Overview of the Second Quarter 2010 Surveillance and Maintenance Report for the LM Rocky Flats Site

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Surface Water Monitoring and Operations

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Pond Operations – Second Quarter 2010

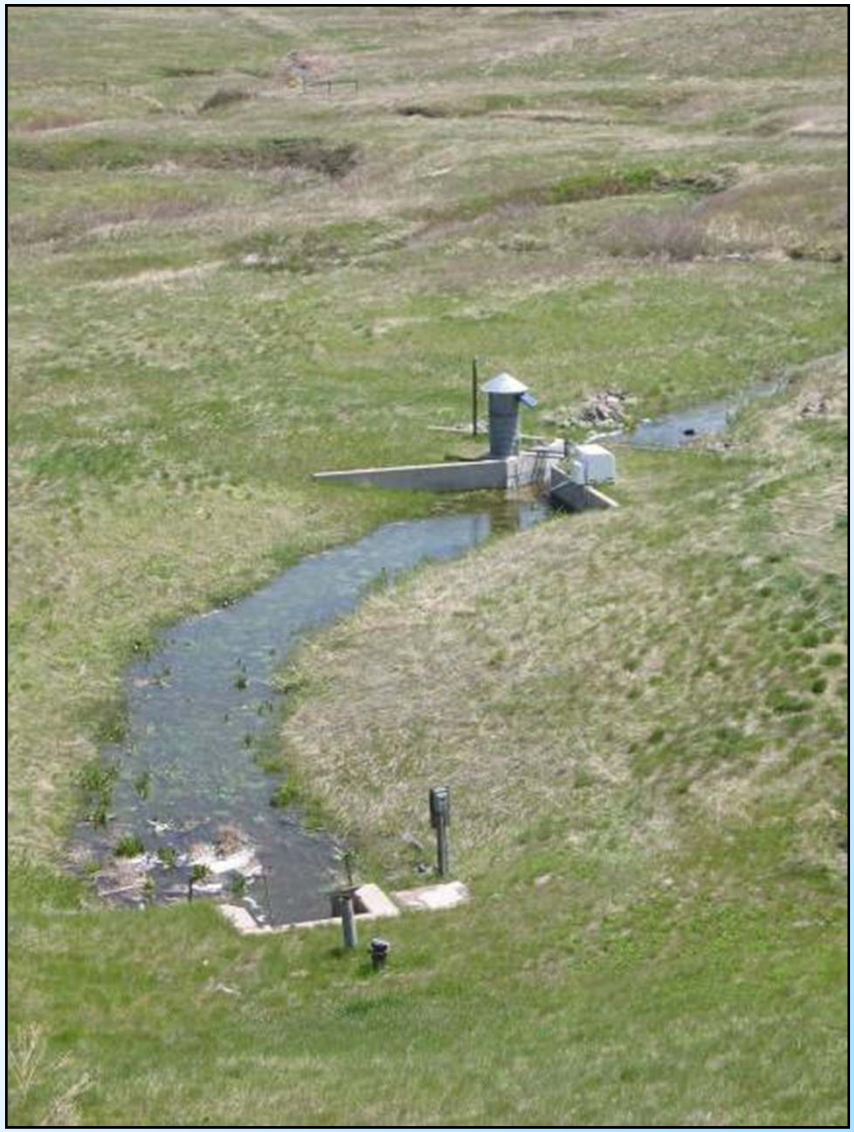
- Terminal Pond Discharges:
  - Pond A-4: May 1 through May 19, 2010, 32.4 MG
  - Pond B-5: April 23 through May 16, 2010, 20.8 MG
- Transfers:
  - A-3 to A-4: intermittently during the quarter; total of 24.2 MG
- Pond Levels:
  - As of June 1, 2010, Ponds A-3, A-4, B-5, and C-2 and the Landfill Pond were holding approximately 19.6 MG (19.8 percent of capacity)

November 1, 2010, Pond Levels

- Landfill (20.5 percent)
- A-3 (0.4 percent)
- A-4 (23.4 percent)
- B-5 (21.7 percent)
- C-2 (2.4 percent)

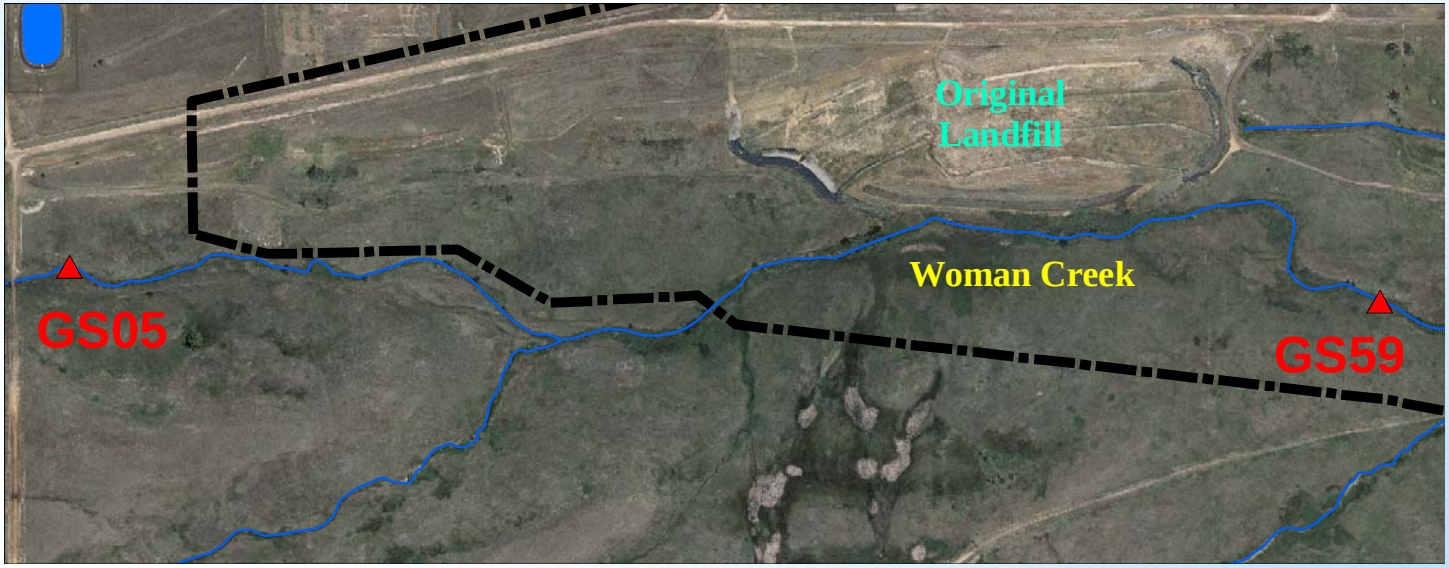
Hydrologic Data – Second Quarter 2010

- Precipitation
  - 6.65 inches total precipitation
  - 122 percent of WY 1993–2009 average
- Flow rates (percentage of average)
  - GS01 (183 percent)
  - GS03 (151 percent)
  - GS10 (116 percent)
  - SW027 (11 percent)
  - SW093 (128 percent)

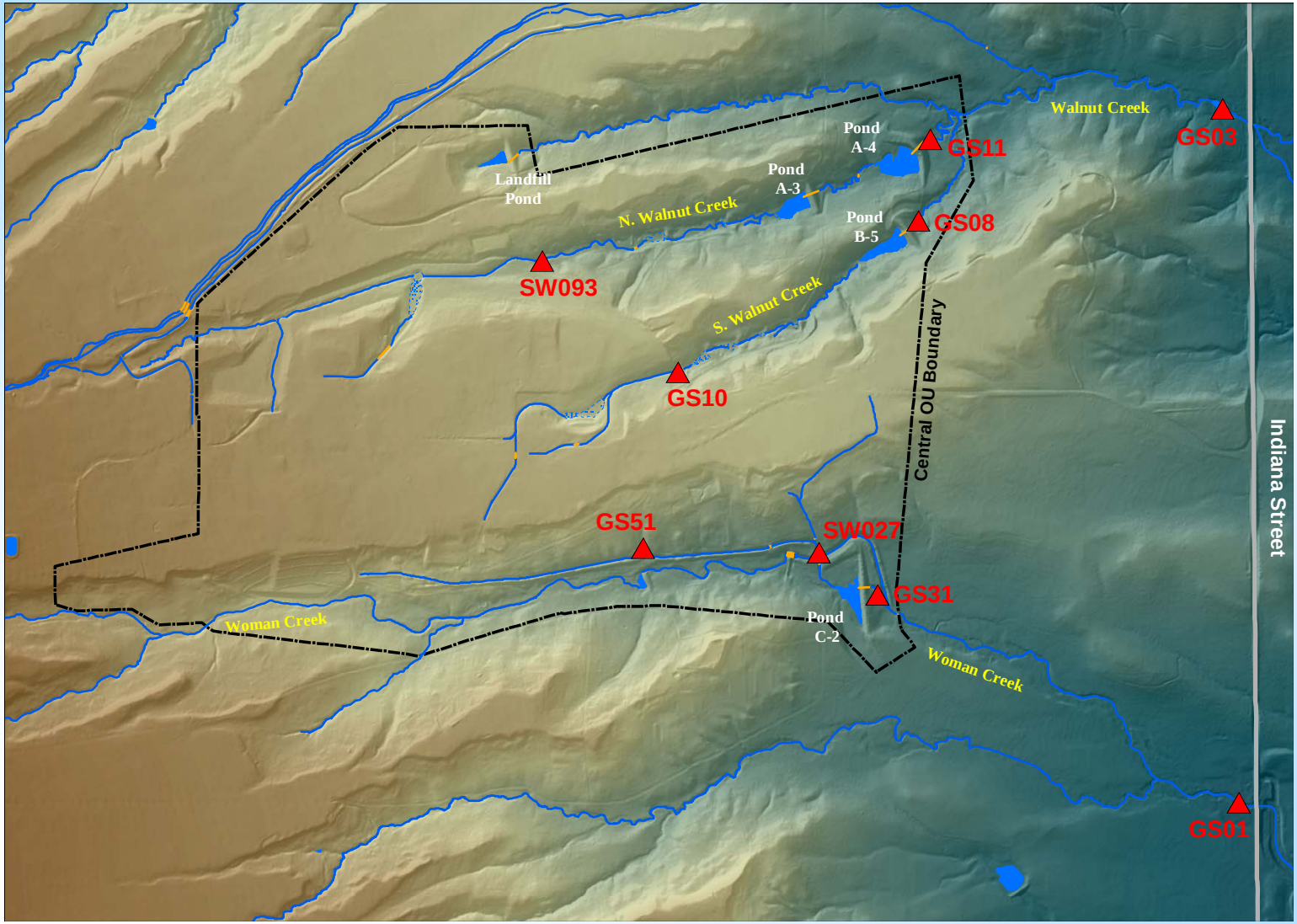


Performance Monitoring – Second Quarter 2010 Original and Present Landfills

- **Original Landfill (OLF)**: Surface water quality results were all below standards for the quarter
- **Present Landfill (PLF)**: Surface water quality results were all below standards for the quarter

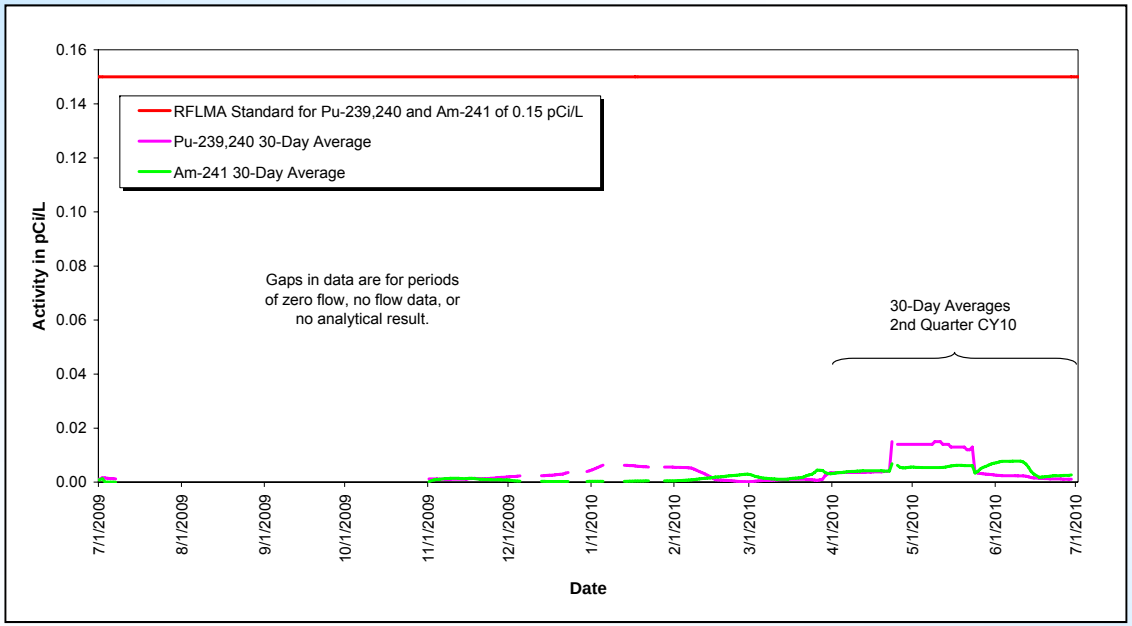


Selected Surface Water Monitoring Locations

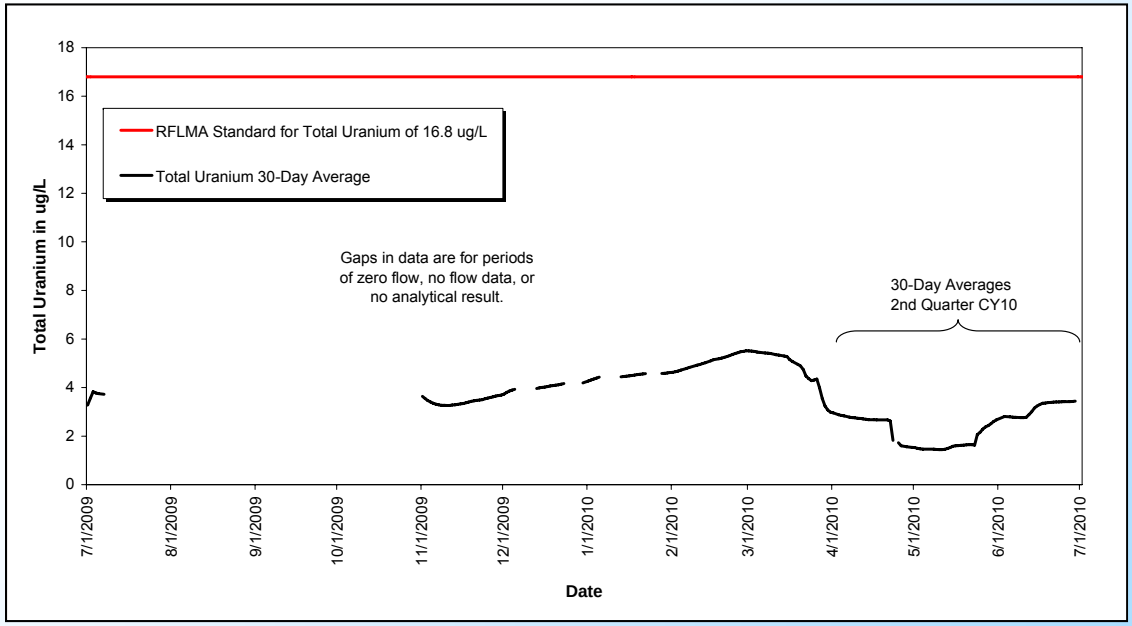


POC GS01

- Plutonium and Americium



- Total Uranium



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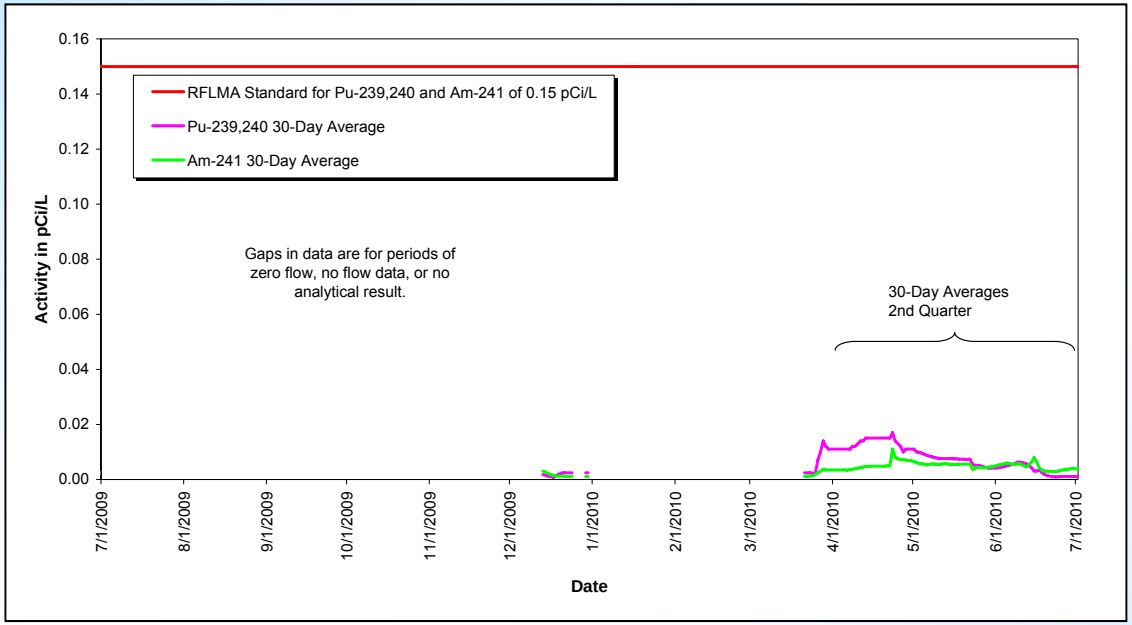
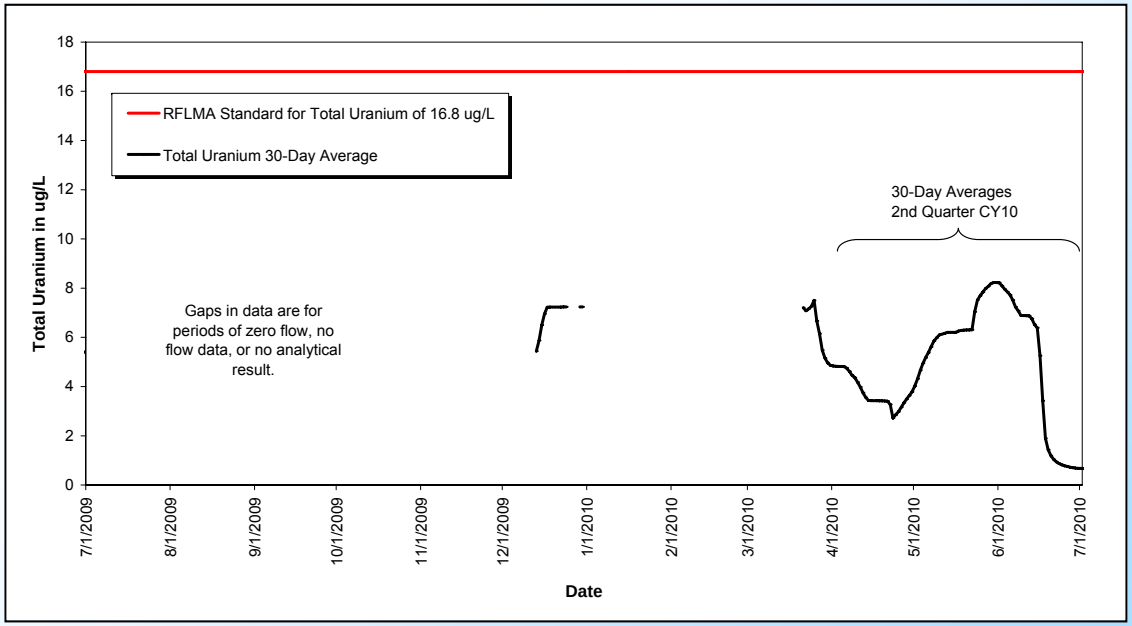
POC GS03

- Plutonium and Americium



- Total Uranium



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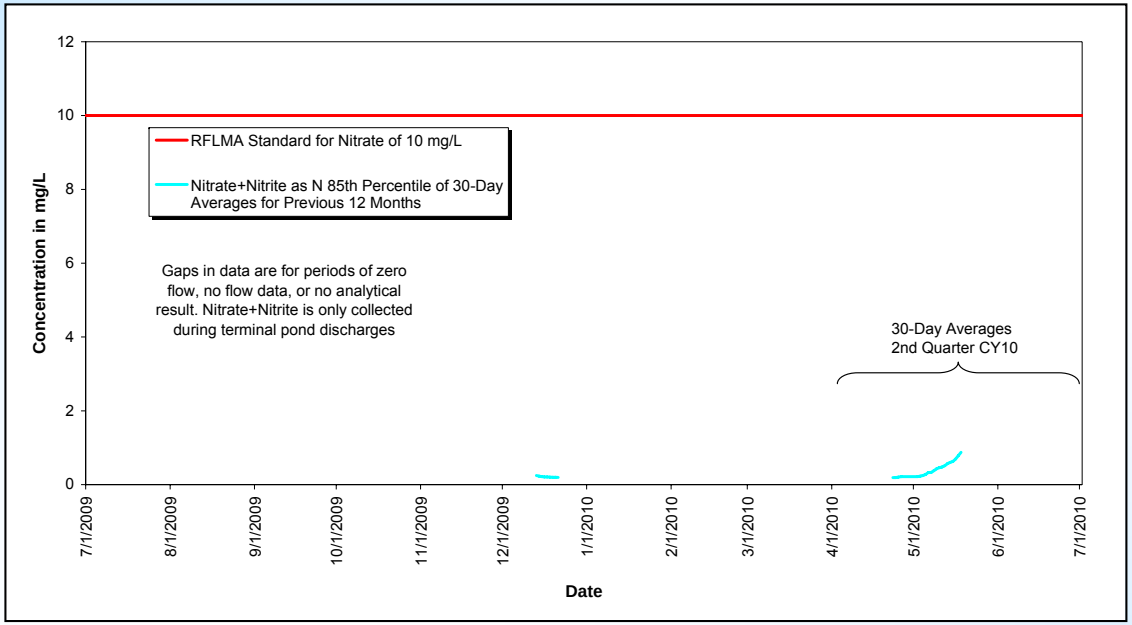
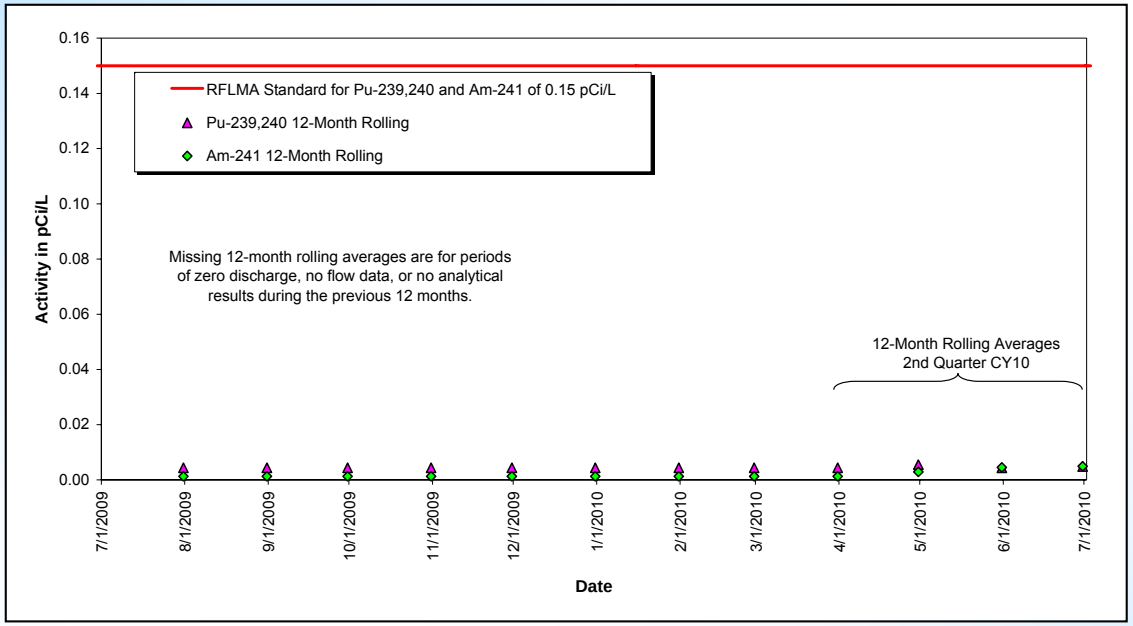
POC GS03

- Nitrate + Nitrite as Nitrogen

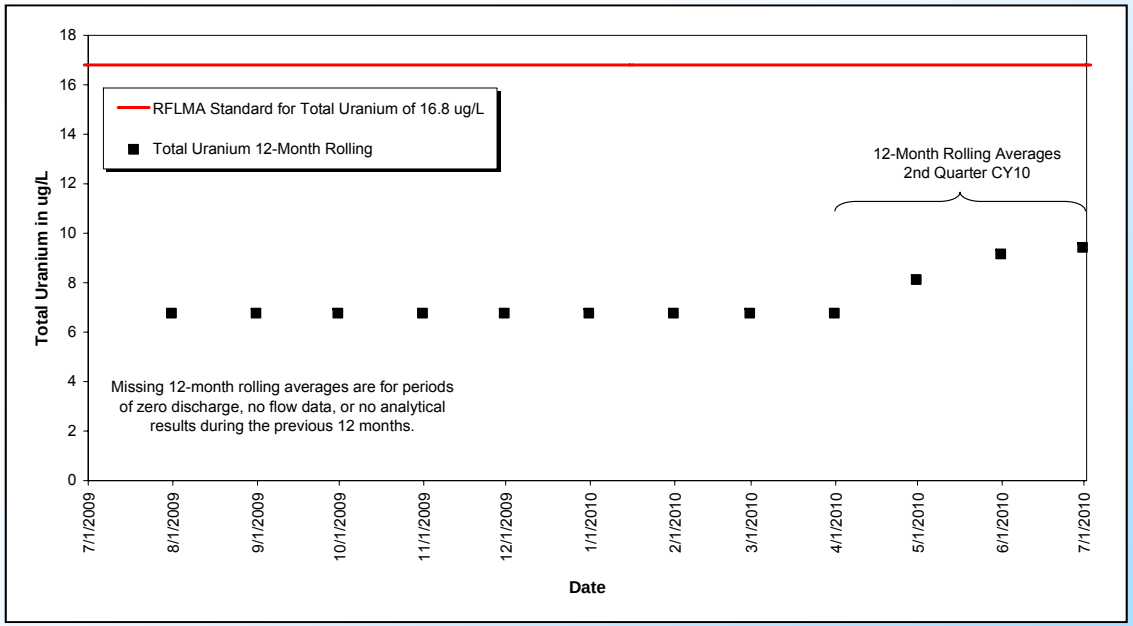


POC GS08

- Plutonium and Americium



- Total Uranium



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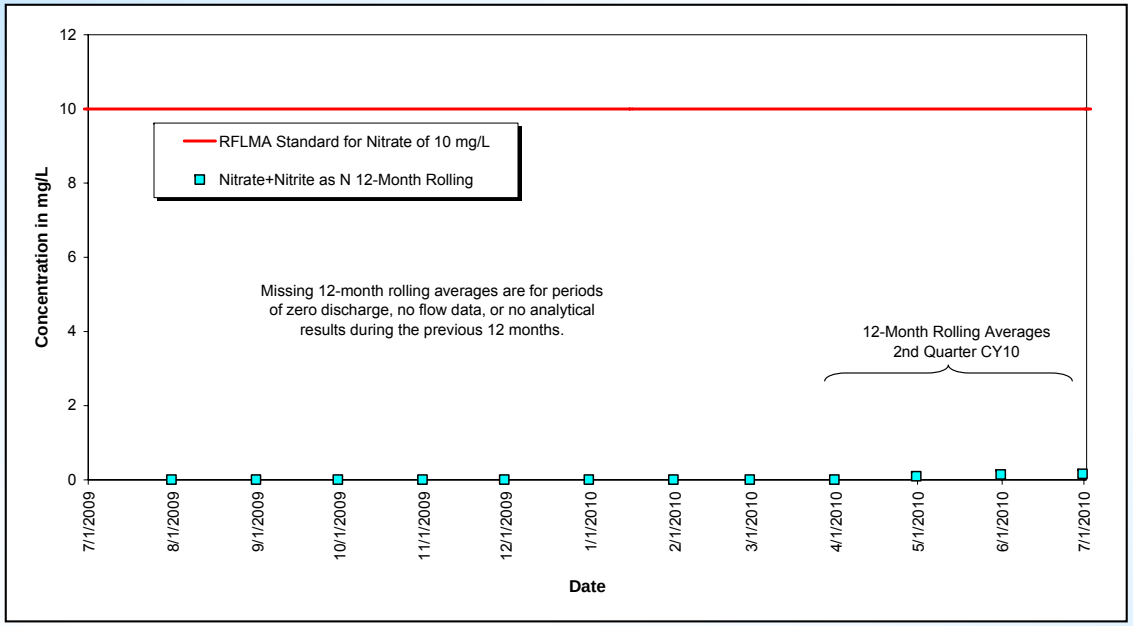
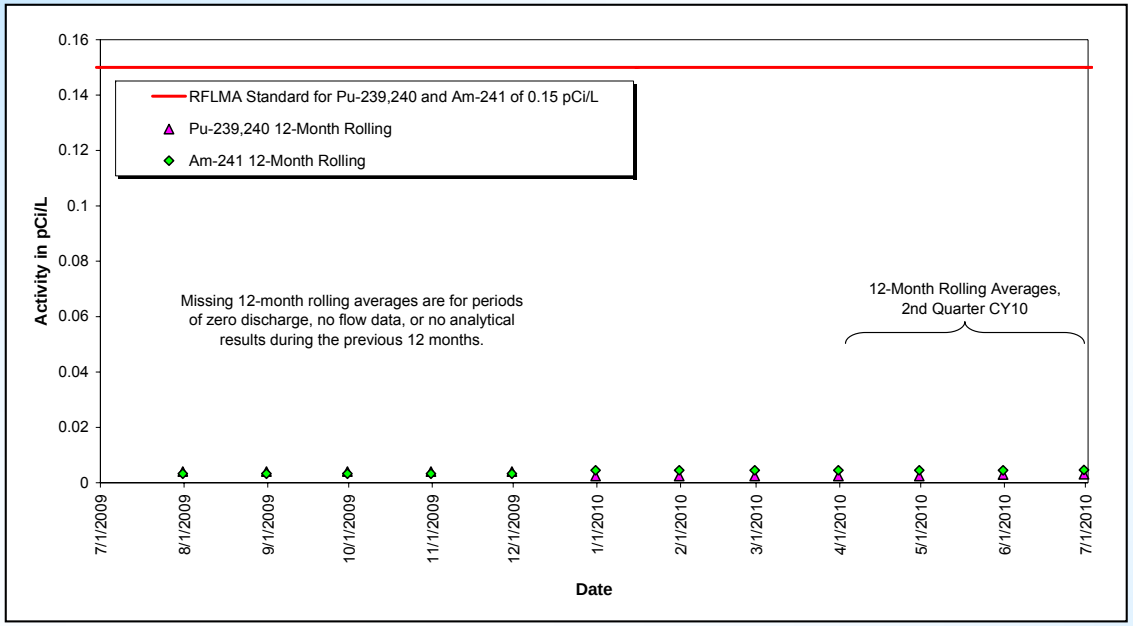
POC GS08

- Nitrate + Nitrite as Nitrogen

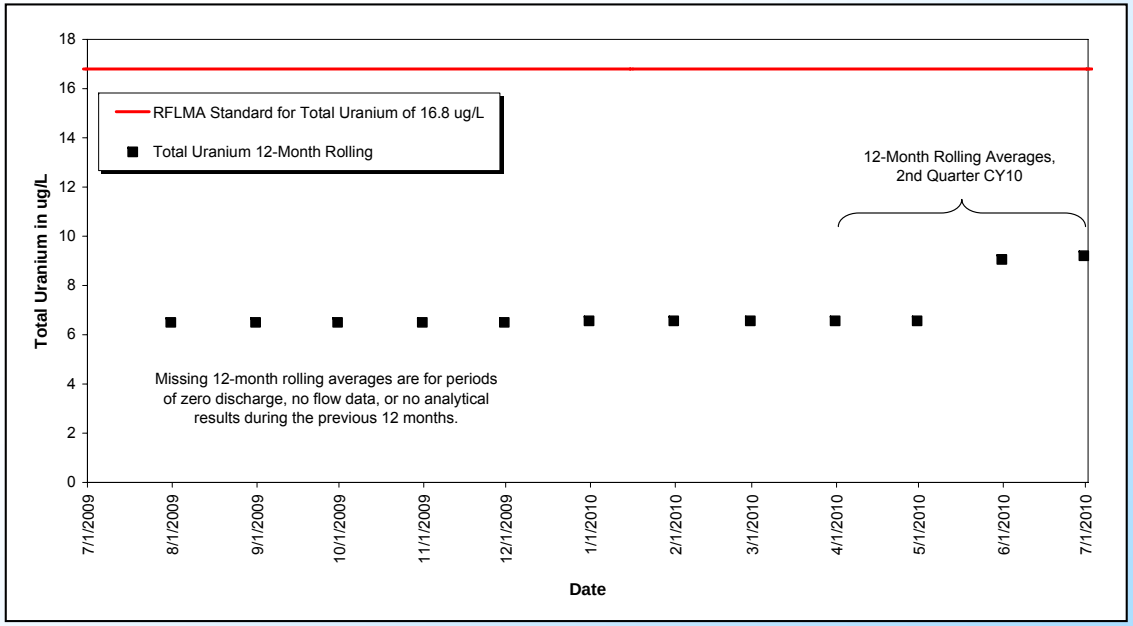


POC GS11

- Plutonium and Americium



- Total Uranium



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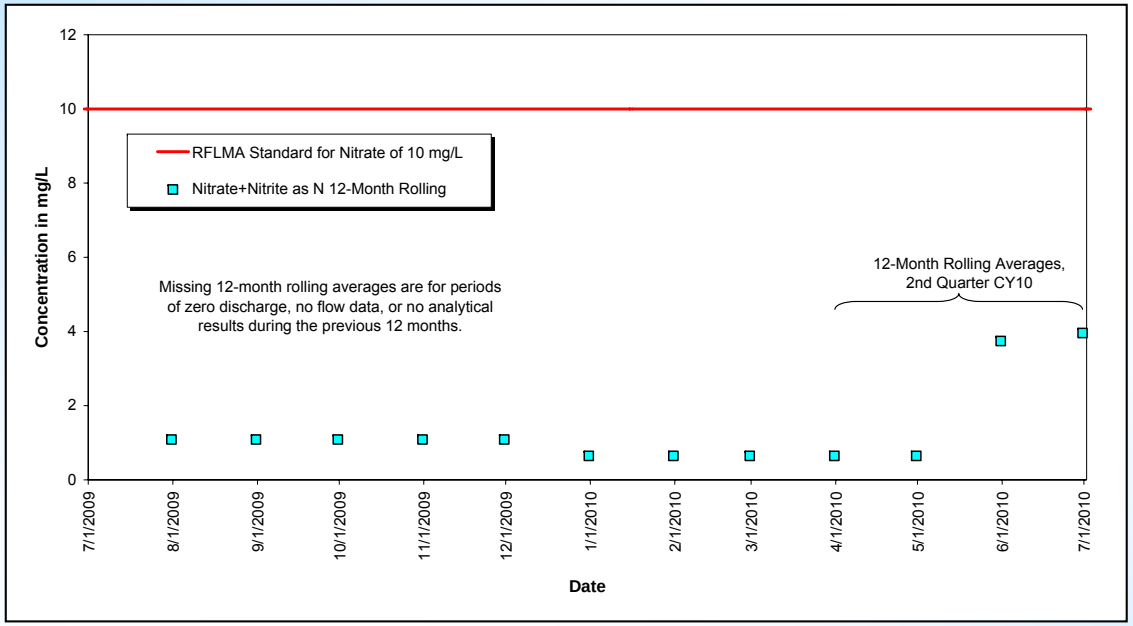
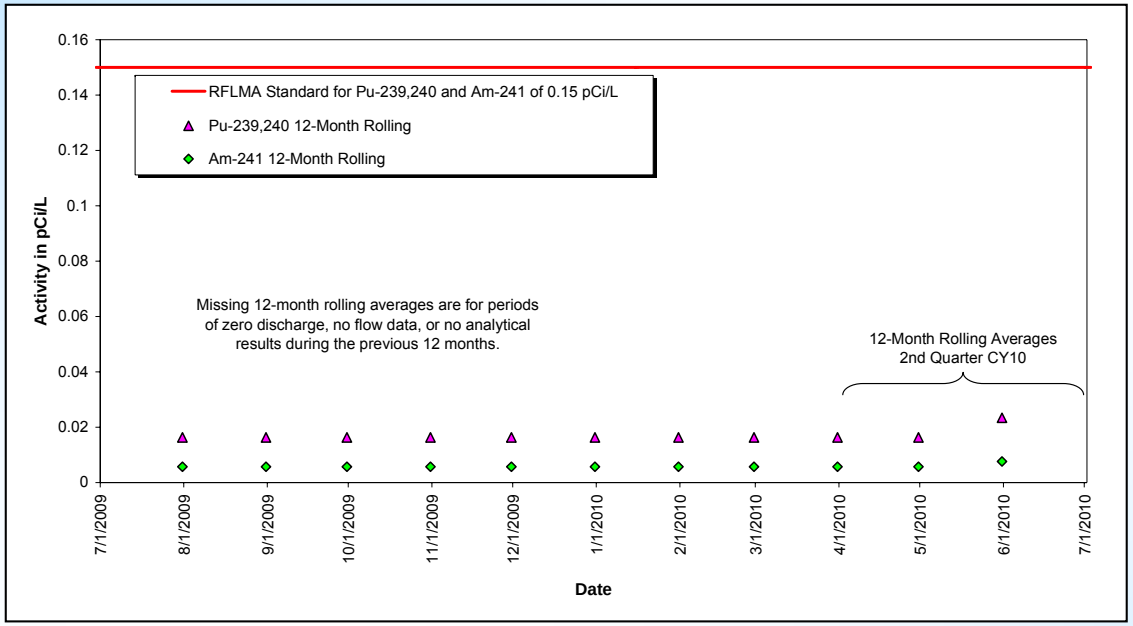
POC GS11

- Nitrate + Nitrite as Nitrogen

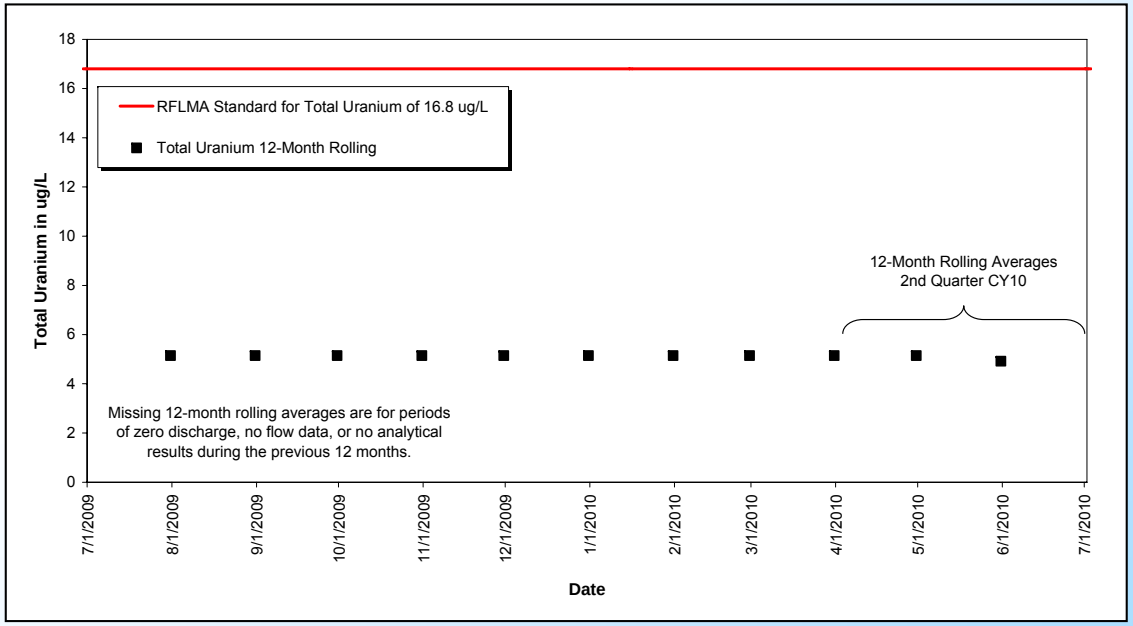


POC GS31

- Plutonium and Americium



- Total Uranium



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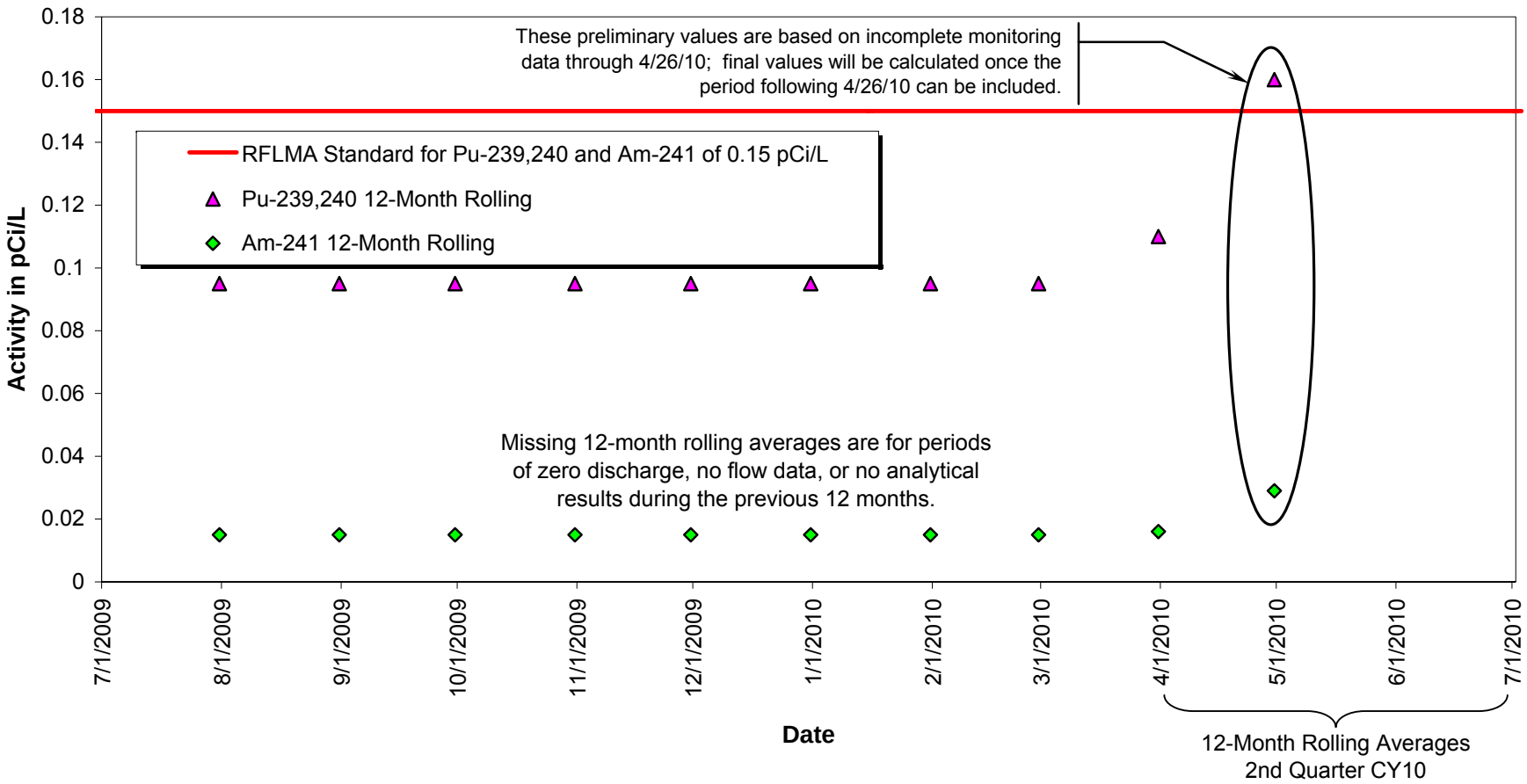
Point of Evaluation (POE) Monitoring – Second Quarter 2010

- Water quality data at POE SW027 (through April 26, 2010) indicate that the standard for Pu-239,-240 (0.15 pCi/L) will be exceeded when complete data are available through April 30, 2010. The formal notification and proposed actions are included in Contact Record (CR) 2010-06 and the subsequent August 31, 2010, Status Report.
- Water quality at all other POEs was below applicable standards during the quarter.

POE Monitoring – Second Quarter 2010 (POE SW027)



Data are preliminary and subject to revision

Grab Sampling for Nitrate + Nitrite and Uranium

- Designed to evaluate spatial variation of water quality
- Started sampling January 27, 2010; have conducted 19 sampling events as of October 6, 2010

North Walnut Creek

			NO3+NO2 as N (mg/L)		Uranium (ug/L)	
	Location Code	Location Description	Average	Sample Count	Average	Sample Count
Upstream	SW093	POE at downstream end of Functional Channel 3	11.4	15	8.7	16
⬇	SPOUT*	Effluent from SPPTS	67.2	17	28.7	18
⬇	GS13	SPPTS Performance Monitoring Loc; influent to Pond A-1	16.8	15	14.8	15
⬇	A1EFF	Effluent from Pond A-1	14.4	16	11.6	17
⬇	A2EFF	Effluent from Pond A-2	13.4	13	21.1	15
⬇	A3EFF	Effluent from Pond A-3	6.1	13	19.9	14
⬇	A4INFLOW^	Influent to Pond A-4	7.6	10	21.9	10
Downstream	A4 POND	Pond A-4 at center of dam face	2.02	17	10.8	17

South Walnut Creek

			Uranium (ug/L)	
	Location Code	Location Description	Average	Sample Count
Upstream	GS10	POE at downstream end of Functional Channel 4	18.3	17
⬇	B3OUTFLOW	Effluent from Pond B-3	16.4	17
⬇	B5INFLOW	Influent to Pond B-5	13.9	17
Downstream	B5 POND	Pond B-5 at center of dam face	10.9	17

Notes: *SPOUT (SPPTS effluent) is not located in N. Walnut Cr. but is tributary to N. Walnut between locations SW093 and GS13.
^A4INFLOW sampling was terminated on 6/30/10 since data indicate that this location is essentially redundant with A3EFF.
Sample counts vary since some locations are periodically dry.
Summary includes all data available as of 10/6/10; some recent results are not validated (preliminary and subject to revision).

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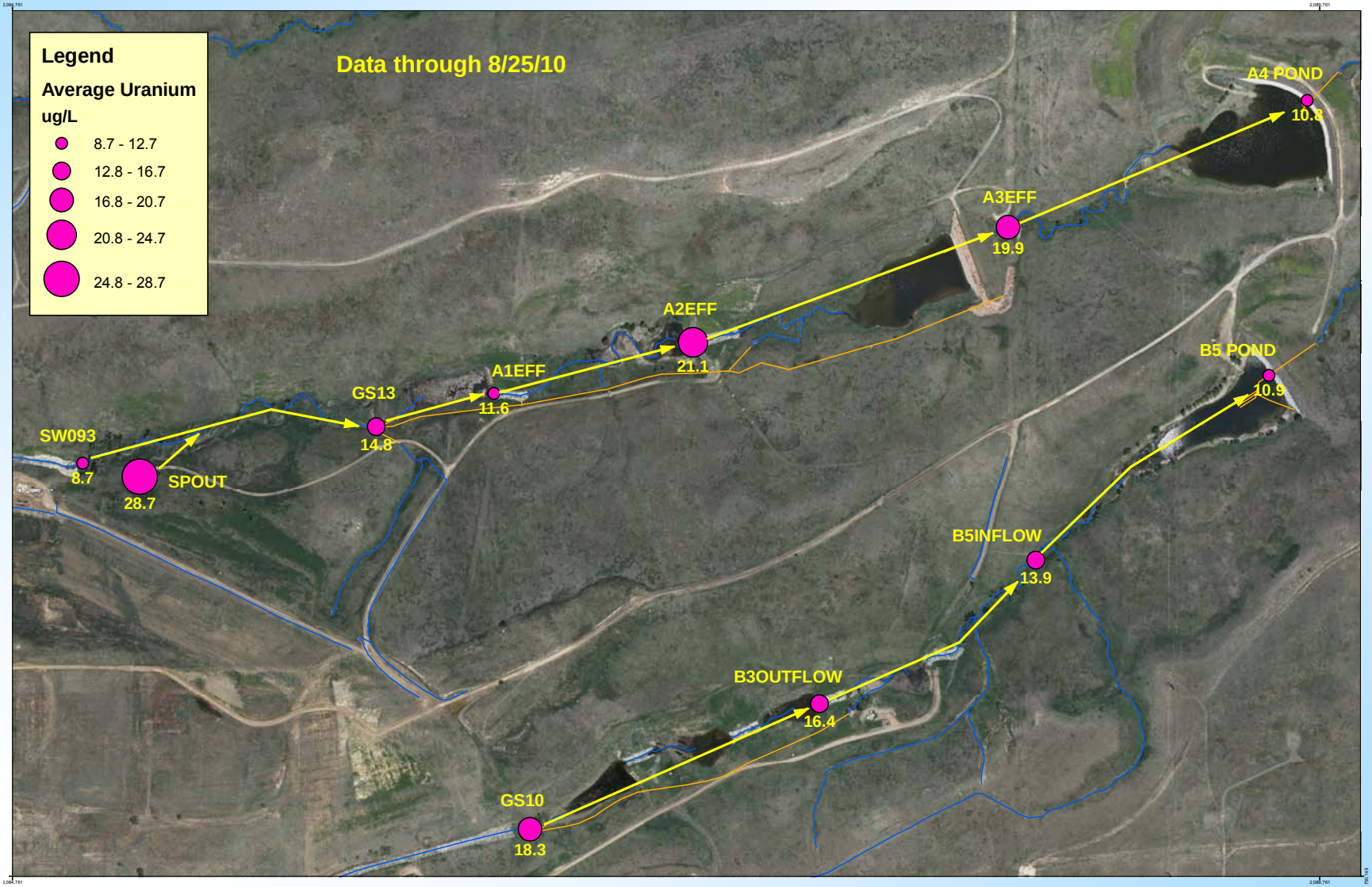
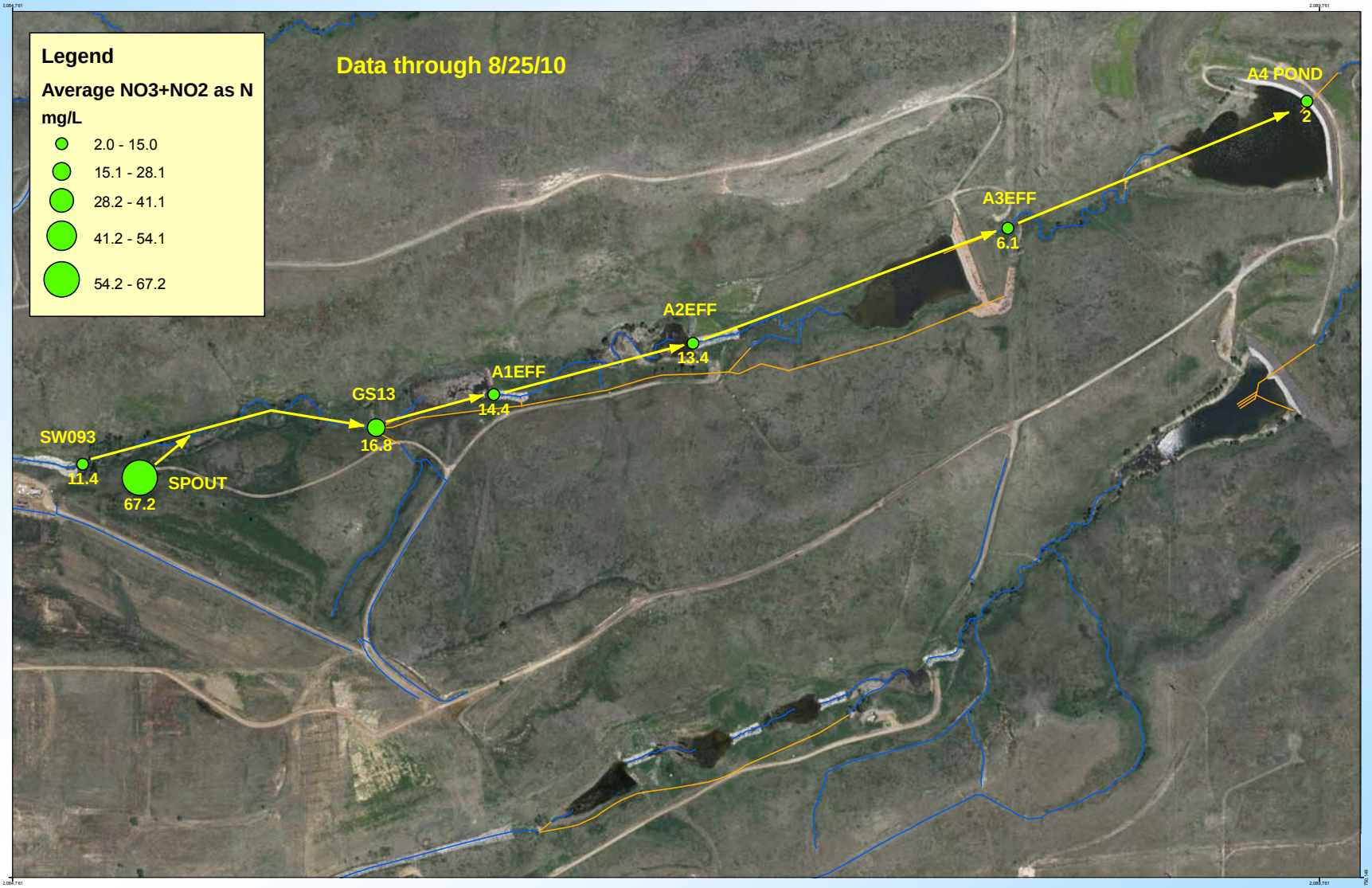
Grab Sampling for Uranium



Grab Sampling for Nitrate + Nitrite



Continuous Flow-Paced Composite Sampling for Uranium

- Designed to evaluate longer-term variation of water quality (e.g., 12-month average)

North Walnut Creek

	Location Code	Location Description	Uranium (ug/L) Volume-Weighted Average	Uranium (ug/L) Sample Count
Upstream	SW093*	POE at downstream end of Functional Channel 3	7.1	13
⬇	GS13*	SPPTS Performance Monitoring Loc; influent to Pond A-1	8.4	12
⬇	GS12	Effluent from Pond A-3	11.5	15
Downstream	GS11*	Effluent from Pond A-4	9.8	9

Data start on 3/10/10

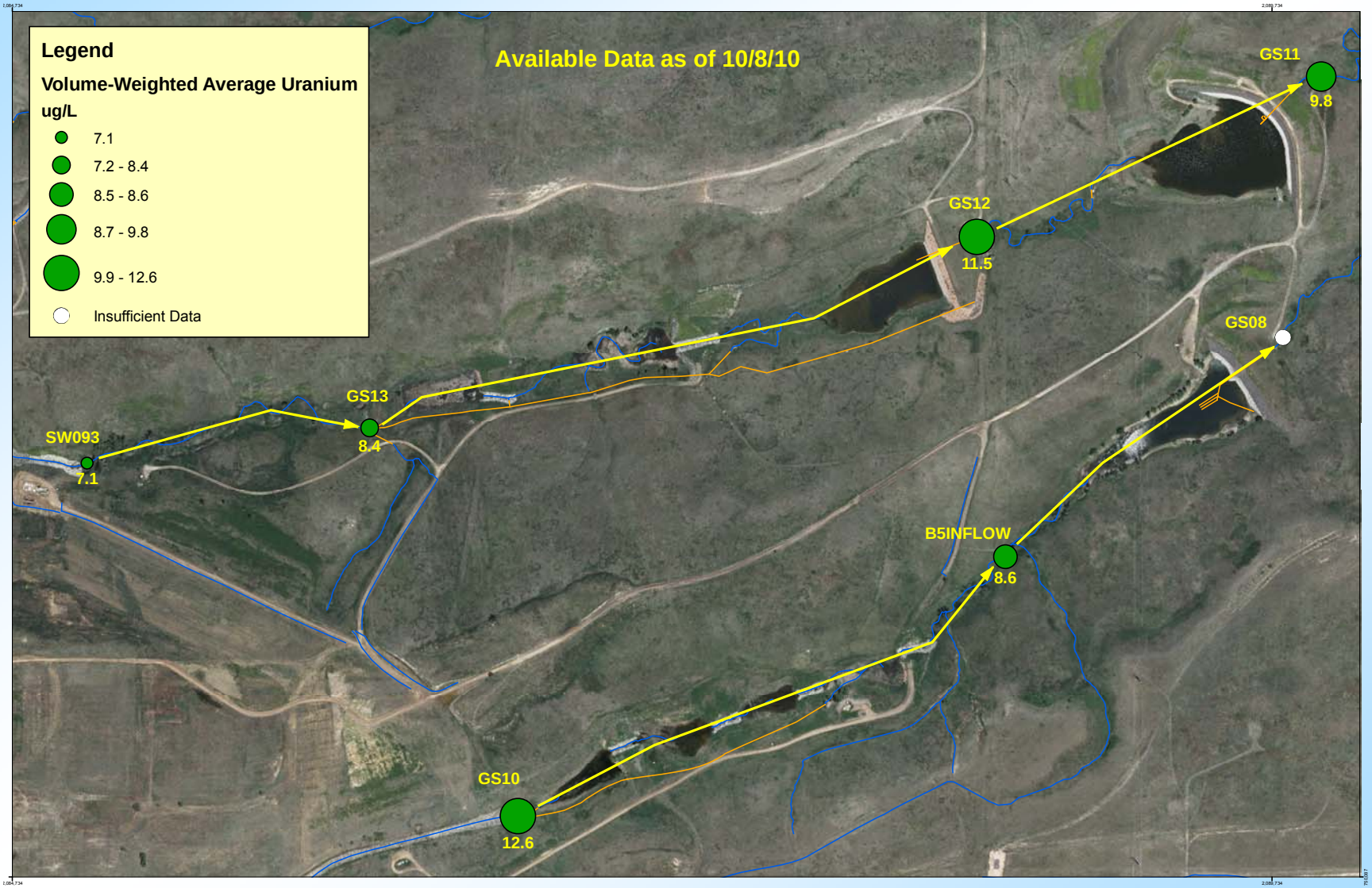
South Walnut Creek

	Location Code	Location Description	Uranium (ug/L) Volume-Weighted Average	Uranium (ug/L) Sample Count
Upstream	GS10*	POE at downstream end of Functional Channel 4	12.6	1
⬇	B5INFLOW	Influent to Pond B-5	8.6	1
Downstream	GS08*	Effluent from Pond B-5	Insufficient Data	0

Data start on 6/16/10

Notes: *Data for SW093, GS13, GS11, GS10, and GS08 are acquired through the routine RFLMA-required monitoring at these locations.
Sample counts vary since composite sampling periods vary with water availability.
Summary includes all data available as of 10/6/10; some recent results are not validated (preliminary and subject to revision).

Automated Sampling for Uranium



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

North Walnut Creek

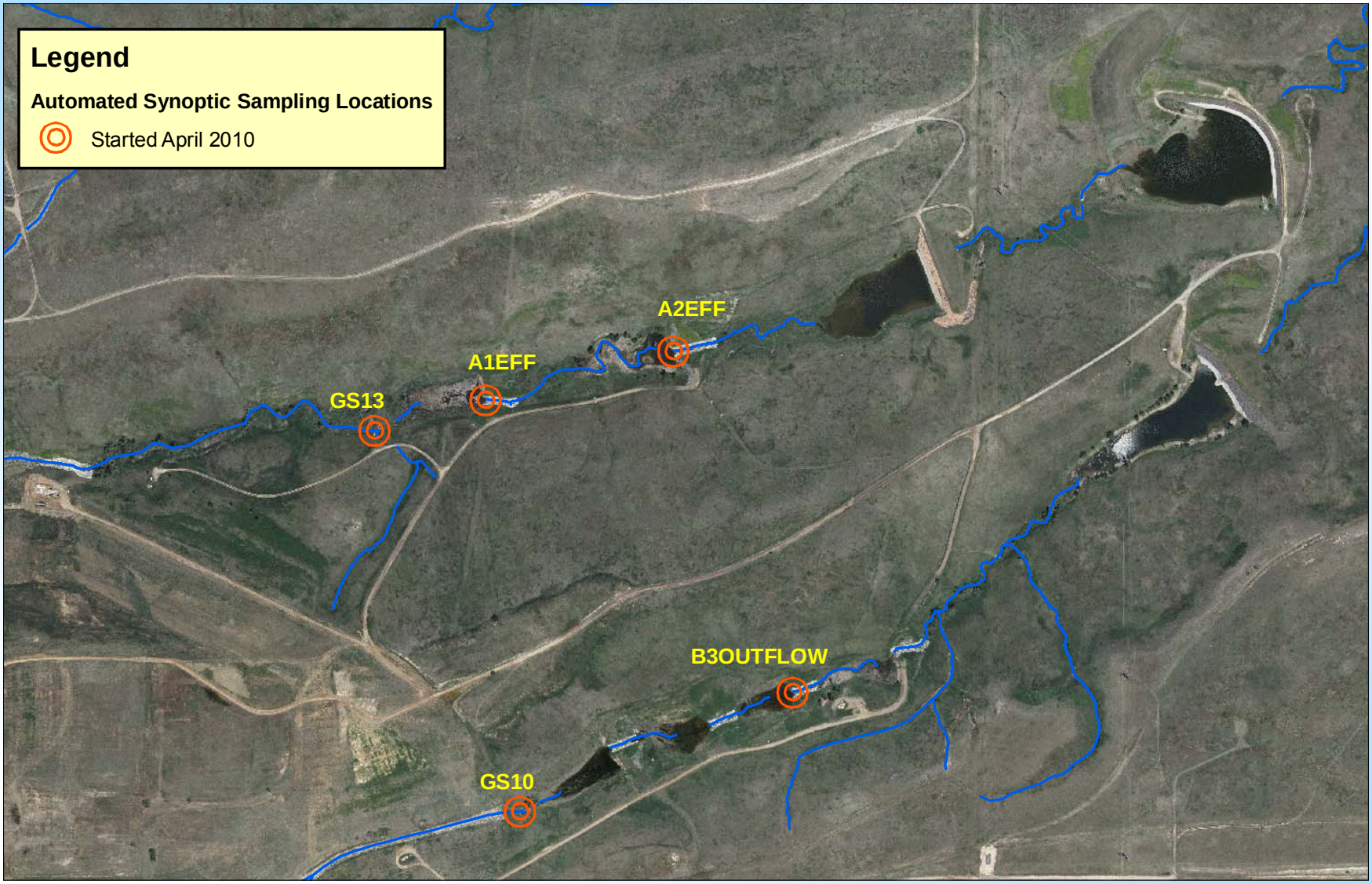
April 22, 2010 Event	Location Code	Location Description	Pu-239,240 (pCi/L)	Am-241 (pCi/L)	Uranium (ug/L)	TSS (mg/L)
Upstream	GS13	Influent to Pond A-1	0.006 ± 0.007	0.01 ± 0.007	10.50	62.0
⬇	A1EFF	Effluent from Pond A-1 / Influent to Pond A-2	0.004 ± 0.006	0 ± 0.004	13.30	0.6
Downstream	A2EFF	Effluent from Pond A-2	0.007 ± 0.006	0 ± 0.012	14.10	0.6

July 4, 2010 Event	Location Code	Location Description	Pu-239,240 (pCi/L)	Am-241 (pCi/L)	Uranium (ug/L)	TSS (mg/L)
Upstream	GS13	Influent to Pond A-1	0.011 ± 0.01	0.006 ± 0.005	9.17	2.4
⬇	A1EFF	Effluent from Pond A-1 / Influent to Pond A-2	0.007 ± 0.008	0.003 ± 0.005	6.24	2.5
Downstream	A2EFF	Effluent from Pond A-2	0.004 ± 0.006	0.002 ± 0.003	8.62	7.2

South Walnut Creek

April 22, 2010 Event	Location Code	Location Description	Pu-239,240 (pCi/L)	Am-241 (pCi/L)	Uranium (ug/L)	TSS (mg/L)
Upstream	GS10	Influent to Pond B-1	0.015 ± 0.008	0.01 ± 0.006	17.30	33.0
Downstream	B3OUTFLOW	Effluent from Pond B-3	0 ± 0.005	0.01 ± 0.013	18.20	0.6

Synoptic Storm-Event Sampling



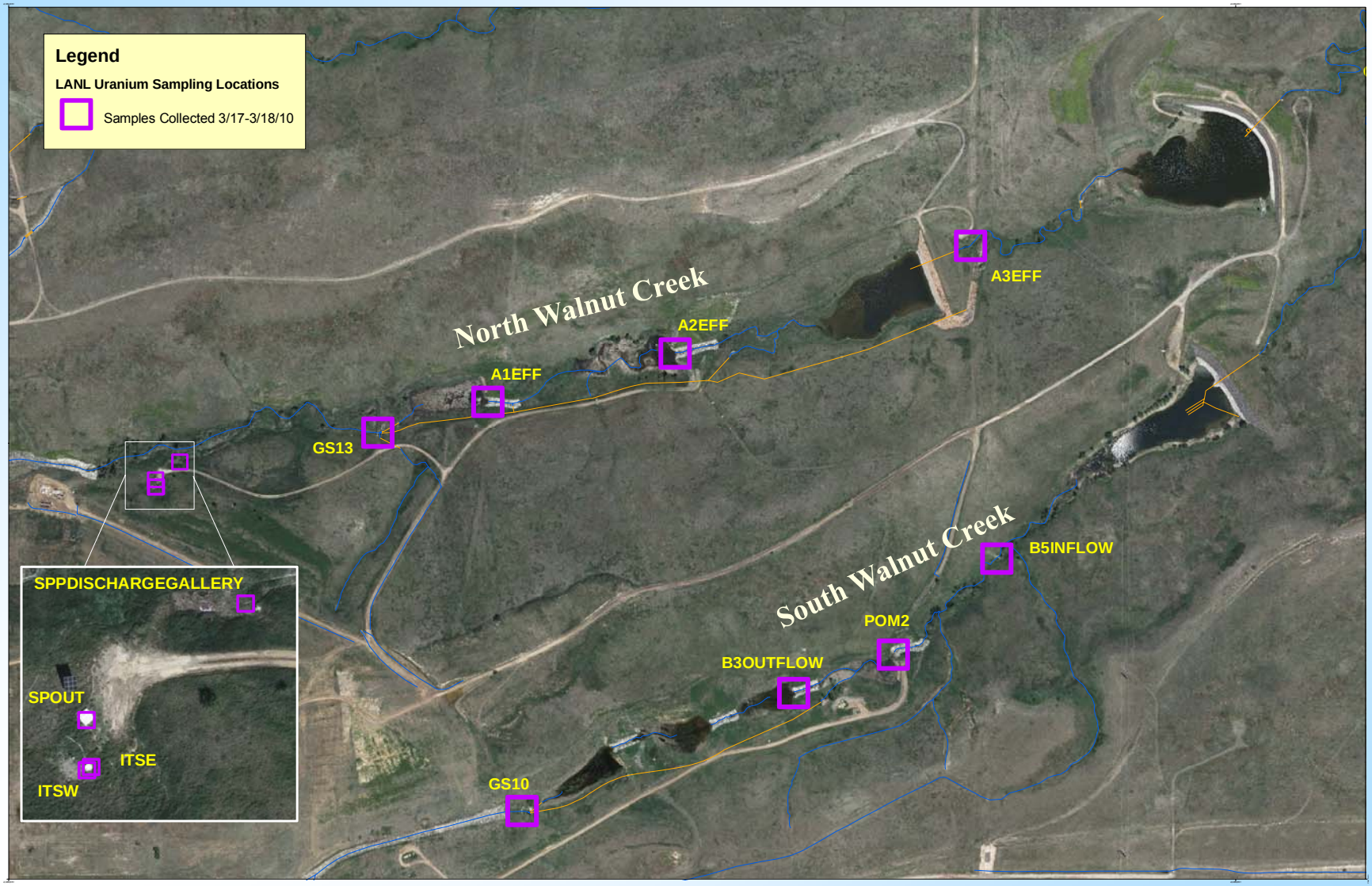
LANL High-Resolution Uranium Sampling

- Designed to evaluate spatial variation of uranium isotopic signatures – anthropogenic (site-related) vs. naturally occurring
- Latest samples collected March 17 and 18, 2010; planning an additional round of samples during CY 2010

LANL Summary for Recently Sampled Locations (3/17-3/18/10)

		Average Percent Natural U	
Location Code	**Location Description**	Pre-Closure	Post-Closure
ITSW	Outlet of ITS West Manifold at ITSS Sump	No Data	49.4
ITSE	Outlet of ITS East Manifold at ITSS Sump	No Data	98.9
SPOUT	SPPTS Effluent Monitoring Point	No Data	65.1
SPPDISCHARGEGALLERY	SPPTS Discharge Gallery	67.2	47.7
GS13	SPPTS Performance Monitoring Location in N. Walnut Cr.	72.4	72.6
A1EFF	Outlet of former Pond A-1 at stoplogs	No Data	69.6
A2EFF	Outlet of former Pond A-2 at stoplogs	No Data	70.9
A3EFF	Outlet on Pond A-3 at GS12 flume	No Data	72.5
GS10	POE at downstream end of Functional Channel 4	70.8	69.7
B3OUTFLOW	Outlet of former Pond B-3 at stoplogs	No Data	74.3
POM2	ETPTS Performance Monitoring Location in S. Walnut Cr.	No Data	72.3
B5INFLOW	Influent to Pond B-5	No Data	77.0

LANL High-Resolution Uranium Sampling



Update on WQCC Rulemaking

- Triennial review Statewide Basic Standards for Surface Water: hearing June 7 and 8, 2010
  - Changed uranium water supply use standard from 30 µg/L (MCL) to range of 16.8−30 µg/L
    - 16.8 µg/L is Colorado calculated human health-based standard
    - Change is consistent with WQCC Policy 96-2, *Human Health-Based Water Quality Criteria and Standards*
  - Footnote
    - When applying uranium standard to individual segments, the Commission shall consider the need to maintain radioactive materials at the lowest practical level
- No impact to Rocky Flats segments – currently 16.8 µg/L

Questions?

Groundwater Monitoring and Operations

Second Quarter 2010

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RFLMA Monitoring

- Second quarter is heaviest sampling quarter, especially in even-numbered years
  - All RCRA wells (10)
  - All AOC wells (9) and Surface Water Support locations (1)
  - All Sentinel wells (28)
  - All Evaluation wells (42)
  - All Treatment System locations (10)
  - Boundary wells (2)
- Results reviewed in accordance with the RFLMA Attachment 2 decision flowcharts
- Results will be evaluated in the 2010 annual report

Additional (Non-RFLMA) Monitoring

- Several locations associated with MSPTS and ETPTS monitored
  - Support consultation and associated CR 2010-07
  - System effluent contained some constituents above RFLMA Table 1 levels
    - Treatment is most effective at low flow rates (high residence time), less effective at high flow rates (low residence time)
    - Second-quarter flows represented relatively higher flow rates
  - Second-quarter RFLMA sampling followed by several consecutive months of follow-up sampling
  - Two non-RFLMA locations at each system, between effluent discharge and surface water performance locations
  - Track water quality downgradient of system effluent points

Additional (Non-RFLMA) Monitoring

- Numerous locations associated with SPPTS monitored
  - Support optimization of upgrades, pilot studies
  - Included well 1786, located adjacent to Phase I upgrades
    - Consistent with previous data
  - Included seepage flowing from SEP hillside
    - Elevated nitrate, uranium

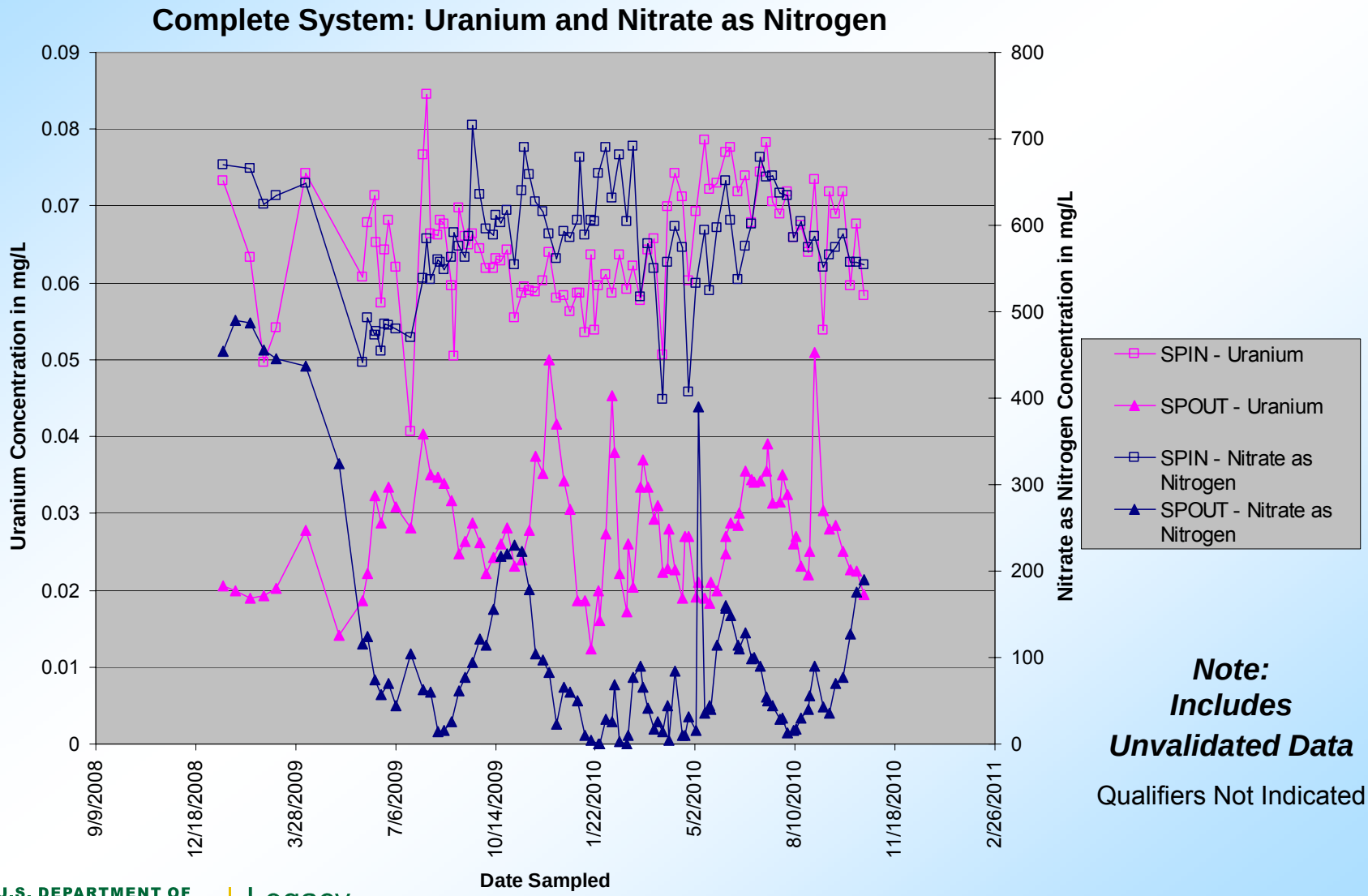
SPPTS Activities in Second Quarter

- Temporarily increased overall system flow to manage spring moisture
  - Led to decrease in overall treatment effectiveness
- Continued to collect samples at least weekly
  - Locations support evaluation of Phase II, III, and entire system
  - Most analyzed by ESL; not validated
  - Splits collected periodically for contract lab analysis
- Optimization of Phases II, III
  - Phase II unable to remove significant uranium under increased flow rates
  - Adjusted Cell A dosing (carbon, phosphorus), flow rates, and recirculation
  - Cell B performance improved with warming temps (very low flows)
- Attempted to improve flow conditions in original cells
  - Biocide application (diluted bleach) did not improve flows

SPPTS Update: Current

- Increased overall flow rates through the system
  - Flows decreased in third quarter, but water built up in the collection trench
  - Effects of higher flows consistent with previous flow increases: reduced treatment
  - Higher flow rate means shorter residence time in the treatment media
  - Flow rates decreased when water levels in trench reached desired depth

SPPTS Update: Current



Note: Includes Unvalidated Data

Qualifiers Not Indicated

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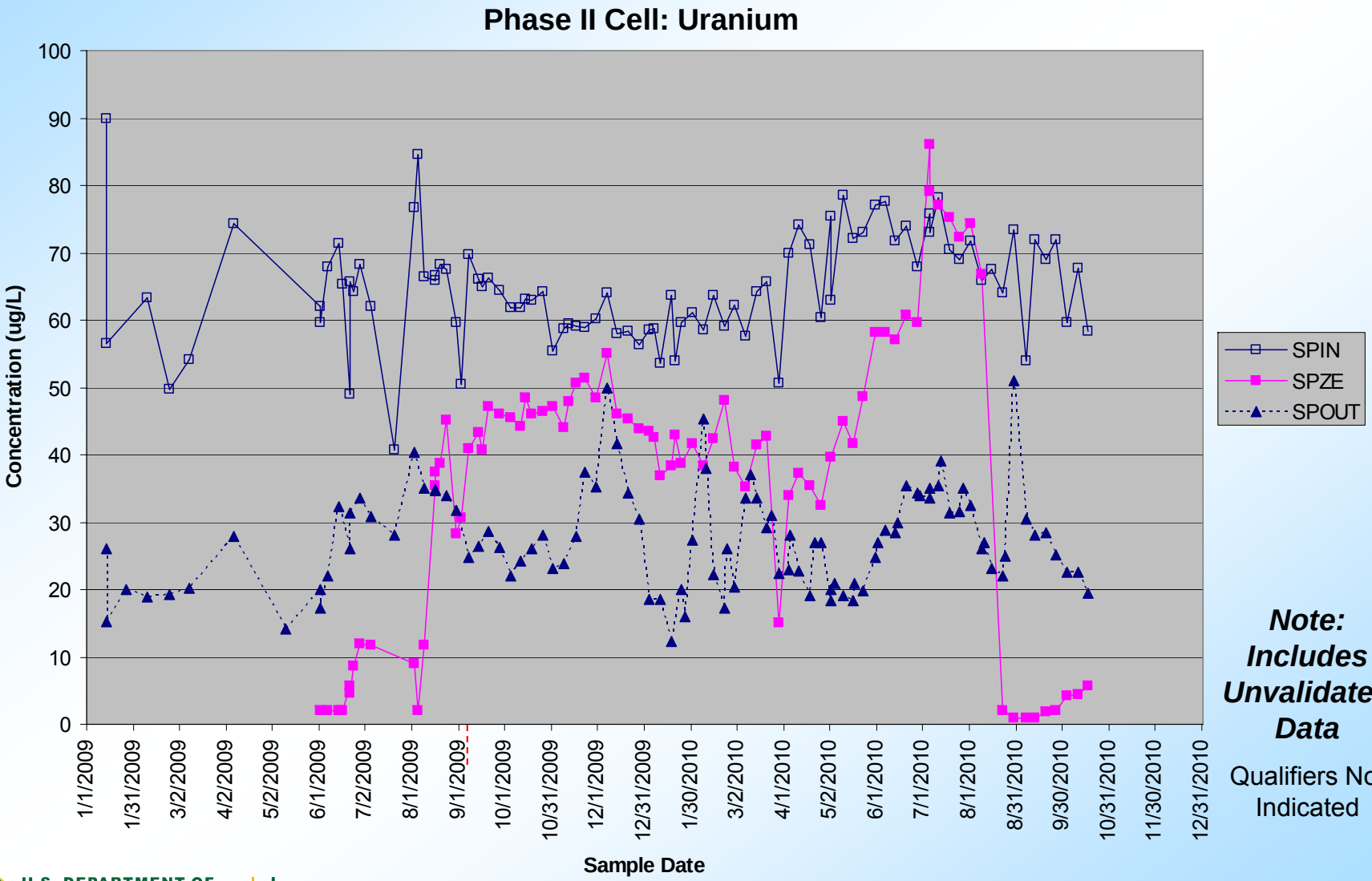
SPPTS Update: Current

- Phase II cell
  - Uranium removal essentially ceased in July 2010, under higher-flow setting
  - Media replaced in August 2010
  - Treatment effectiveness restored
  - Lab studies not fully confirmed by full-scale application
    - Studies showed removing uranium before nitrate would be successful and long-lasting
    - Uranium treatment may be most effective and efficient (i.e., media will last longer) after nitrate is removed
    - Continuing to evaluate

SPPTS Update: Current



Note: Includes Unvalidated Data

Qualifiers Not Indicated

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SPPTS Update: Current

- Phase III pilot studies complete
- Cell A (inert media, carbon dosing) selected for Phase IV alternative development
- Evaluated several alternatives
- Recommending original structure be converted to small building that will house nitrate treatment cells
  - More active than desired, but affords best treatment and easiest access to components for maintenance
  - Requires upgrading carbon storage tank to permit direct fill via tanker truck
  - Allows change if needed to allow uranium treatment after nitrate treatment

Ongoing Activities

- SPPTS
  - Designing Phase IV (full-scale nitrate treatment)
  - Operating Phase III to support nitrate treatment
  - Continuing to evaluate Phase II performance
- MSPTS
  - Designing effluent polishing component
    - Will be installed as part of previously planned media replacement activity
    - Passive air stripping
    - Construction in early CY 2011

Questions?

Site Operations

Second Quarter 2010

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OLF Inspections

- Monthly inspections at the OLF were completed on April 29, May 27, and June 30

OLF Seeps

- Seep 1 was dry throughout the second quarter
- Seep 2 and 3 area saturated in second quarter – showed some surface expression but no surface flow
- Seep 4 and 5 area saturated in second quarter – showed surface expression, but drained via Berm 3 drain as designed
- Seep 6 area had three new locations that showed surface expression and supported wetland vegetation

OLF Seeps

- Seep 7 flowed 2 to 5 gallons per minute (gpm) in second quarter. Water from Seep 7 flowed down the Berm 7 channel and the top of the buttress.
- Seep 8 flowed at approximately 5 gpm throughout the second quarter
- Sampled Seep 7 in two places on April 10, 2010 – analyzed for VOCs, SVOCs, metals, and uranium
  - Only a few analytes were detected above the detection limits
  - All detected analytes were well below RFLMA surface water standards

OLF Seep Locations

OLF Settlement Monuments and Inclinometers

- Settlement monuments were surveyed on June 25; 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 May 5, May 26, and June 28
  - Inclinometers 2, 3, and 4 were also measured April 19 after high precipitation and noted deflection in March
  - Very little deflection on the April 19 measurement
  - All inclinometers measured May 5 due to snow on the OLF surface at the end of April
- Inclinometer 2 showed approximately 3 inches of movement on the May 5 measurement

Inclinometers

- Inclinometer 3 showed little movement during this period
- Inclinometer 4 could not be measured below 13-foot depth on May 5 and after
  - Previous measurements were to 29-foot depth
  - Indicates that the tube has broken at 13 feet
  - Measured approximately 1 inch of movement after May 5

Inclinometers

- Inclinometers 5, 6, and 7 measured approximately 0.25 to 0.5 inch of deflection, and Inclinometer 1 showed little deflection
- Per M&M Plan qualified geotechnical engineer consulted
- Consistent with the findings of the 2008 geotechnical investigation
  - Organic layer near the bedrock surface is weak zone, especially if it becomes lubricated by subsurface moisture
  - Seeps 4 and 7 also showed significant moisture and had surface expressions during this period

OLF Slumps

Berm 1

- A significant crack in Berm 1 was noted on April 26 following a precipitation event of approximately 3 inches
- Crack was 100 feet long, 6 to 8 inches deep, had 2 to 4 inches of vertical displacement, and followed the same contour as previously reported cracks in the area
- **Appears consistent with the observed inclinometer deflection**
- Per M&M Plan crack was filled and compacted with Rocky Flats Alluvium to extent possible the same day
- Larger-scale repairs were completed with heavy equipment on June 7

OLF Observed Crack Location

Berm 1 Actual Crack Location

Berm 1 Crack

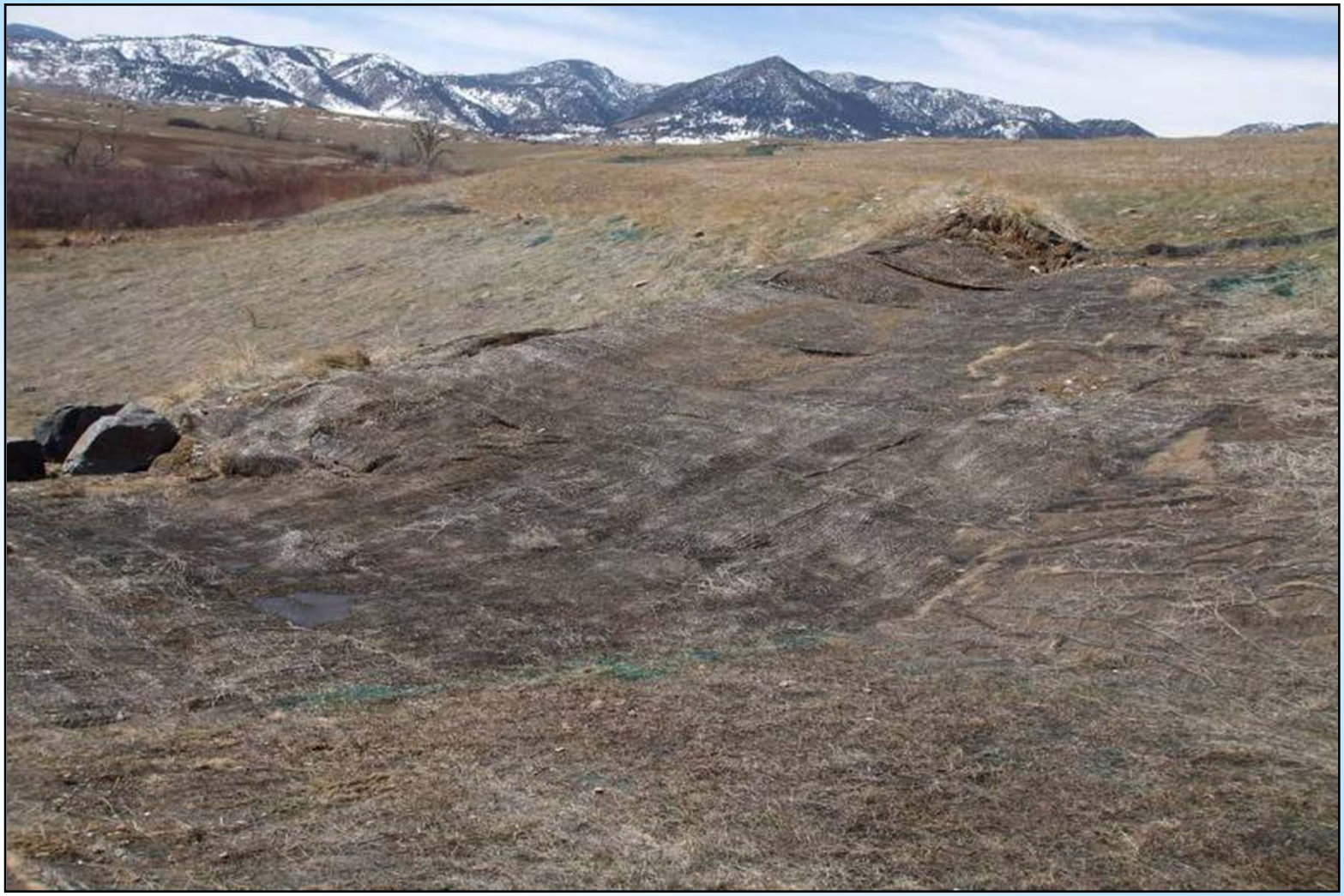
Berm 1 Repairs

OLF Slumps

Berm 7 Slump

- Slump at end of Berm 7 was observed on March 30 and inspected by Engineering on April 20
- A design drawing outlining proposed modifications to Berm 7 was submitted on May 3 and verbally approved by CDPHE on May 18
- Design included removing soil mass that extended into East Perimeter Channel, backfilling area with soil and rock, and recontouring area to match surrounding grade
- Repairs were completed on June 3

Berm 7 Slump



Berm 7 Slump Repairs

Berm 7 Slump Repairs

Berm 7 Slump Repairs

Berm 7 Slump Repairs

Berm 7 Slump Repairs

PLF Inspections and Surveys

- The quarterly inspection was completed on May 27
- No areas of concern were observed
- No vegetation inspection was completed due to cover meeting vegetation success criteria

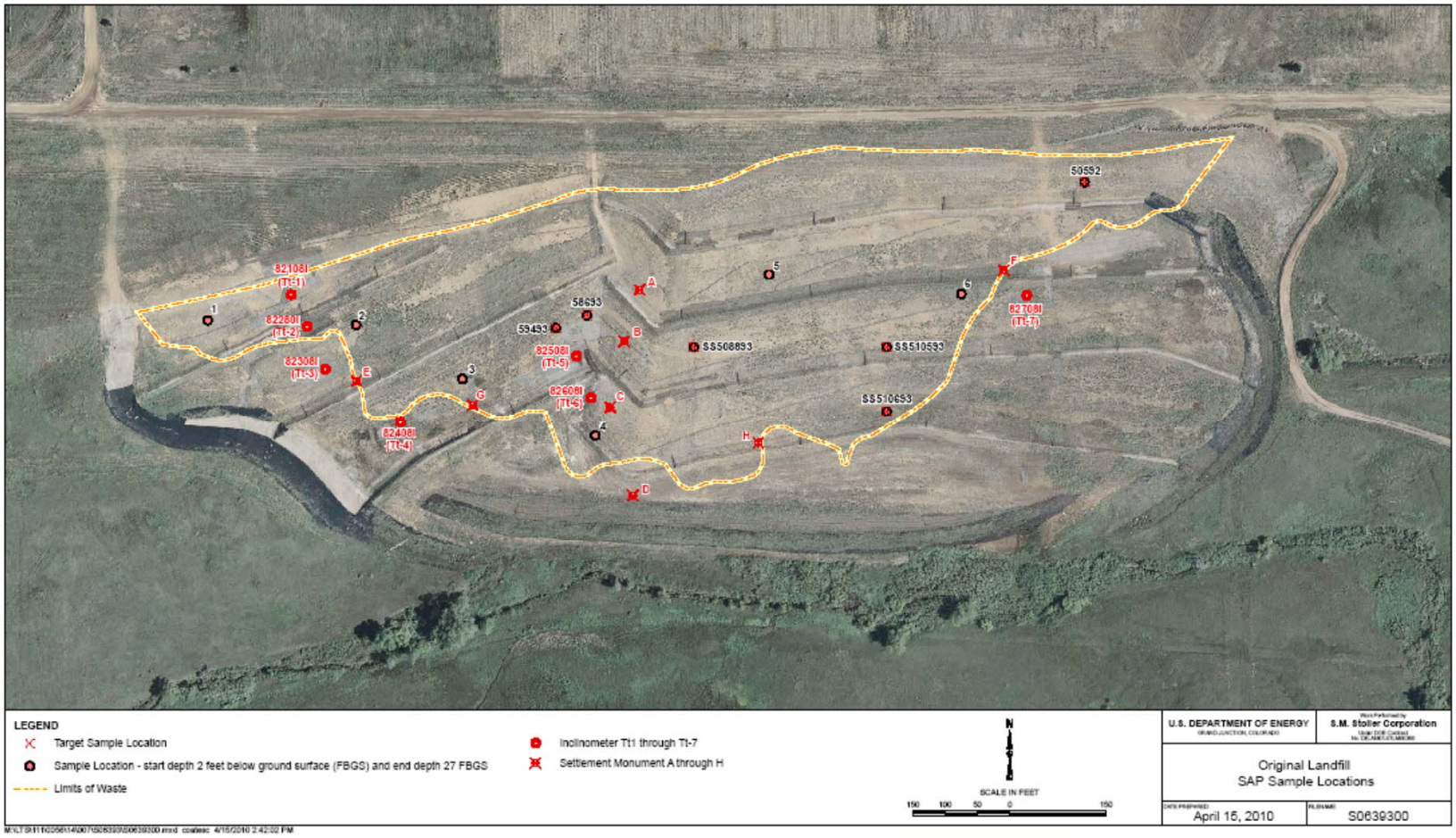
OLF Soil Sampling Project

- Preliminary evaluation of residual contamination levels in relation to CDPHE's August 2008 policy, *End of Post-Closure Care*
  - Project covered by CR 2010-01
  - Pre-closure residual soil contamination data are between 15 and 19 years old
  - Provide data for comparison to risk-based levels
- Does not necessarily mean that post-closure controls for the OLF would end
  - Some M&M requirements possibly may be reduced
  - Remains subject to land-use restrictions under Environmental Covenant

OLF Soil Sampling Project

- CDPHE approved the OLF SAP on June 9, 2010
  - Goal – Twelve 25-foot boreholes, below 2-foot cover soil
  - Sample 5-foot core intervals
- Six OLF IM/IRA targeted locations
  - Three from the surface soil data set, and 3 from subsurface soil data set
- Six additional locations to provide subsurface data from the east and west side
- Analyze for VOCs, SVOCs, pesticides and PCBs, metals, and plutonium, americium, and uranium

OLF Soil Sampling Project



OLF Soil Sampling Project

- Sampling June 29 to July 8, 2010
- 228 samples collected
- Data evaluation and summary reporting will be completed in the third and fourth quarters 2010

Questions?