

**Annual Report of
Site Surveillance and
Maintenance Activities at the
Rocky Flats, Colorado, Site
Calendar Year 2012**

April 2013



**U.S. DEPARTMENT OF
ENERGY**

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**U.S. Department of Energy
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Appendixes

- Appendix A Hydrologic Data
- Appendix B Water-Quality Data
- Appendix C Landfill Inspection Forms—Fourth Quarter CY 2012
- Appendix D Data Evaluation Flowcharts Reproduced from RFLMA and the RFSOG
- Appendix E *Technical Memorandum Regarding Instrumentation and Monitoring at the Rocky Flats OLF*
- Appendix F RFLMA Contact Records

Available on DVD:

Ecology DVD: 2012 Annual RFS Ecology Reports

Abbreviations

Ag	silver
Am	americium
ANOVA	Analysis of Variance
AOC	Area of Concern
B	boron
Be	beryllium
BMP	best management practice
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	<i>Code of Federal Regulations</i>
cfs	cubic feet per second
COU	Central Operable Unit
Cr	chromium
Cu	copper
CY	calendar year
DCB	dichlorobenzene
DCE	dichloroethene
DER	duplicate error ratio
DOE	U.S. Department of Energy
DQA	data quality assessment
EPA	U.S. Environmental Protection Agency
ERP	<i>Emergency Response Plan for Rocky Flats Site Dams</i>
ESL	Environmental Sciences Laboratory
ETPTS	East Trenches Plume Treatment System
FC	Functional Channel
FR	<i>Federal Register</i>
ft/yr	feet per year
GIS	geographic information system
gpm	gallons per minute
GWIS	Groundwater Intercept System
HRC	Hydrogen Release Compound
IA	Industrial Area
IC	institutional control
IHSS	Individual Hazardous Substance Site
IMP	Integrated Monitoring Plan
ITPH	Interceptor Trench Pump House

ITS	Interceptor Trench System
ITSS	Intercept Trench System Sump
IX	ion-exchange
J	For sampling data, a laboratory and/or validation qualifier that indicates an estimated value.
K-H	Kaiser-Hill Company LLC
L	liter
LANL	Los Alamos National Laboratory
LCS	laboratory control sample
LM	Office of Legacy Management
M&M	monitoring and maintenance
M-K	Mann-Kendall
MCG	MicroCg
µg	microgram
µg/L	micrograms per liter
mg/L	milligrams per liter
MS	matrix spike
MSD	matrix spike duplicate
MSPTS	Mound Site Plume Treatment System
N	nitrogen
NA	not applicable
Ni	nickel
NOIPD	Notice of Intent for Partial Delete
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
RER	relative error ratio
RFCA	<i>Rocky Flats Cleanup Agreement</i>
RFETS	Rocky Flats Environmental Technology Site
RFLMA	<i>Rocky Flats Legacy Management Agreement</i>
RFSOG	<i>Rocky Flats Site Operations Guide</i>
RMRS	Rocky Mountain Remediation Services
RPD	relative percent difference
S-K	Seasonal-Kendall
Se	selenium
SED	Sitewide Ecological Database
SEPro	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
TSS	total suspended solids
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
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
yr	year
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 the *Rocky Flats Site Operations Guide* to serve as the primary internal document to guide work performed to satisfy the requirements of RFLMA and implement best management practices at the Site.

This report addresses all surveillance and maintenance activities conducted at the Site during calendar year (CY) 2012 (January 1 through December 31, 2012). 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 2012 and the contact record status as of December 31, 2012.
- Inclinerometers 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 a review of the inclinometer data by a qualified geotechnical engineer. The inclinometers have shown little deflection in the past 2 years. Continued monitoring and routine maintenance of the OLF cover are presently considered adequate to address any observed surface cracking resulting from minor slumping.

- Surface-water flow volumes continue to show expected reductions resulting from land configuration changes and removal of impervious surfaces.
- All surface-water Points of Compliance showed acceptable water quality for the entire year.
- Reportable 12-month rolling average plutonium (Pu) activities were observed starting on April 30, 2010, in surface water at RFLMA Point of Evaluation (POE) monitoring station SW027, which is located on the South Interceptor Ditch upstream of Pond C-2. SW027 has recorded very little water flow since 2010, and as of April 30, 2011, the 12-month rolling average for Pu was no longer reportable at SW027. No analytical samples were able to be collected in 2012 because of insufficient flow. Reportable 12-month rolling average uranium (U) concentrations were observed starting on April 30, 2011, in surface water at RFLMA POE monitoring station GS10, which is located on South Walnut Creek upstream of former Pond B-1. Reportable 12-month rolling average americium (Am) activities were also observed starting on August 31, 2011. Pu also became reportable for 12-month rolling average activities on May 31, 2012. As of the end of CY 2012, U, Pu, and Am were still reportable at GS10.
- All other POE analyte concentrations remained below reporting levels throughout CY 2012.
- 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 2011.
- Water monitoring at the Present Landfill Treatment System during CY 2012 showed two analytes detected above the applicable standards for individual sample results. The observed concentrations did not recur and RFLMA consultation was not required. Groundwater samples collected from the three downgradient PLF Resource Conservation and Recovery Act (RCRA) wells indicated concentrations of boron in one well, boron and nickel in another, and chromium and selenium in the third. All 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. Regulatory consultation was conducted in response to these conditions.
- Surface-water monitoring for the OLF during CY 2012 showed two analytes detected above the applicable standards for individual sample results. The observed concentrations did not recur and RFLMA consultation was not required. Consistent with 2010 and 2011, boron in all three downgradient OLF RCRA wells and uranium in one of these wells was determined in 2012 to be present at statistically higher concentrations than in upgradient groundwater; also for 2012, nickel was calculated to be statistically higher in samples from one downgradient well than in upgradient groundwater. Boron in one of the downgradient wells was also found to be present on an increasing trend. In all cases, the concentrations of these constituents in downgradient groundwater were below the associated RFLMA limits. Regulatory consultation was conducted in response to these conditions.
- Analytical results for effluent from the Mound Site Plume Treatment System (MSPTS) and East Trenches Plume Treatment System (ETPTS) continued to demonstrate the vast majority of contaminants is removed. However, concentrations of some volatile organic compounds (VOCs) in system effluent exceeded target concentrations. A test air stripper installed in the existing effluent manhole at the MSPTS in 2011 was operated for most of 2012 to evaluate the effectiveness and feasibility of this method to remove residual VOCs in effluent from the treatment cells. Results were promising and installation of a more permanent, full-time air

stripper in the effluent manhole was underway at the end of 2012. A similar air stripper was also being installed at the ETPTS at the end of 2012, but in the influent manhole.

- Phase II and Phase III upgrades to the Solar Ponds Plume Treatment System (SPPTS) were completed and implemented in May 2009. Concentrations of nitrate and uranium measured at the effluent discharge gallery have decreased since Site closure, even as influent concentrations have sharply increased, demonstrating the overall improvement resulting from the phased upgrades installed since 2008. However, the Phase II uranium treatment component is not performing adequately; alternative approaches to uranium treatment were identified and testing was underway in 2012. This “microcell” approach uses small containers of treatment media—on the order of 1 to 2 gallons—to remove uranium from system influent. At the same time, the first iteration of the Phase III pilot-scale nitrate treatment studies, which were completed in 2011, continued to support nitrate removal for much of 2012. However, in 2011 this treatment method was confirmed to be infeasible for long-term implementation. Therefore, bench-scale testing was performed in 2012 on an alternative, “lagoon” approach to nitrate treatment, and late in the year the Phase III pilot-scale cells were cleaned out and modified to support this new approach. Increased sampling of SPPTS and North Walnut Creek locations continued to support various evaluations.
- Groundwater quality and flow at the Site were generally consistent with previous years. Statistical trending calculations indicated numerous significant concentration trends. Conditions observed at some locations suggested climatic causes (i.e., reduced precipitation in 2012) and/or effects of changes in sampling procedures implemented in recent years.
- All RFLMA-required ecological data collection, analysis, and reporting were completed as scheduled.
- Revegetation monitoring data continue to document the establishment of desirable grassland species at the Site. Several locations met success criteria this year.
- The annual data quality assessment showed that the Site continues to collect high-quality data sufficient for decision making.

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