Overview of the First Quarter 2010 Surveillance and Maintenance Report for the LM Rocky Flats Site
Surface Water Monitoring and Operations

First Quarter 2010
Pond Operations – First Quarter 2010

- Terminal Pond Discharges:
  - None

- Transfers:
  - A-3 to A-4; intermittently during the quarter; total of approximately 12.6 MG

- Pond Levels:
  - As of April 1, 2010, Ponds A-3, A-4, B-5, and C-2 and the Landfill Pond were holding approximately 32.6 MG (32.9 percent of capacity)

August 17, 2010, Pond Levels
- Landfill (20.9 percent)
- A-3 (2.6 percent)
- A-4 (28.3 percent)
- B-5 (24.3 percent)
- C-2 (3.9 percent)
Hydrologic Data – First Quarter 2010

- Precipitation
  - 1.58 inches total precipitation
  - 124 percent of WY 1993–2009 average

- Flow rates (percentage of average):
  - GS01 (216 percent)
  - GS03 (58 percent)
  - GS10 (103 percent)
  - SW027 (75 percent)
  - SW093 (155 percent)
Performance Monitoring – First Quarter 2010 Original and Present Landfills

- **Original Landfill (OLF):** Surface water quality results triggered monthly sampling for selenium; selenium was not detected in subsequent samples.

- **Present Landfill (PLF):** Surface water quality results were all below standards for the quarter.
POC GS01

- Plutonium and Americium

- Total Uranium

Gaps in data are for periods of zero flow, no flow data, or no analytical result.

30-Day Averages
1st Quarter CY10

RFLMA Standard for Pu-239,240 and Am-241 of 0.15 pCi/L
Pu-239,240 30-Day Average
Am-241 30-Day Average

RFLMA Standard for Total Uranium of 16.8 ug/L
Total Uranium 30-Day Average

Gaps in data are for periods of zero flow, no flow data, or no analytical result.

30-Day Averages
1st Quarter CY10
Gaps in data are for periods of zero flow, no flow data, or no analytical result.
POC GS03

- Plutonium and Americium

- Total Uranium
POC GS03

- Nitrate + Nitrite as Nitrogen

Gaps in data are for periods of zero flow, no flow data, or no analytical result. Nitrate+Nitrite is only collected during terminal pond discharges.

RFLMA Standard for Nitrate of 10 mg/L
Nitrate+Nitrite as N 85th Percentile of 30-Day Averages for Previous 12 Months
Gaps in data are for periods of zero flow, no flow data, or no analytical result.
POC GS08

- Plutonium and Americium

- Total Uranium

![Graph showing Plutonium and Americium activity and Total Uranium in ug/L over time from 4/1/09 to 4/1/10.](image)
**POC GS08**

- Nitrate + Nitrite as Nitrogen

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![Graph showing Nitrate + Nitrite concentrations over time with missing 12-month rolling averages for periods of zero discharge, no flow data, or no analytical results during the previous 12 months. The graph includes the RFLMA standard for Nitrate of 10 mg/L and 12-month rolling averages for the first quarter of CY10.](image)
POC GS11

- Plutonium and Americium

- Total Uranium

RFLMA Standard for Pu-239,240 and Am-241 of 0.15 pCIL
Pu-239,240 12-Month Rolling
Am-241 12-Month Rolling

Missing 12-month rolling averages are for periods of zero discharge, no flow data, or no analytical results during the previous 12 months.

RFLMA Standard for Total Uranium of 16.8 ug/L
Total Uranium 12-Month Rolling

Missing 12-month rolling averages are for periods of zero discharge, no flow data, or no analytical results during the previous 12 months.
POC GS11

- Nitrate + Nitrite as Nitrogen

![Graph showing nitrate and nitrite concentrations over time with RFLMA standard for nitrate of 10 mg/L. Missing 12-month rolling averages are for periods of zero discharge, no flow data, or no analytical results during the previous 12 months.](image)
POC GS31

- Plutonium and Americium
- Total Uranium
Point of Evaluation Monitoring – First Quarter 2010

- Water quality at all points of evaluation was below applicable standards during the quarter.
Plutonium and Americium Loading
Conclusions at Rocky Flats

- Postclosure concentrations remain within historic variability and have decreased significantly
- Loading has decreased significantly
- Insignificant contribution to sediment concentrations
Example Loading Figures from the 2009 Annual Report: Lower Walnut Creek

Figure 3.13: Relative Average Annual Au Load Totals at G503, G508, and G511

Figure 3.16: Relative Average Annual Au Load Totals at G503, G508, and G511
Relative Average Annual Plutonium Load Totals at GS03, GS08, and GS11 (Scaled to Show Relative Load Quantities)

Walnut Cr. Terminal Ponds A-4 [GS11] + B-5 [GS08]

Walnut Cr. At GS03

98.0 μg

6.0 μg

Load Removal (Loss) to Walnut Cr.

Walnut Cr. at GS03

92.0 μg

Load Added (Gain) in Walnut Cr.

Walnut Cr. Terminal Ponds A-4 [GS11] + B-5 [GS08]

3.0 μg

3.7 μg

6.7 μg

CY97-05

CY06-09
Relative Average Annual Americium Load Totals at GS03, GS08, and GS11 (Scaled to Show Relative Load Quantities)

Walnut Cr. at GS03

Load Added (Gain) in Walnut Cr.

CY97-05

Walnut Cr. Terminal Ponds A-4 [GS11] + B-5 [GS08]

Load Added (Gain) in Walnut Cr.

CY06-09

Walnut Cr. Terminal Ponds A-4 [GS11] + B-5 [GS08]
Example Loading Figure from the 2009 Annual Report: Pond C-2
Relative Average Annual Plutonium Load Totals for Pond C-2 (Scaled to Show Relative Load Quantities and Updated with CY 2010 Data)

Influent to Pond C-2 (SW027)

Load Removal

Influent to Pond C-2 (SW027)

Pond C-2 Effluent (GS31)

**CY97-05**

- 122.5 g
- 113.1 g
- 9.4 g

**CY06-10**

- 11.1 μg
- 10.1 μg
- 1.0 μg

* Data through 4/26/10
Monitoring Location GS51 (Drainage Swale Tributary to the S. Interceptor Ditch): Plutonium and Americium Results for Continuous Flow-Paced Composite Samples

Notes:
- Negative analytical results due to blank correction are shown here as zero.
- Sample results shown at midpoint of composite sampling period.
- Data are validated through 4/22/10

Sampling for characterization of Pond C-2

Gaging station GS51 installed 8/13/01 to establish baseline
Period of remediation activities for 903 Lip Area
Post 903 Lip Area remediation period
Monitoring Location SW027 (S. Interceptor Ditch upstream of Pond C-2): Plutonium and Americium Results for Continuous Flow-Paced Composite Samples

Notes:
- Negative analytical results due to blank correction are shown here as zero.
- Sample results shown at midpoint of composite sampling period.
- Data are all validated

Sampling for characterization of Pond C-2 sediment

RFCA monitoring period prior to 903 Lip Area remediation
Period of remediation activities for 903 Lip Area
Post 903 Lip Area remediation period
Monitoring Location GS01 (Woman Creek at Indiana St.): Plutonium Results for Continuous Flow-Paced Composite Samples

Notes:
- Negative analytical results due to blank correction are shown here as zero.
- Sample results shown at midpoint of composite sampling period.
- Error bars represent analytical uncertainty

Average (10/1/96-12/31/05; N=168): 0.004 pCi/L
Average (1/1/06-6/12/10; N=76): 0.004 pCi/L
Conceptual Dam Breach Design

Profile View

Plan View

EXISTING POOL AREA

CHANNEL FLOWLINE

DAM EMBANKMENT

CHANNEL EXCAVATION

POND BOTTOM AREA TO BE FILLED WITH EMBANKMENT MATERIAL

EXISTING POND BOTTOM

NEW POND BOTTOM (NO POOLED WATER)

CHANNEL INLET

DAM EMBANKMENT

CHANNEL FLOWLINE
Conceptual Dam Breach Design

Legend
- Orange: Pond Bottom Area to be Filled with Embankment Material
- Blue: Pond Level During Flow Through Operation
- Green: Area to be Revegetated During Flow Through Operation
- Brown: Breach Channel
Non-RFLMA Enhanced Sampling

- Grab sampling for uranium and nitrate + nitrite in North and South Walnut Creeks
- Continuous flow-paced composite sampling for uranium in North and South Walnut Creeks
- Synoptic storm-event sampling for Plutonium, Americium, and TSS in North and South Walnut Creeks
- Grab sampling at various locations for high-resolution uranium analysis at LANL
Grab Sampling for Nitrate + Nitrite and Uranium

- Designed to evaluate spatial variation of water quality
- Samples are collected biweekly during a variety of flow conditions; frequency may change based on data evaluation
- Sampling locations
  - North Walnut Creek: SW093, SPOUT, GS13, A1EFF, A2EFF, A3EFF, A4INFLOW, A4 POND
  - South Walnut Creek (uranium only): GS10, B3OUTFLOW, B5INFLOW, B5 POND
- Started sampling January 27, 2010; have conducted 17 sampling events to date
Grab Sampling for Nitrate + Nitrite and Uranium

Legend
NO3+NO2 and Uranium Grab Sampling Locations
- Bi-Weekly Started 1/27/10
Uranium Grab Sampling Locations
- Bi-Weekly Started 1/27/10
Continuous Flow-Paced Composite Sampling for Uranium

- Designed to evaluate longer-term variation of water quality (e.g., 12-month average)
- Samples are collected continuously during all flow conditions using automated samplers
- Sampling locations
  - North Walnut Creek: SW093*, GS13*, GS12, GS11*
  - South Walnut Creek: GS10*, B5INFLOW, GS08*
- Samples to date during CY 2010

<table>
<thead>
<tr>
<th>Location</th>
<th>Number of Composites (CY 2010)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW093</td>
<td>15</td>
</tr>
<tr>
<td>GS13</td>
<td>15</td>
</tr>
<tr>
<td>GS12</td>
<td>15</td>
</tr>
<tr>
<td>GS11</td>
<td>9</td>
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<td>GS10</td>
<td>13</td>
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<tr>
<td>B5INFLOW</td>
<td>2</td>
</tr>
<tr>
<td>GS08</td>
<td>10</td>
</tr>
</tbody>
</table>

* RFLMA Sampling
Automated Sampling for Uranium
Example of Continuous Flow-Paced Sample Hydrograph
Synoptic Storm-Event Sampling

- Designed to evaluate spatial variation of water quality during storm events – specifically targeted at previously breached Dams A-1, A-2, B-1, B-2, and B-3
- Samples analyzed for plutonium, americium, uranium, and total suspended solids
- Samples are collected using automated samplers that trigger during the rising limb of a runoff hydrograph as the event moves down a drainage – opportunistic
- Sampling locations
  - North Walnut Creek: GS13, A1EFF, A2EFF
  - South Walnut Creek: GS10, B3OUTFLOW
- Sampling events to date during CY 2010
  - North Walnut Creek: two events
  - South Walnut Creek: one event
Synoptic Storm-Event Sampling

Legend
Pu, Am, U, and TSS Automated Synoptic Sampling Locations
Started April 2010
Example of Synoptic Storm-Event Sample Period

N. Walnut Creek: Storm-Event Water Levels Showing Individual Grabs

Date; Time

GS13 Water Level
GS13 Grab Samples
A1EFF Water Level
A1EFF Grab Samples
A2EFF Water Level
A2EFF Grab Samples
LANL High-Resolution Uranium Sampling

- Designed to evaluate spatial variation of uranium isotopic signatures – anthropogenic (site-related) vs. naturally occurring
- Samples are collected as grabs; targeted to baseflow periods to avoid dilution from runoff
- Sampling locations
  - North Walnut Creek: ITSW, ITSE, SPOUT, SPPDG, GS13, A1EFF, A2EFF, A3EFF
  - South Walnut Creek: GS10, B3OUTFLOW, POM2, B5INFLOW
- Sampling events to date during CY 2010: March 17 and 18, 2010
- Planning an additional round of samples during CY 2010
LANL High-Resolution Uranium Sampling

Legend
LANL Uranium Sampling Locations

- GS13
- GS10
- A1EFF
- A2EFF
- A3EFF
- POM2
- B5INFLOW
- SPPDISCHARGE
- GALLERY
- SPOUT
- ITSE
- ITSW

North Walnut Creek
South Walnut Creek

Samples Collected 3/17-3/18/10
Enhanced Sampling: Preliminary Results

- Uranium: results show expected variability
  - Higher concentrations during baseflow periods
  - North Walnut Creek: concentrations increase in Pond A-2 and decrease further downstream; SPPTS effluent not a major contributor
  - South Walnut Creek: concentrations decrease upstream to downstream

- Nitrate + Nitrite
  - SPPTS effluent not a major contributor
  - Concentrations decrease upstream to downstream; natural degradation especially during warmer periods

- Synoptic storm-event sampling
  - Previously breached dams not contributing Plutonium, Americium, or TSS
LANL High-Resolution Uranium Sampling Results

- Results showed predominantly natural uranium at each surface water location
- Results for locations sampled previously are generally consistent with the earlier data
- Highlights of special interest discussed with SPPTS content
Questions?
RFLMA Monitoring

- First quarter is a light sampling quarter
  - All RCRA wells (six at PLF, four at OLF)
- Results reviewed in accordance with the RFLMA Attachment 2 decision flowcharts
  - Generally consistent with past results
- Results will be evaluated in the 2010 annual report
SPPTS Update

- Continue to collect samples at least weekly
  - Sample locations to support evaluation of Phase II, III, and entire system
  - Most analyzed by ESL; not validated
  - Splits collected periodically for contract lab analysis
  - Support optimization efforts
- Evaluated treatment by entire system, Phases II, III
  - Cell A dosing (carbon, phosphorous)
  - Varied flow rates
- Flow conditions in original cells
SPPTS Update

Complete System: Uranium and Nitrate as Nitrogen

Date Sampled

- 9/9/2008
- 12/18/2008
- 3/28/2009
- 7/6/2009
- 10/14/2009
- 1/22/2010
- 5/2/2010
- 8/10/2010
- 11/18/2010

Uranium Concentration in mg/L

Nitrate as Nitrogen Concentration in mg/L

Note: Includes Unvalidated Data Qualifiers Not Indicated
SPPTS Update

- Phase II cell
  - Uranium removal decreased when flow rates increased to manage spring 2010 moisture
  - Uranium removal essentially ceased in July 2010
  - Media replaced in August 2010
  - Treatment effectiveness restored
Phase II Cell: Uranium

Note: Includes Unvalidated Data
Qualifiers Not Indicated

Flow Increased

Phase II, III Online
SPPTS Update

- Phase III pilot studies
  - Cell A (inert media) testing completed
  - Cell B (organic media) testing completed
  - Inert media selected for Phase IV alternative development
Phase III Cells: Nitrogen as Nitrogen

Note:
Includes Unvalidated Data
Qualifiers Not Identified
SPPTS Update

- LANL high-resolution uranium sampling
  - ITSS, the sump installed as part of SPPTS Phase I
    - Both east and west drains feeding sump sampled
    - West drain 50 to 51 percent anthropogenic uranium
    - East drain 99 percent natural
  - SPP discharge gallery
    - Preclosure, predominantly natural
    - Postclosure, pre-Phase I, predominantly anthropogenic
    - Result this spring: predominantly natural
    - Shows Phase I is capturing, and SPPTS is treating, more anthropogenic uranium
SPPTS Update

- Ongoing activities
  - Conceptualizing and costing Phase IV alternatives (full-scale nitrate treatment)
  - Operating Phase III to support nitrate treatment
  - Installed auxiliary flow distribution piping in original Cell 1 to address biofouled piping; adding associated plumbing
MSPTS, ETPTS Update

- Effluent includes constituents above RFLMA values
- Treatment effectiveness corresponds to residence time (how long the water is in contact with treatment media), media condition, and specific contaminants
  - Spring moisture presented high flow rates (less treatment)
  - MSPTS due for media replacement (coming fall 2010)
  - MSPTS now treating high concentrations of breakdown products (take longer residence time to treat)
- Consulted CDPHE; consultation continues
- Performed additional sampling in June, July, August
  - RFLMA locations and additional locations between effluent and surface water performance locations
  - More to come in second quarter and annual reports
Questions?
Site Operations

First Quarter 2010
OLF Inspections

- Monthly inspections at the OLF were completed on January 28, February 25, and March 30
- A vegetation inspection was completed on February 16
OLF Seeps

- Seep 4 had some surface expression, but did not show any surface flow; this is due to the rock drain that was installed in 2009.
- Seep 8 flowed at a rate of 2 to 5 gpm throughout the first quarter.
- The rock drain located at the base of the West Perimeter Channel was flowing at a rate of 0.5 gpm during the January inspection; flow increased to 2 to 4 gpm during the February and March inspections.
Seep 7 showed a surface flow of approximately 0.5 gpm during the January inspection; flow increased to 2 to 4 gpm during the February and March inspections.

Increased seep flow rates in February and March were due to the melting of recent snow events.
OLF Settlement Monuments and Inclinometers

- Settlement monuments were surveyed on March 26; data are within the expected range per the *Original Landfill Monitoring and Maintenance Plan*, which is between 1.34 and 2.86 feet depending on the location.

- Inclinometers were measured on January 26, February 24, and March 30, 2010:
  - March readings indicated deflection for inclinometers between Berm 1 and Berm 3.
  - Surface cracking in vicinity of Berm 1 appears consistent with inclinometer indications.
  - Also consistent with findings of 2008 geotechnical investigation.
OLF Slumps

- A small hairline crack that ran through the top and south face of Berm 1 was noted on March 30; the crack was filled and compacted with Rocky Flats alluvium the same day.

- The end of Berm 7 was observed as having slumped into the Eastern Perimeter Channel during the March 30 inspection; the area was too wet to perform any immediate repairs.

- Berm 7 repair completed in June 2009.
OLF Observed Crack Location
OLF Berm 7 Slump
PLF Inspections and Surveys

- The quarterly inspection was completed on February 25
- No areas of concern were observed
- The vegetation inspection was completed on February 17
Annual Site (COU) Inspection – March 17, 2010

- Inspection and monitoring for evidence of significant erosion
  - Conduct visual observation for precursors of significant erosion
  - Evaluate proximity of any significant erosion to subsurface features

- Inspect effectiveness of institutional controls (ICs)
  - Determine effectiveness by any evidence of violation of ICs and determine whether required signs are in place
  - Verify that Environmental Covenant is in Administrative Record and on file with Jefferson County (verified March 19, 2010)

- Evidence of any adverse biological conditions observed during inspection
Annual Inspection (continued)

- COU divided into five areas:
  - A – Former 300 and 400 Areas
  - B – Former 700 and 991 Areas
  - C – Former 800 Area
  - D – Former 903 Pad and East Trenches Area
  - E – Former Ash Pits Area

- Landfills, treatment systems, and water monitoring stations inspected during the year on a routine basis

- Team walked down surface of each area (A–E) to observe conditions
Annual Inspection

- No significant erosion noted – minor holes and surface debris
  - Very limited aerial extent – holes filled in
  - Debris and trash collected or flagged for pick up
- No adverse biological conditions noted
- No evidence of IC violations
- Signs in place
Questions?