitoring results and recaps the outcome of the RFLMA Parties consultation regarding the evaluation steps to be taken. This contact record is available on the Rocky Flats website, http://www.lm.doe.gov/Rocky_Flats/ContactRecords.aspx.

- All other POC analyte concentrations/activities remained below reporting levels throughout CY 2013.

- Reportable 12-month rolling average uranium concentrations continued to be observed periodically in CY 2013, in surface water at RFLMA Point of Evaluation (POE) monitoring station GS10, which is located on South Walnut Creek upstream of former Pond B-1. Reportable 12-month rolling average americium (Am) and plutonium (Pu) activities also continued to be observed periodically during CY 2013. However, all sampling results since August 2013 show Am and Pu activities well below the 0.15 picocurie per liter surface water standard. The evaluation of these reportable conditions is ongoing.

- All other POE analyte concentrations/activities remained below reporting levels throughout CY 2013.

- As with many locations on the Front Range, the Site experienced very high water flows due to heavy precipitation during the second week of September 2013. In some cases the high flows and debris caused damage to the automated sampling equipment, resulting in temporary interruptions in composite sampling. At almost all Site locations, the unanticipated runoff volumes caused flow-paced composite bottles to fill before personnel could safely replace them with empty bottles. Access to various areas of the Site was unsafe and restricted by local authorities during certain periods.

  Due to the interruptions in automated sampling at RFLMA POCs and POEs, tables have been added to this report (see Sections 3.1.2.1 and 3.1.2.2 below) detailing automated composite sample collection during September 2013. That said, the automated surface-water monitoring network performed as well as could be expected. During September 2013, composite samples collected at RFLMA POCs and POEs included more than 2,000 individual grabs.

- The results of statistical evaluations of groundwater quality at the OLF and Present Landfill (PLF) were largely identical to the results of these evaluations performed in 2012.
- Water monitoring at the Present Landfill Treatment System during CY 2013 showed three analytes detected above the applicable standards for individual sample results. The observed concentrations did not recur and RFLMA consultation was not required during CY 2013. Groundwater samples collected from the three downgradient PLF Resource Conservation and Recovery Act (RCRA) wells indicated notable concentrations of boron in one well; boron and nickel in another; and boron, chromium, and selenium in a third well. These concentrations were statistically higher than in upgradient groundwater and were on increasing trends, although only the selenium results exceeded corresponding RFLMA levels. These conditions are generally consistent with those reported for earlier years. After reviewing the results of statistical evaluation of the 2013 groundwater data presented in this Annual report, the RFLMA Parties may decide that subsequent consultation regarding the appropriate response is required. Such consultation, if it occurs, will be documented in a new contact record (in accordance with guidelines described in Contact Record 2011-03). Surface-water monitoring for the OLF during CY 2013 showed one analyte detected above the applicable standards for individual sample results. The observed concentrations did not recur and RFLMA consultation was not required. Boron was determined to be present at higher concentrations in groundwater at all three downgradient OLF RCRA wells than in upgradient wells. This condition also applied to uranium in two of these wells and nickel in one downgradient well. An increasing trend in downgradient concentrations was only calculated for boron in one downgradient well. These conditions are generally consistent with those reported for earlier years. In all cases, the concentrations of these constituents in downgradient groundwater were below the associated RFLMA limits. After reviewing the results of statistical evaluation of the 2013 groundwater data presented in this Annual report, the RFLMA Parties may decide that subsequent consultation regarding the appropriate response is required. Such consultation, if it occurs, will be documented in a new contact record (in accordance with guidelines described in Contact Record 2011-03). Analytical results for effluent from the Mound Site Plume Treatment System (MSPTS) and East Trenches Plume Treatment System (ETPTS) continued to demonstrate that the vast majority of contaminants have been removed. However, concentrations of some volatile organic compounds (VOCs) in system effluent exceeded target concentrations. Both of these treatment systems received new, larger air strippers in early 2013 that were modeled after the unit installed in the existing effluent manhole at the MSPTS in 2011. The air stripper installed in 2013 at the MSPTS was placed in the effluent manhole, while that at the ETPTS was installed in the influent manhole. Both operated continuously and acted to remove additional VOCs.
- The Solar Ponds Plume Treatment System (SPPTS) was the focus of continued study in an effort to improve cost and treatment effectiveness. Building on results obtained in 2012, pilot-scale lagoons are being tested to treat nitrate. An approach using small containers of treatment media—on the order of 1 to 2 gallons—is being tested to treat uranium. Both of these approaches are being optimized for potential full-scale implementation.
- Groundwater quality and flow at the Site were generally consistent with previous years. No reportable conditions were indicated. Statistical trending calculations indicated numerous significant concentration trends. Conditions observed at some locations, particularly with respect to groundwater elevations, suggested climatic causes (i.e., the extremely heavy precipitation received in September 2013).

- Wetlands constructed to mitigate the impacts to wetlands caused by both Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and non-CERCLA related projects have been managed and monitored in accordance with the *Rocky Flats, Colorado, Site Wetland Mitigation Monitoring and Management Plan* (Plan) (DOE 2006b). That Plan states "The annual report for the fifth year will contain the wetland delineation data and will serve as the final wetland mitigation report (unless further monitoring is required by the regulatory agencies)." This annual report serves as that final wetland mitigation report for those projects that disturbed wetlands in 2009 or earlier and closes out the Plan. In summary, the CERCLA and non-CERCLA wetland impacts were mitigated onsite in a one-to-one ratio. A detail accounting for the impacted and compensatory mitigation wetland acreage is provided in this annual report.

  Although the Plan is closed out (with the delivery of this report), projects with wetland impacts after 2009 will continue to be monitored following the same basic methodology as outlined in the Plan. The methodology and process will be documented in the *Rocky Flats, Colorado, Site, Site Operations Guide*. CERCLA-related projects that impact wetlands will have their compensatory wetlands delineated in the fifth year and closed out. Non-CERCLA projects that impact wetlands subject to the U.S. Army Corps of Engineers Clean Water Act Section 404 permitting process will be closed out as required by the permit issued for the project. The status of any CERCLA-related impacted/mitigated wetlands will be reported in future annual reports.
- All RFLMA-required ecological data collection, analysis, and reporting were completed as scheduled.
- Revegetation monitoring data continued to demonstrate the establishment and sustainability of desirable grassland species at the Site.
- The annual data quality assessment showed that the Site continues to collect high-quality data sufficient for decision making.