Overview of the Rocky Flats Site Annual Report of Site Surveillance and Maintenance Activities

Calendar Year 2010

Rocky Flats Stewardship Council
June 6, 2011

U.S. DEPARTMENT OF ENERGY | Legacy Management

Surface Water Monitoring and Operations

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Pond Operations – Calendar Year 2010

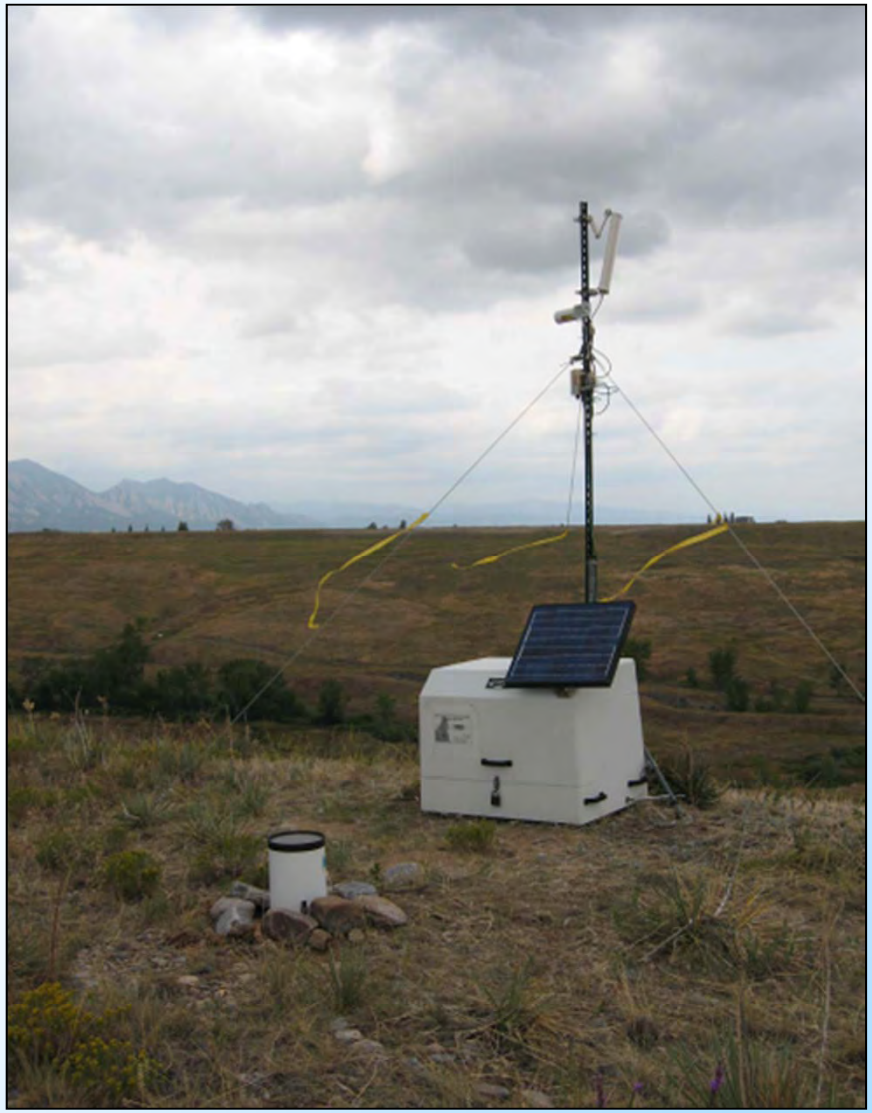
- Terminal Pond Discharges:
  - Pond B-5
    - April 23 through May 16, 2010 (20.82 MG)
  - Pond A-4
    - May 1 through May 19, 2010 (32.44 MG)
  - Pond C-2
    - July 31 through August 12, 2010 (6.97 MG)
- Transfers:
  - Pond A-3 to A-4
    - Eight periods (44.96 MG total)
- Pond Levels:
  - As of January 1, 2011, Ponds A-3, A-4, B-5, and C-2 and the Landfill Pond were holding approximately 14.5 MG (14.7 percent of capacity).

Recent Pond Levels (May 31, 2011):

- Landfill (14 percent)
- A-3 (6 percent)
- A-4 (26 percent)
- B-5 (27 percent)
- C-2 (10 percent)

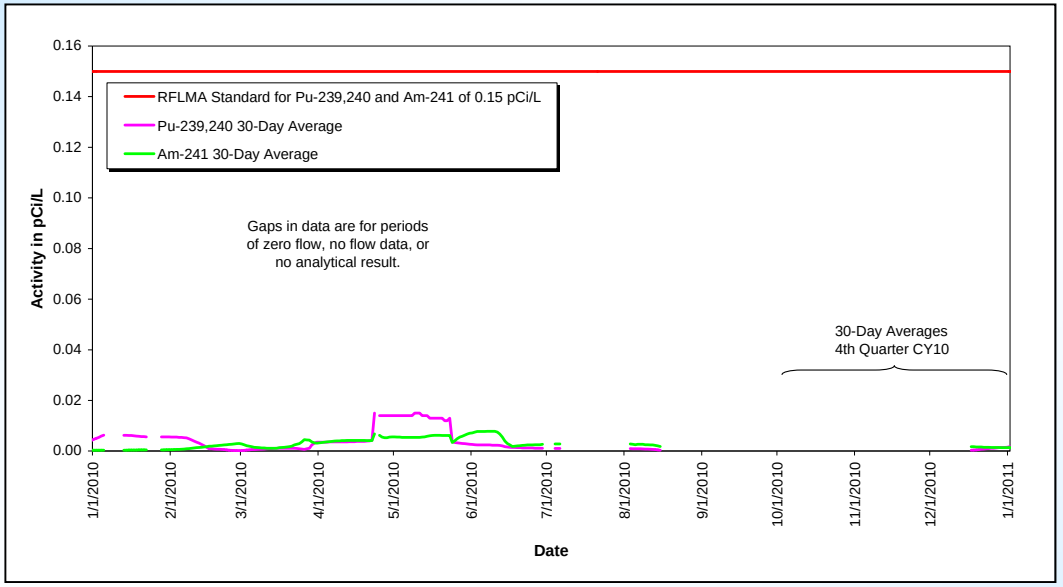
Hydrologic Data – Calendar Year 2010

- Precipitation:
  - 11.6 inches total precipitation
  - 94 percent of average CY 1993–2009
- Flow rates (percentage of CY 1997–2009 average):
  - GS01 (158 percent)
  - GS03 (124 percent)
  - GS10 (85 percent)
  - SW027 (75 percent)
  - SW093 (102 percent)

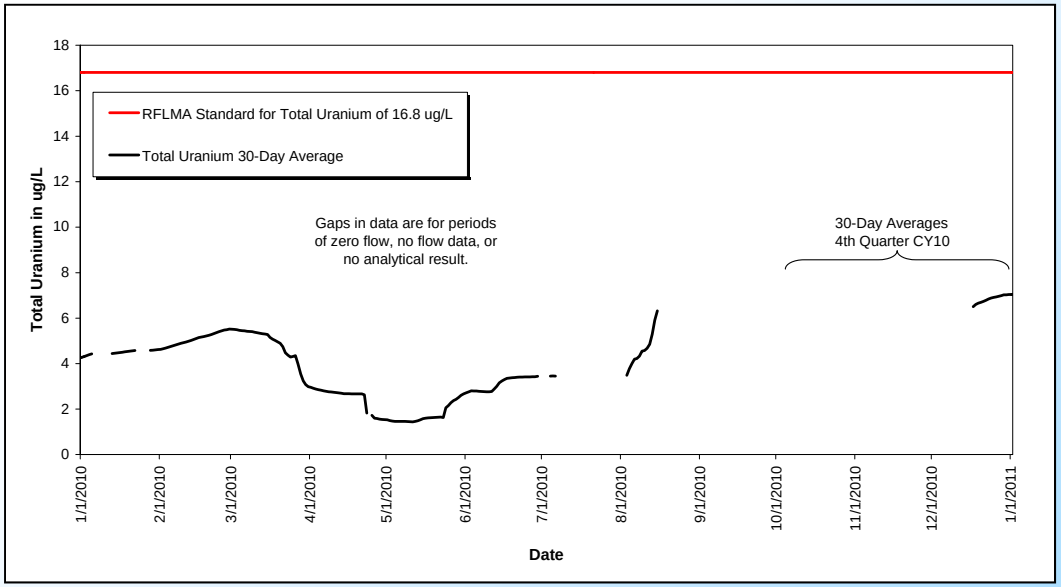


POC GS01

- Plutonium and Americium



- Total Uranium



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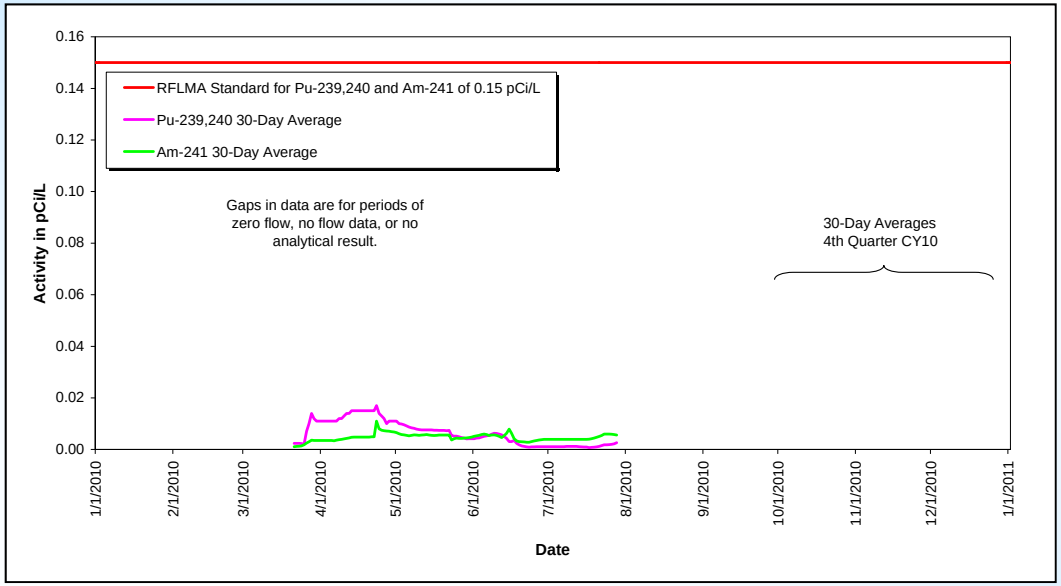
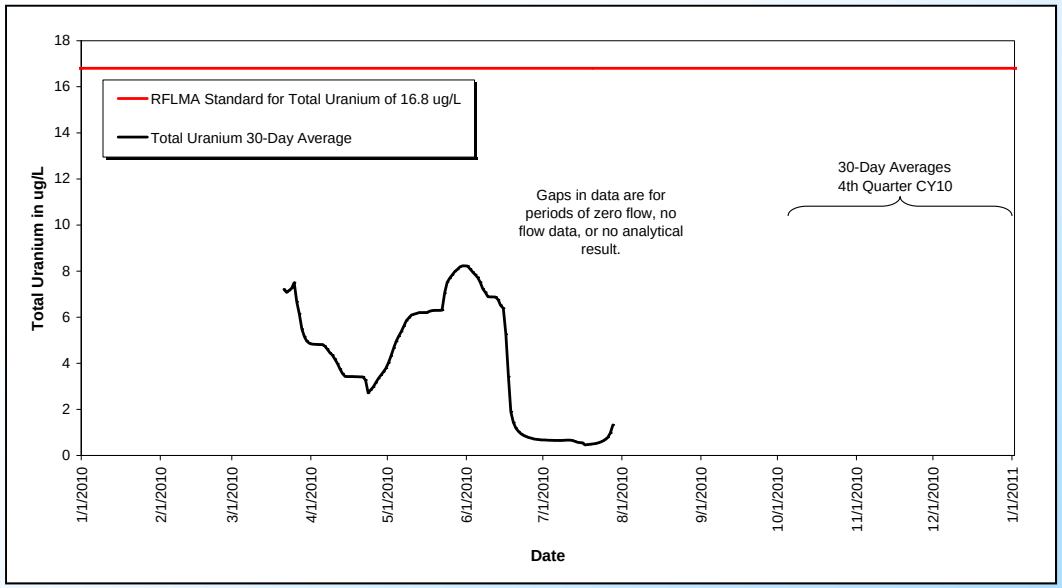
POC GS03

- Plutonium and Americium



- Total Uranium



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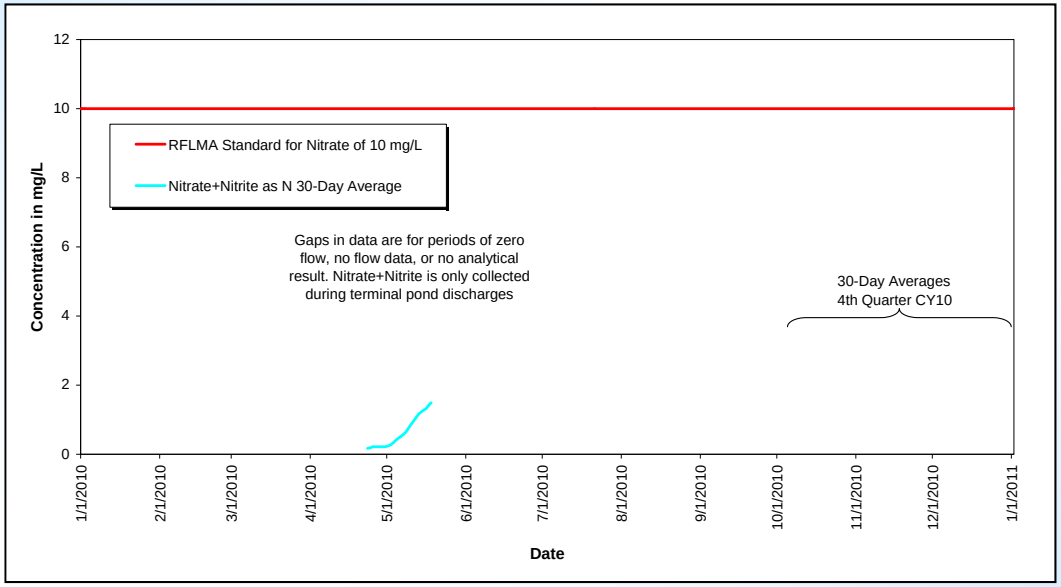
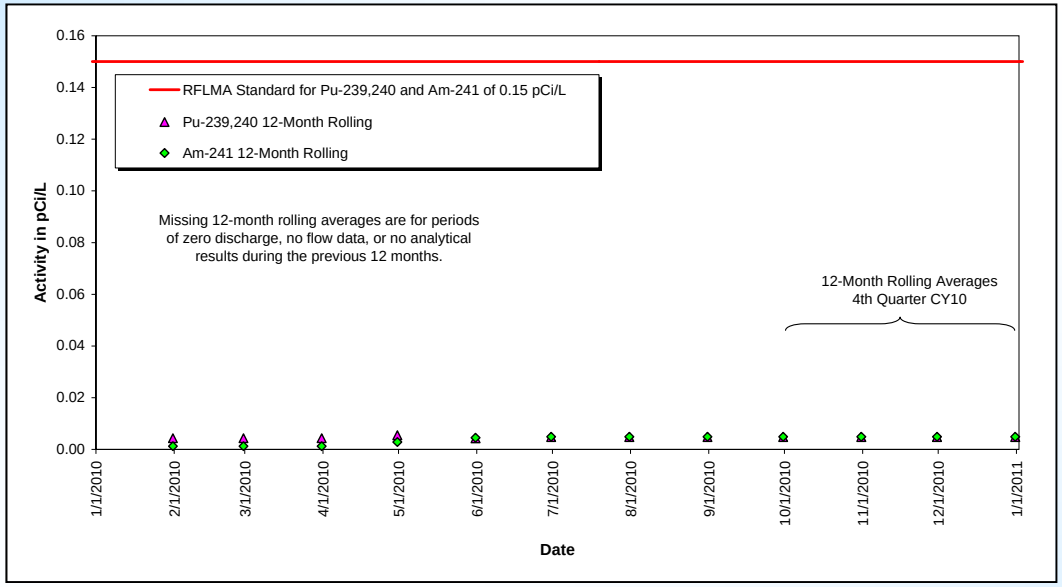
POC GS03

- Nitrate + Nitrite as Nitrogen

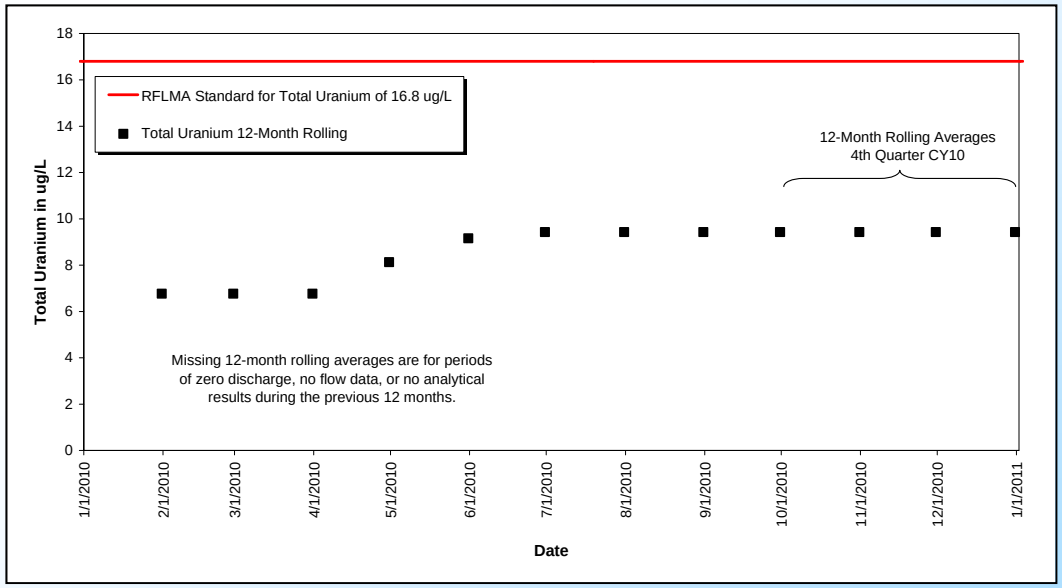


POC GS08

- Plutonium and Americium



- Total Uranium



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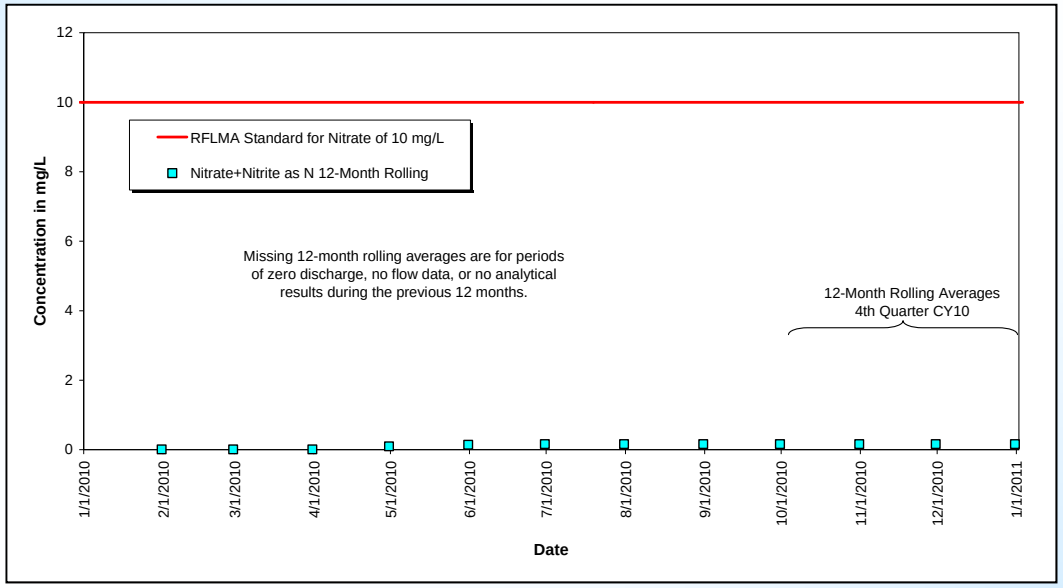
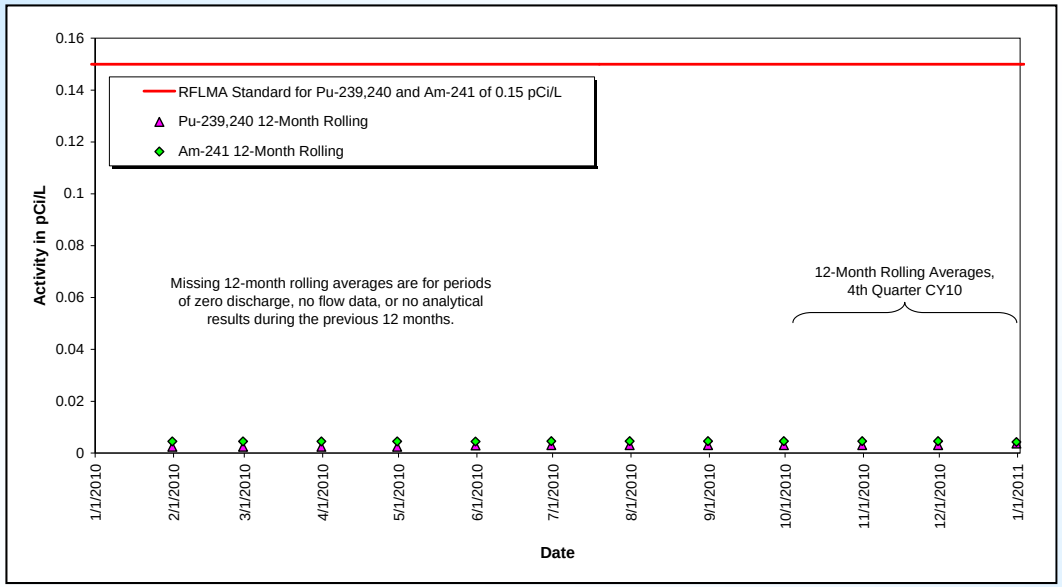
POC GS08

- Nitrate + Nitrite as Nitrogen

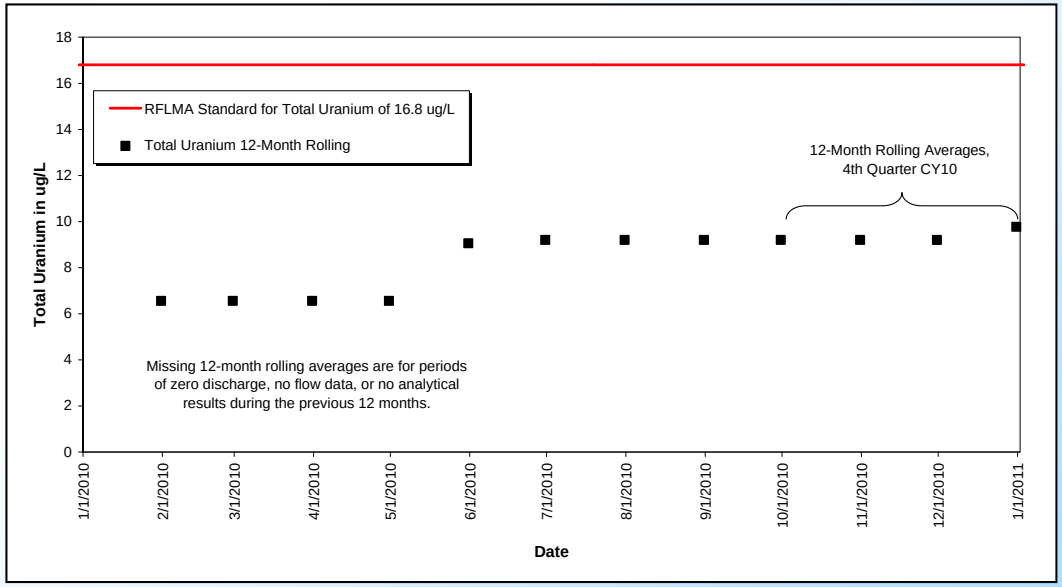


POC GS11

- Plutonium and Americium



- Total Uranium



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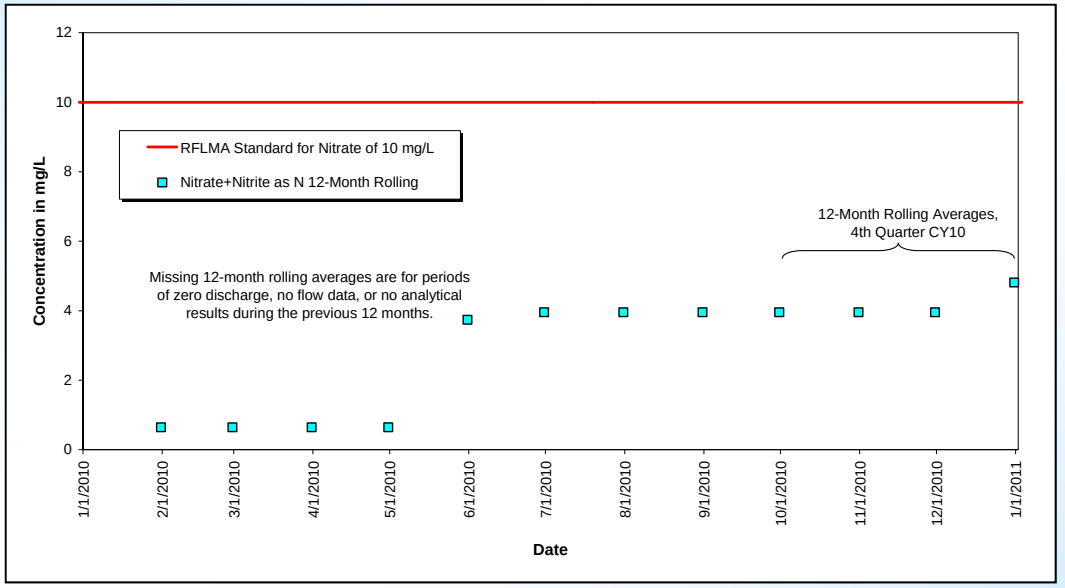
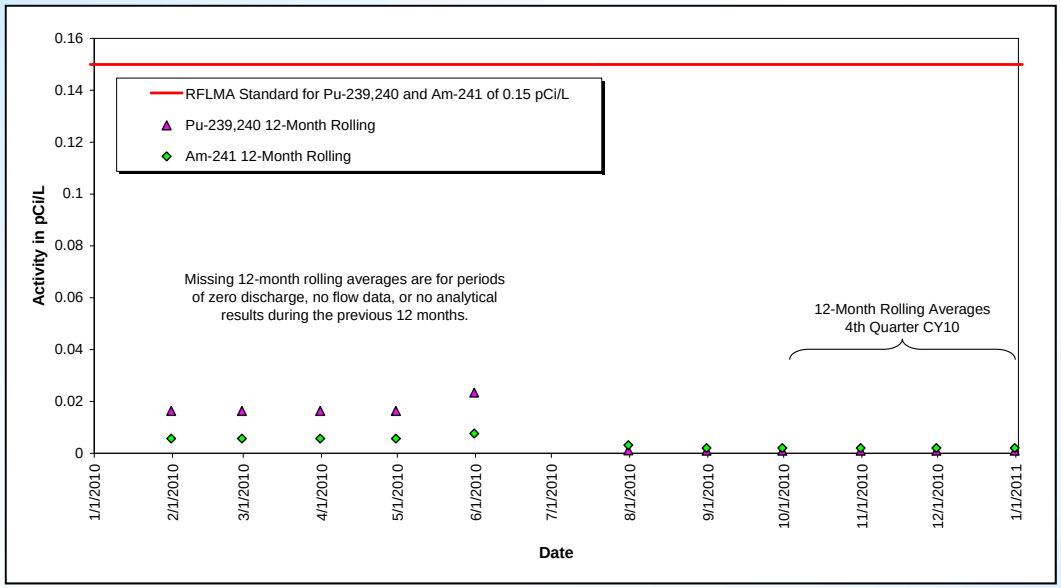
POC GS11

- Nitrate + Nitrite as Nitrogen

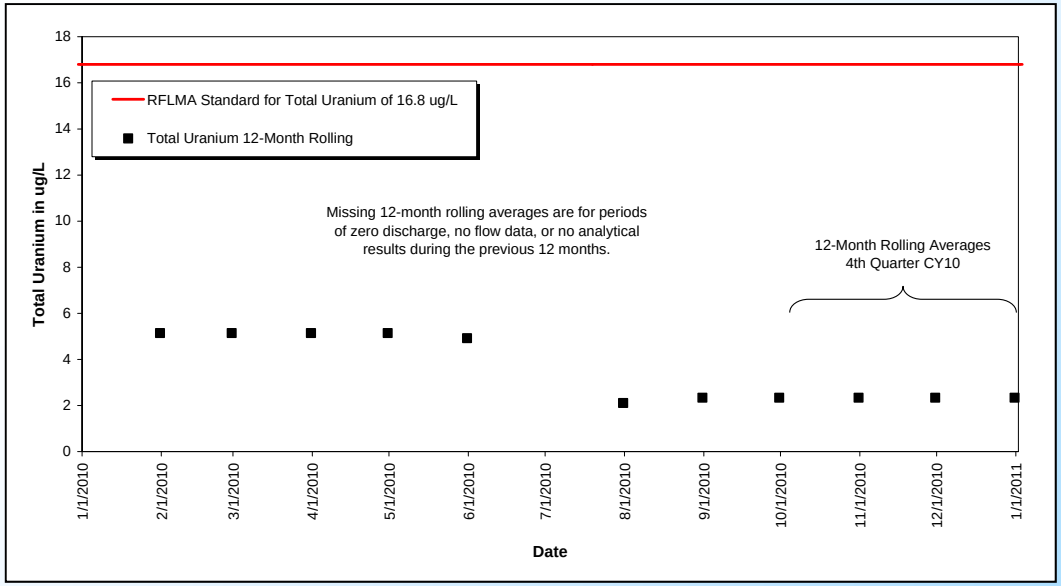


POC GS31

- Plutonium and Americium



- Total Uranium



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Point of Evaluation Monitoring – Calendar Year 2010

- Water quality at all points of evaluation, except SW027, was below applicable standards
  - Reportable 12-month rolling average values for plutonium at SW027 were observed starting April 30, 2010. Concentrations are likely caused by transport of low-level residual contamination in the SW027 drainage.

Mitigating actions taken in accordance with Contact Record 2010-06 included installing additional erosion control wattles in locations along the hillside north of the South Interceptor Ditch (SID) and permanent erosion blankets and reseeding three areas in the SID. This work was successfully completed on December 20, 2010. Approximately 2,560 linear feet of Filtrexx wattles and 8,452 square feet of permanent erosion matting were installed.

Performance Monitoring – Calendar Year 2010
Original and Present Landfills

No analytes were detected above the applicable standards

Questions?

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Groundwater Monitoring and Operations

Fourth Quarter and Calendar Year 2010

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Groundwater Monitoring, Fourth Quarter 2010

- RFLMA monitoring
  - All AOC, Sentinel, and RCRA wells were monitored
    - AOC wells monitored for impact of groundwater on surface water
    - Sentinel wells provide indication of plume movement
    - RCRA wells support PLF, OLF
  - Treatment system locations were monitored
- Non-RFLMA monitoring
  - Additional samples were collected at and around the SPPTS
    - Support optimization of Phase II (uranium) and Phase III (nitrate) treatment
  - Continued evaluation of treatment at MSPTS and ETPTS
    - Refer to CR 2010-07

Summary Highlights from 2010

- All RFLMA-required monitoring was performed
  - Included all evaluation wells (sampled every other year)
  - Evaluation wells monitor source areas
- Fewer locations were dry due to higher spring precipitation and corresponding recharge
- Groundwater treatment systems continue to remove contaminants from the groundwater
- SPPTS Phase II (uranium) media replaced
- SPPTS Phase III (nitrate) pilot studies continued

Summary Highlights from 2010

- Seepage velocities (groundwater flow rates) estimated from water levels measured across the COU
  - Eighteen well pairs used
  - Median velocity: 120 ft/yr
  - Range: 8 to 424 ft/yr
  - Locations where velocity is at least 200 ft/yr
    - Part of 881 hillside (B881 well 88205 to 00797: over 400 ft/yr)
    - B771 hillside (IHSS 118.1 well 18199 to 20505: over 375 ft/yr)
    - OLF
    - Part of 903 pad/lip
  - Locations where velocity is less than 50 ft/yr
    - South IA
    - North side of solar ponds

Statistics Performed for 2010 Annual

- Statistical analyses of groundwater quality data performed per RFLMA
  - Analysis of variance (ANOVA): RCRA wells
    - Downgradient PLF groundwater vs. upgradient PLF groundwater
    - Downgradient OLF groundwater vs. upgradient OLF groundwater
  - Statistical trending: Sentinel, RCRA, and Evaluation wells
- Additional, non-RFLMA statistical analyses performed
  - AOC wells
- See Annual Report text, tables, figures, and Appendix B for well- and chemical-specific details
- References to concentration trends in this presentation are for those calculated to have 95 percent statistical confidence

Statistical Analysis: PLF Groundwater

- ANOVA results for 2010 are very similar to 2009
  - Downgradient concentrations of several metals exceed upgradient concentrations
  - May be attributable to natural sources (ore mineralization, organic-rich sediments)

Analyte	73005	73105	73205
B	x	x	x
Cd			x
Se	x		x
U	x	x	x
Zn	x	x	

    - Cadmium (Cd), zinc (Zn) at 73005 are new findings as of 2010; both datasets include multiple nondetects
  - As in 2008 and 2009, only selenium (Se) exceeded applicable RFLMA level
- Statistical trending calculations also similar to 2009
  - Boron (B) concentrations at well 73105 are on an increasing trend
    - Concentrations are well below RFLMA standard
  - Chromium (Cr) is also increasing in well 73005 (new as of 2010)
    - Numerous nondetects in dataset suggest trend may not be real
- RFLMA: higher downgradient concentration *and* increasing trend trigger consultation – **B conditions meet this requirement**
- See Contact Record 2011-03

Statistical Analysis: OLF Groundwater

- Summary: ANOVA results for 2010 same as for 2007, 2008, 2009
  - Downgradient concentrations of two metals higher than upgradient concentrations

Analyte	80005	80105	80205
B	x	x	x
U			x

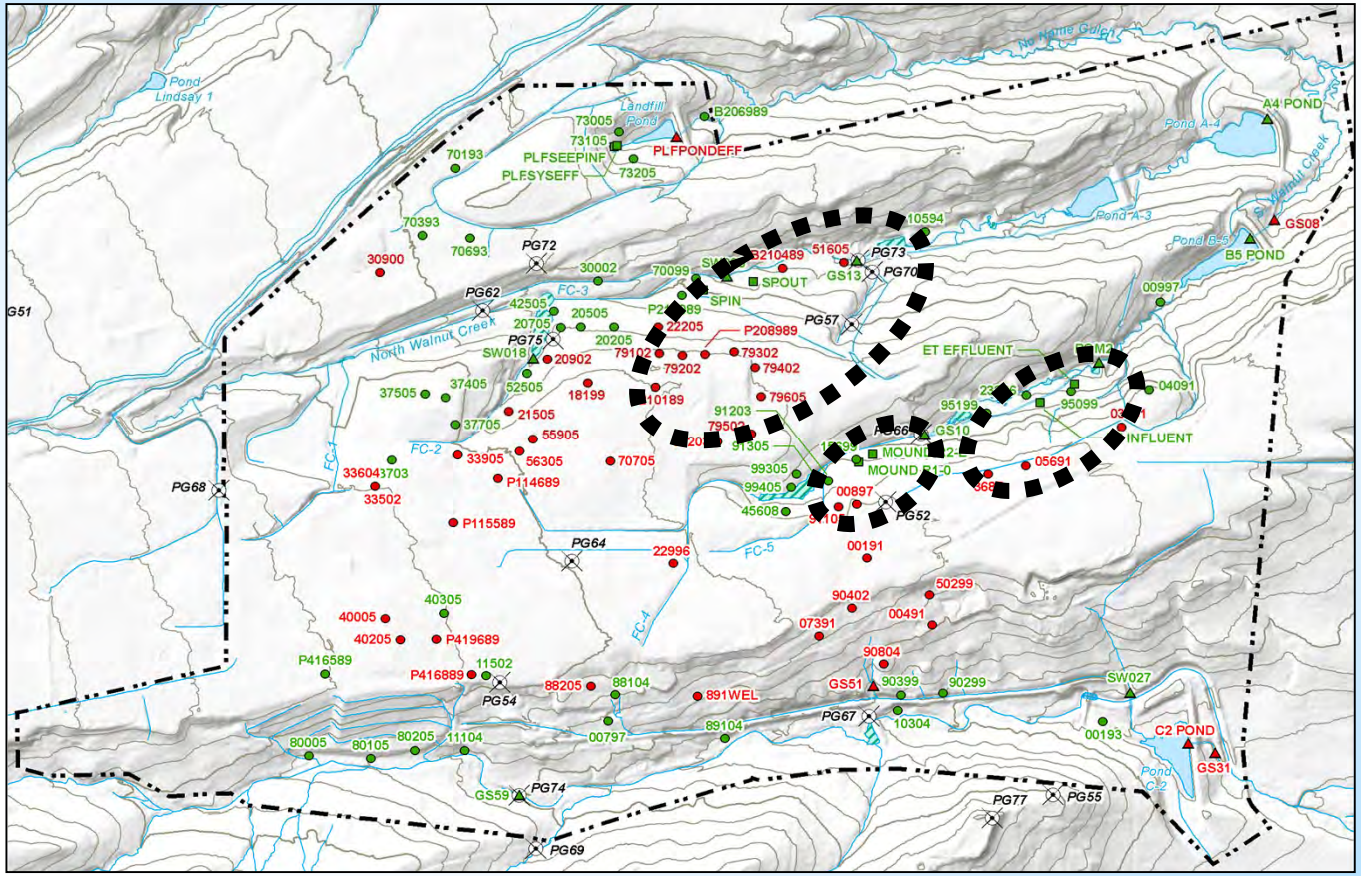
  - All below applicable RFLMA levels
  - Uranium (U) confirmed 100 percent natural in previous high-resolution analysis (2007)
  - Boron (B) and Uranium (U) may be attributable to natural sources
- Statistical trending calculations also similar to 2009
  - No increasing trends at downgradient wells
  - Boron (B) decreasing at well 80005 (increasing at upgradient well P416589)
  - Uranium (U) decreasing at well 80205 (new as of 2010)
- RFLMA: higher downgradient concentration *or* increasing trend trigger consultation – **B and U conditions meet this requirement**
- See Contact Record 2011-03

Other PLF, OLF Results

- PLF VOC detections in downgradient groundwater
  - 1,3-dichlorobenzene: first and second quarters, wells 73105, 73205
  - Not the first detections; also commonly detected in upgradient wells
  - Estimated concentrations, well below RFLMA level
- OLF VOC, SVOC detections in downgradient groundwater
  - VOC: methylene chloride (lab solvent): first quarter, wells 80005, 80105
  - SVOCs
    - Bis(2-ethylhexyl)phthalate, hexachloroethane (fourth quarter, 80005); Diethyl phthalate (second quarter, 80105)
      - Only hexachloroethane was not qualified as estimated
      - Hexachloroethane exceeded RFLMA level (reported at 16 µg/L; RFLMA PQL is 1 µg/L)
  - Methylene chloride has been previously reported in downgradient OLF groundwater, but the others represent first-time validated detections
- See Annual Report for more detail and discussion

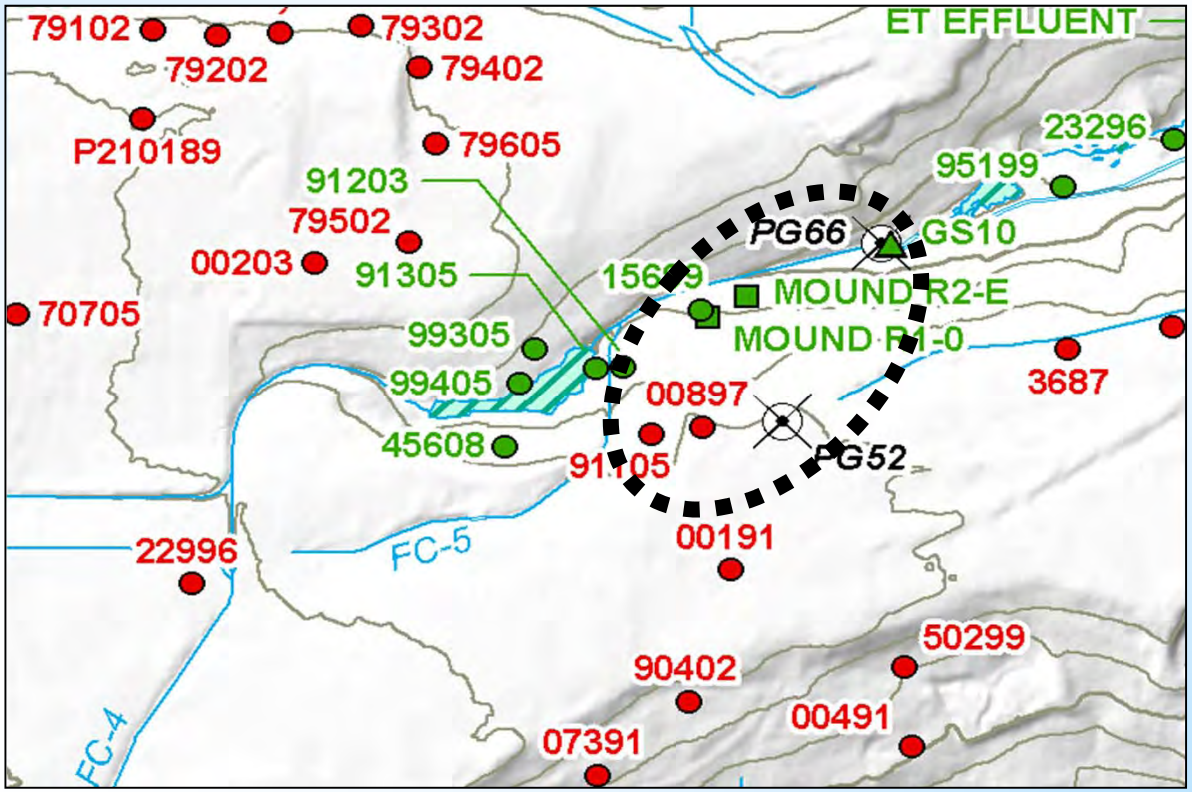
Selected Highlights from 2010: Plumes with Treatment Systems

- General areas of discussion



Selected Highlights from 2010: Mound Site Plume

- General area to be discussed
  - Includes Mound and Oil Burn Pit #2



Selected Highlights from 2010: Mound Site Plume (continued)

- Mound and Oil Burn Pit #2 (OBP #2) Plume
  - Source area Evaluation wells sampled in 2010
    - Results generally consistent with previous data
    - TCE, PCE at OBP #2 source-area well increased in 2010, but below historic highs
  - Downgradient Sentinel wells (15699, 91299) generally consistent with previous results, with some fourth quarter increases
    - Concentrations of several VOCs in well 91203 were increased in fourth quarter
  - 2010 saw highest water levels on record for source-area and downgradient wells
  - Several trends identified for source-area and downgradient wells (see Annual Report)

Selected Highlights from 2010: MSPTS

- MSPTS treated approximately 420,000 gallons
  - Highest volume since 2006
  - Continues trend of higher volumes observed since 2005

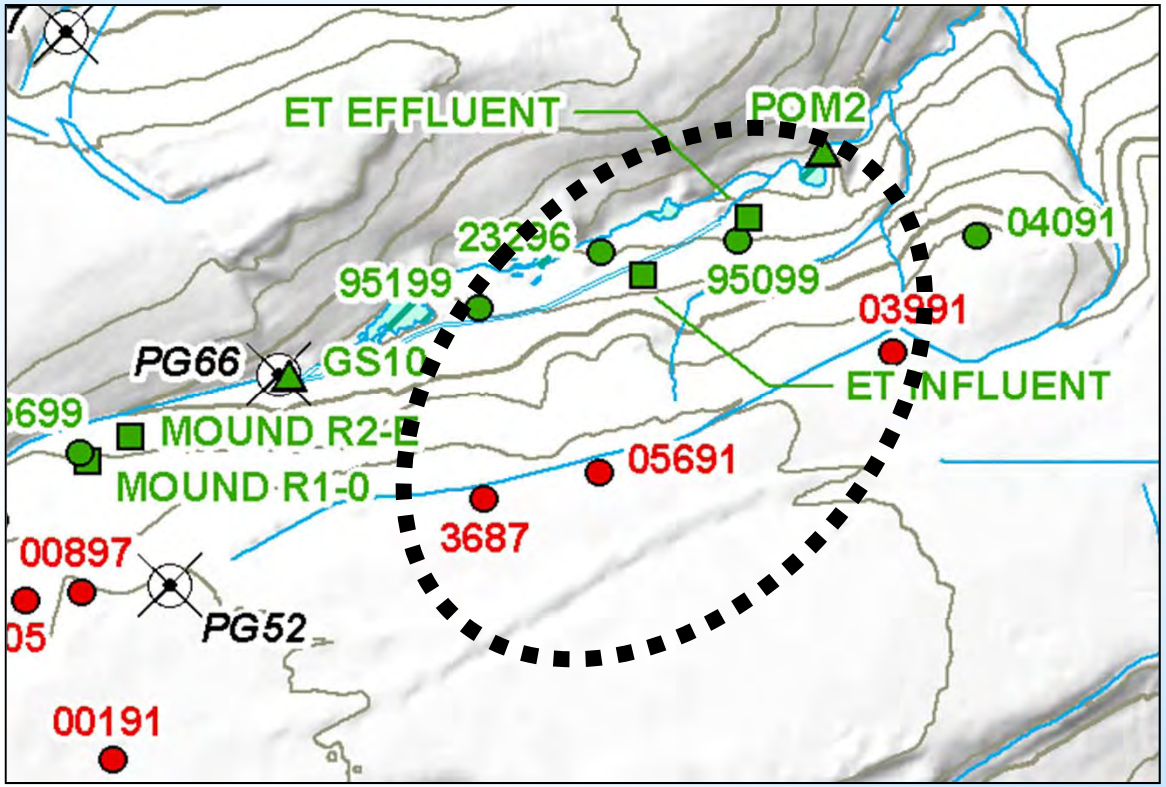
Calendar Year	Annual Estimates of Volume Treated (gallons)	Estimated Cumulative Volume Treated (gallons)
2000	258,000	660,000
2001	119,000	780,300
2002	53,000	833,000
2003	82,000	915,000
2004	86,000	1,001,000
2005	506,000	1,507,000
2006	430,000	1,937,000
2007	326,000	2,263,000
2008	358,000	2,621,000
2009	287,000	2,908,000
2010	420,000	3,328,000

Selected Highlights from 2010: MSPTS (continued)

- MSPTS characteristics
  - Influent concentrations of PCE, TCE generally higher in 2010, and increased sharply in fourth quarter
  - Influent continues to reflect presence of OBP #2-impacted groundwater
  - Higher spring flow rates dramatically reduced residence time (therefore also reduced treatment effectiveness)
  - Effluent showed some increased concentrations vs. previous years
    - Especially PCE, TCE, and associated daughter products present in influent
  - Results from surface water performance location GS10 in June included two values above RFLMA levels
    - TCE, 2.8 µg/L (RFLMA: 2.5 µg/L)
    - VC, 0.69 µg/L (estimated) (RFLMA: PQL, 0.2 µg/L)
  - Consulted CDPHE, performed additional sampling (see CR 2010-07)
  - Media replacement in 2011 to include effluent polishing component

Selected Highlights from 2010: East Trenches Plume

- General area to be discussed



Selected Highlights from 2010: East Trenches Plume (continued)

- Source area Evaluation wells sampled in 2010
  - Results generally consistent with previous data
- Water quality at downgradient Sentinel, AOC wells also consistent with previous
- Downgradient Sentinel well 23296 (next to South Walnut Creek)
  - Increasing trends in main degradation byproducts
  - Decreasing trends in main parent compounds
  - Higher water levels since dam breach
- Several other trends identified for both source-area and downgradient wells – see Annual Report

Selected Highlights from 2010: ETPTS

- ETPTS treated approximately 1,606,000 gallons
  - Highest volume treated since 2005 – about 1.7 to 4 times the volumes treated in previous post-closure years
  - Reverses trend of decreasing volumes observed since 2007

Calendar Year	Annual Estimates of Volume Treated (gallons)	Estimated Cumulative Volume Treated (gallons)
2000	1,633,000	2,800,000
2001	1,900,000	4,700,000
2002	≤1,000,000	5,700,000
2003	2,100,000	7,800,000
2004	1,500,000	9,300,000
2005	1,800,000	11,100,000
2006	675,000	11,775,000
2007	951,000	12,726,000
2008	629,000	13,355,000
2009	406,000	13,761,000
2010	1,606,000	15,367,000

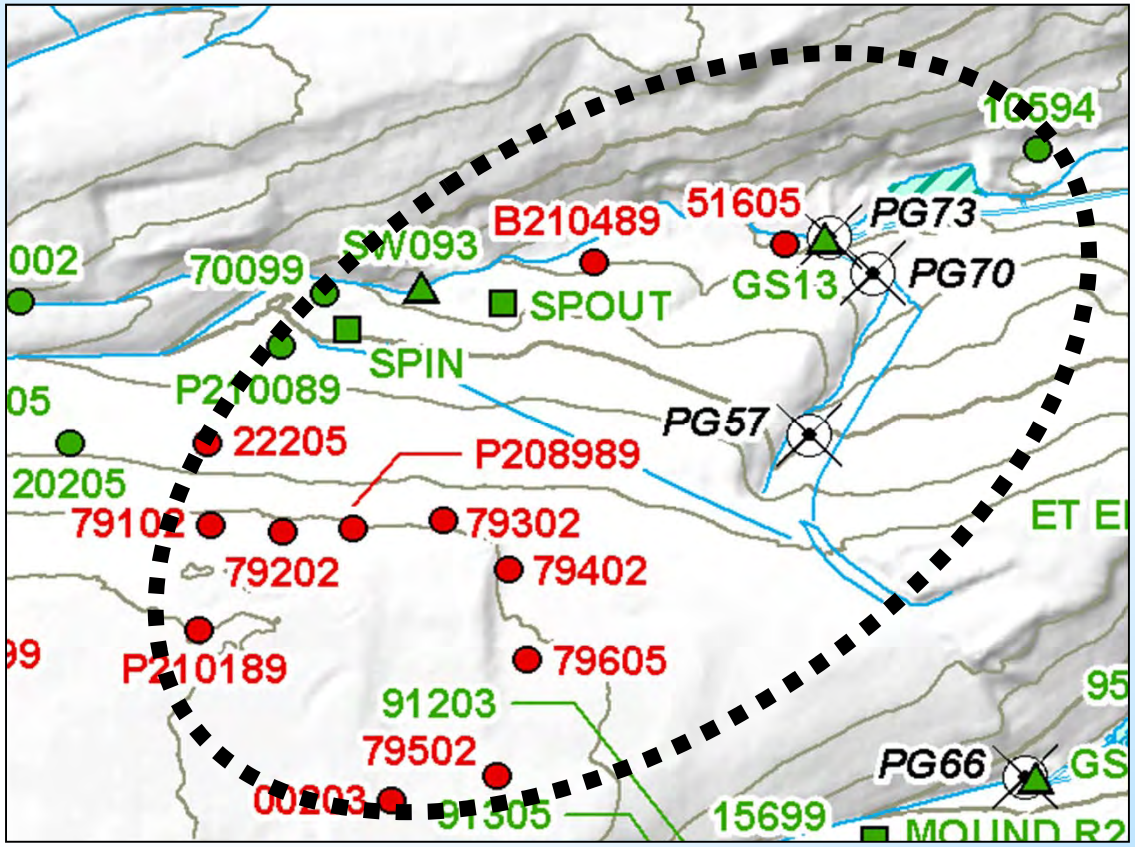
Selected Highlights from 2010: ETPTS (continued)

ETPTS characteristics

- Contaminant concentrations in system influent are generally consistent with previous years
- Higher flow rates dramatically reduced residence time (therefore also reduced treatment effectiveness)
- Effluent showed some increased concentrations compared with previous years
  - Particularly PCE, TCE, and some daughter products
- Results from surface water performance location POM2 included VOC detections, but none exceeded RFLMA levels
- Together with MSPTS, consulted CDPHE, performed additional sampling (see CR 2010-07)

Selected Highlights from 2010: Solar Ponds Plume

- General area to be discussed



Selected Highlights from 2010: Solar Ponds Plume (continued)

- Source-area Evaluation wells sampled in 2010
  - Nitrate concentrations fairly consistent, uranium concentrations more variable
    - Increasing uranium trends at 79302 (northeast corner of former ponds) and 22205 (between source area and SPPTS), decreasing at 79502 (southeast corner of ponds)
- Overall patterns at downgradient Sentinel and Evaluation wells
  - Higher uranium often not accompanied by higher nitrate
    - Wells nearer source area (Evaluation well 22205, Sentinel well P210089) are lower in uranium than wells farther away (Sentinel well 70099, AOC well 10594)
    - Illustrates importance of natural uranium
- AOC well 10594 reports decreasing uranium trend
- See Annual Report for more trends, discussion

Selected Highlights from 2010: SPPTS

- SPPTS treated approximately 738,000 gallons
  - Significantly higher than all previous years
    - Volume in 2010 exceeded combined volume in 2003, 2004, and 2005
    - Due to installation of Phase I upgrades and heavy spring precipitation

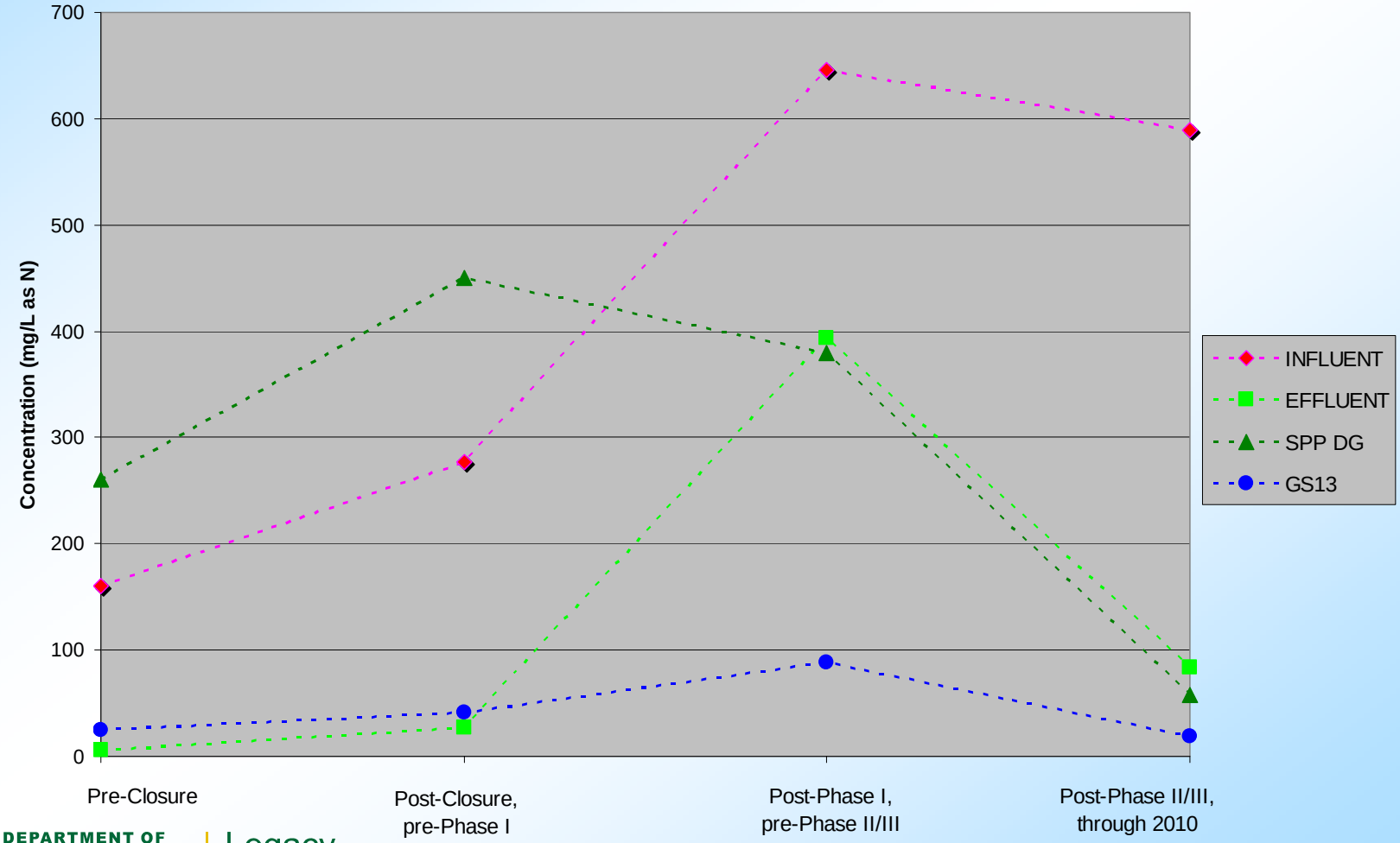
Calendar Year	Annual Estimates of Volume Treated (gallons)	Estimated Cumulative Volume Treated (gallons)
2000[a]	64,000	64,000
2001[a]	424,000	452,700
2002	5,600[b]	458,000
2003	340,000	797,000
2004	230,000	1,027,000
2005	140,000	1,167,000
2006	251,000	1,418,000
2007	244,000	1,662,000
2008	280,000	1,942,000
2009	524,000	2,466,000
2010	738,000	3,204,000

Selected Highlights from 2010: SPPTS (continued)

- SPPTS characteristics
  - Influent concentrations higher than most previous years
  - Influent flow much higher than previous years
  - Higher flow rates dramatically reduced residence time (therefore also reduced treatment effectiveness)
  - Effluent showed some increased concentrations vs. previous years
    - Phase II media replaced in August
    - Phase III optimization efforts continued
  - Average concentrations of nitrate and uranium are much lower at SPP Discharge Gallery than prior to site closure
  - Results from surface water performance location GS13 indicate overall effectiveness of SPPTS is improving

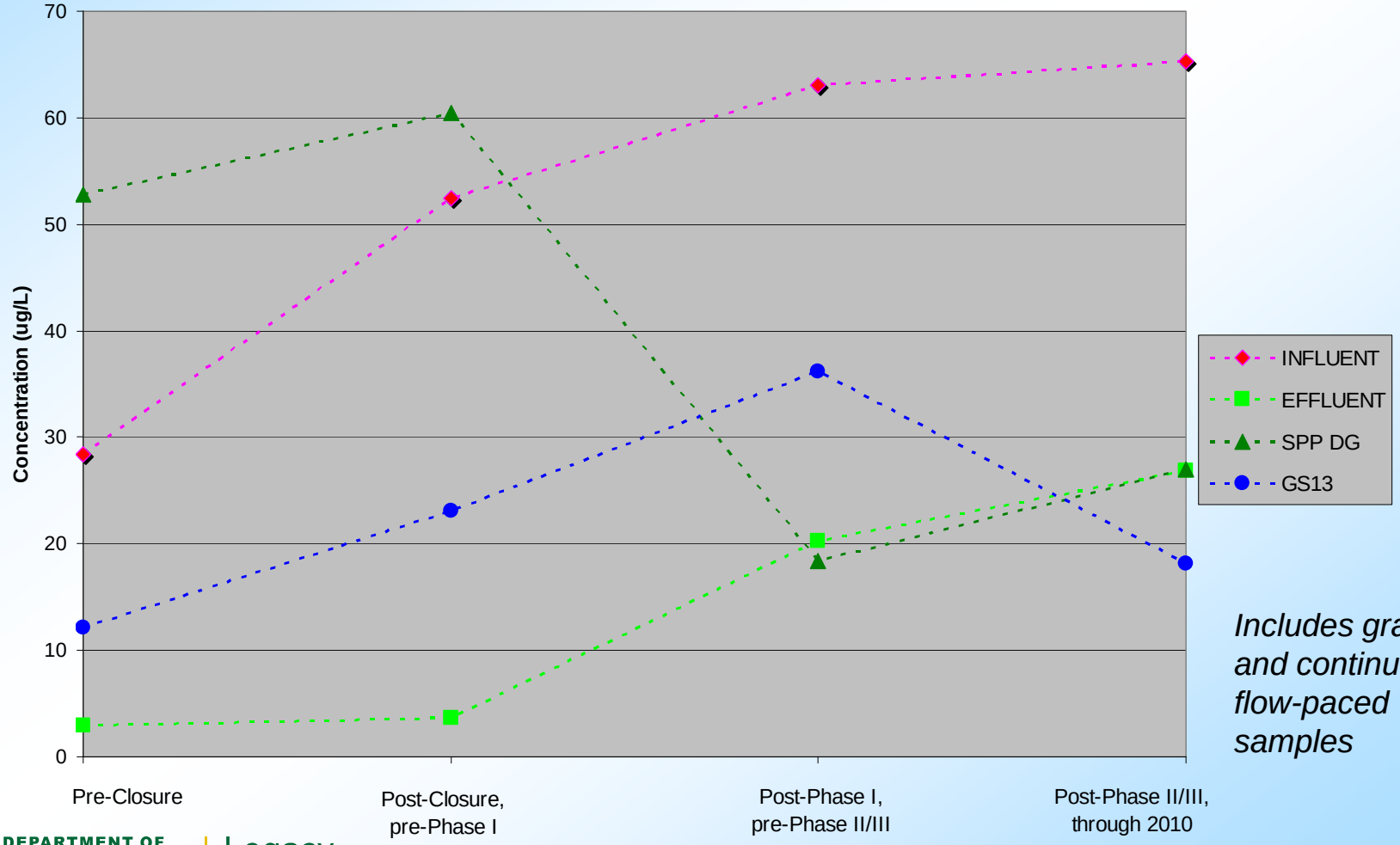
Selected Highlights from 2010: SPPTS (continued)

Average nitrate concentrations (with unvalidated ESL data)



Selected Highlights from 2010: SPPTS (continued)

Average uranium concentrations (with unvalidated ESL data)



Includes grabs and continuous flow-paced samples

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Selected Highlights from 2010: SPPTS (continued)

- Continuing groundwater focal point: SPPTS
  - Upgrade summary
    - Phase I (October 2008) collects more contaminated groundwater and routes to treatment cells, routes effluent via new, non-perforated line
    - Phase II (May 2009) moves uranium treatment to first step in easily accessible cell
    - Phase III (May 2009) evaluates pilot-scale nitrate treatment
  - Phase II media replaced (August 2010)
  - Phase III optimization continued in 2010
  - Fouling of some components (biological growth, chemical precipitates) required increased maintenance and troubleshooting
  - Phase IV (full-scale nitrate treatment) under consideration and development in late 2010
  - Additional detail presented in previous meetings and Annual Report

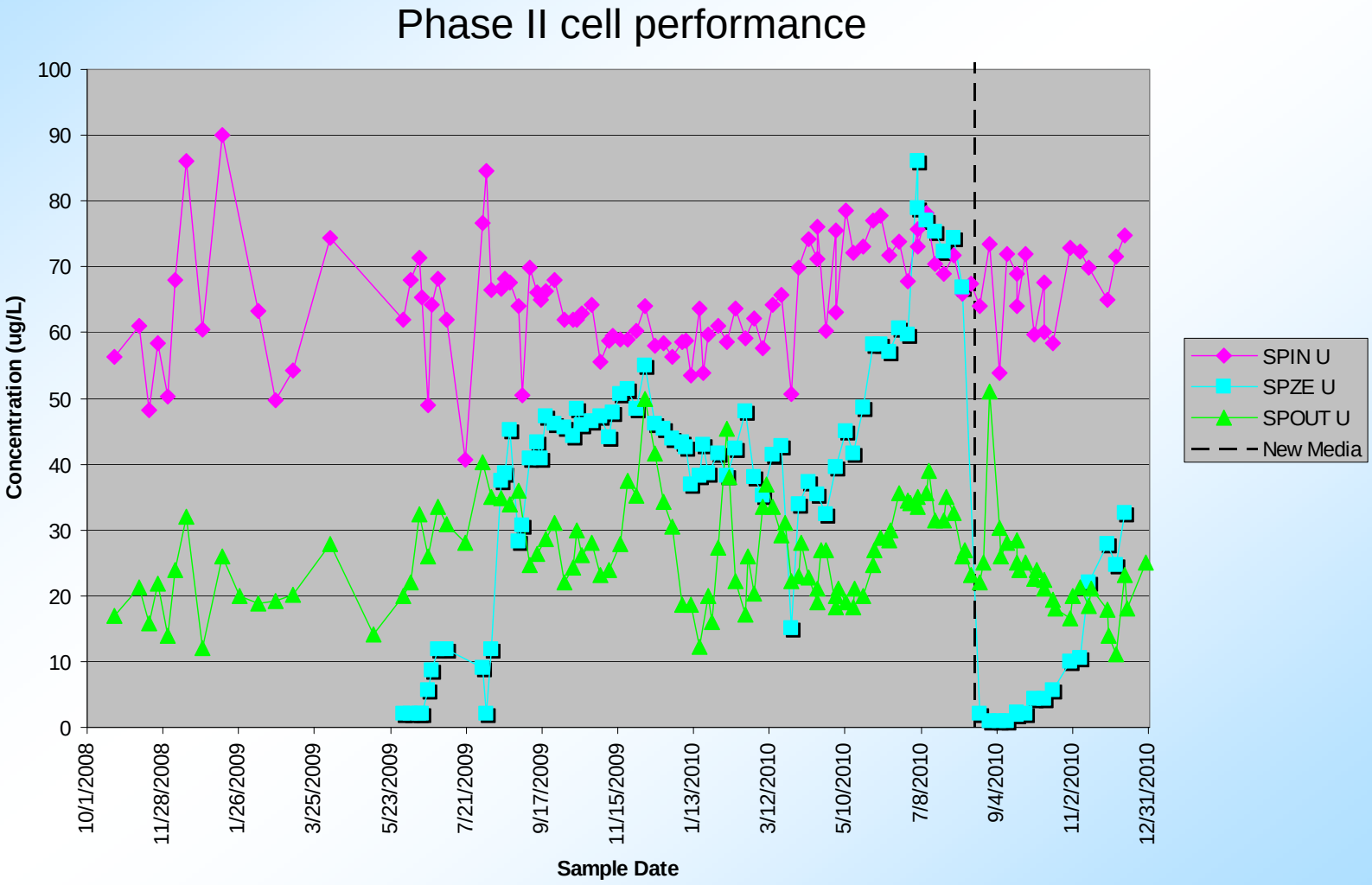
Selected Highlights from 2010: SPPTS (continued)

- Phase II uranium treatment cell
  - Phase II incorporated innovations proven effective in the lab
    - Citrate dosing to reduce clogging, extend media life
    - Uranium treatment upstream of nitrate treatment, thereby removing nitrate treatment media from low-level waste considerations
  - Original implementation did not replicate lab results
    - Uranium treatment effectiveness quickly declined; negligible by mid-2010
  - Considered possible causes
    - Preferential flow had developed, reducing contact with media
      - Two tracer tests demonstrated this was not the cause
    - Accelerated weathering of granitic pea gravel in media
      - Microprobe studies indicated this was not occurring
    - Nitrate, dissolved oxygen, calcium, carbonate, citrate, or a combination of analytes interfered with treatment by passivating (coating) ZVI

Selected Highlights from 2010: SPPTS (continued)

- One path forward: multiple pilot-scale cells run in parallel
  - Costly, time-consuming
- Selected alternative: replace media
  - New media design addressed several concerns
    - No citrate dosing
    - Replaced granitic gravel with quartzite gravel
    - Used fresh lot of ZVI
    - Increased percentage of ZVI in media
- Results: good treatment initially, but saw decreasing effectiveness within a few weeks
  - Results similar to original Phase II media
  - Still removing about half to two-thirds of influent uranium
  - Evaluating next steps

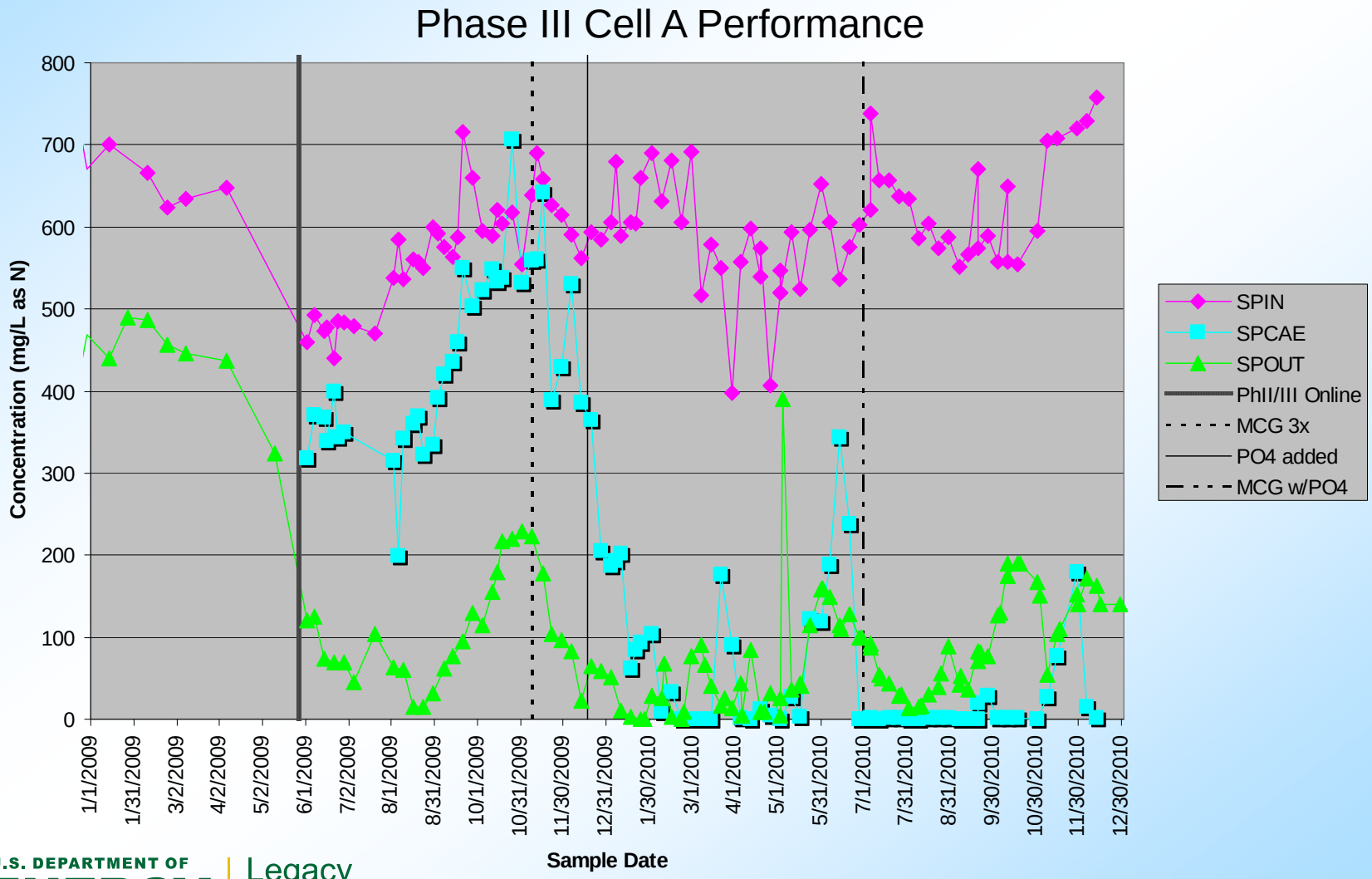
Selected Highlights from 2010: SPPTS (continued)



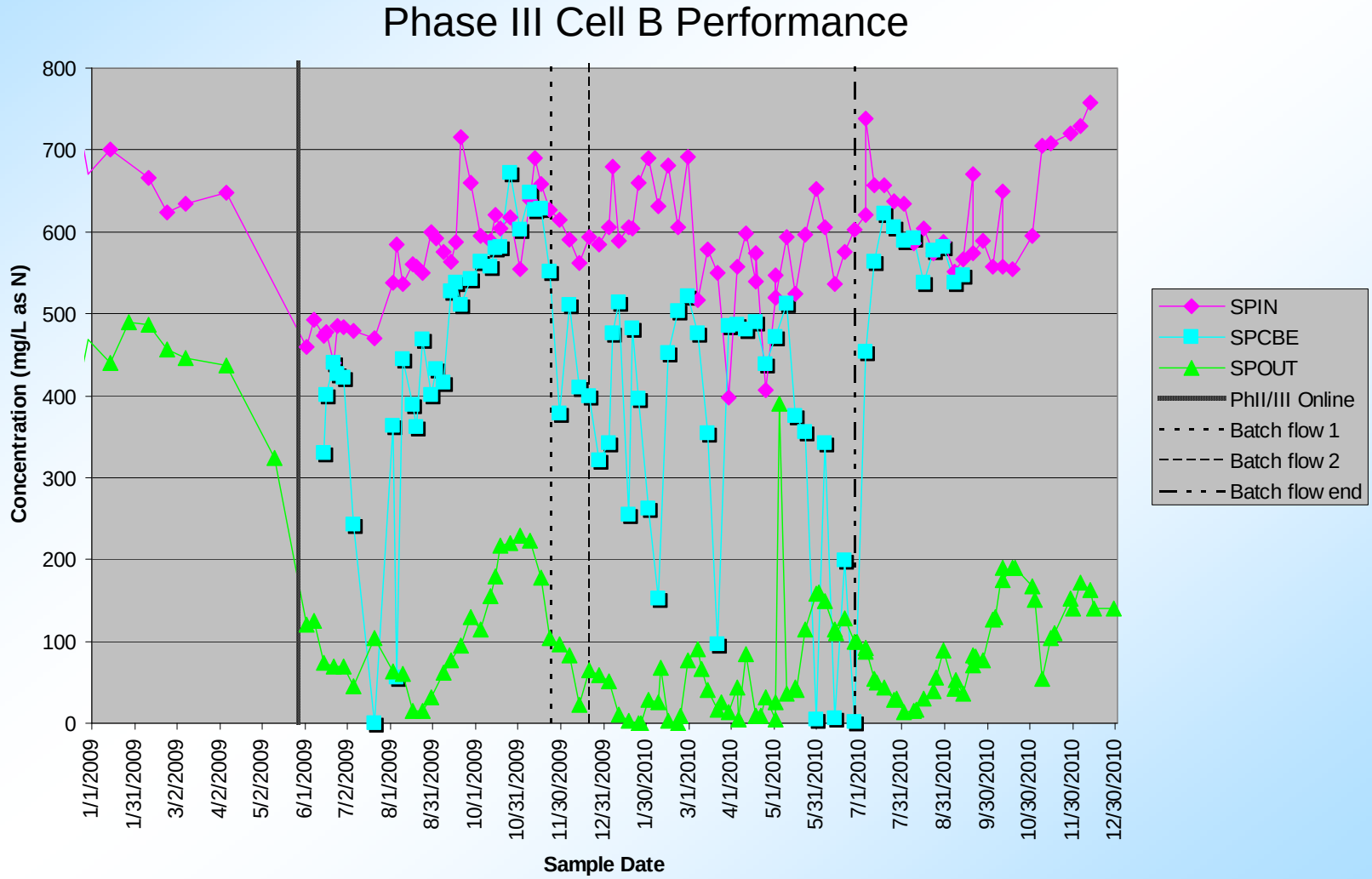
Selected Highlights from 2010: SPPTS (continued)

- Phase III Cell A
  - Operation and optimization continued in 2010
  - Cell continued to treat nitrate effectively
  - Biofouling observed in December
  - Began routinely puncturing the media to break it up
  - More aggressive maintenance under consideration
- Phase III Cell B
  - Ceased studies in summer 2010
    - Treatment rates very low
    - Full-scale system would have been infeasible

Selected Highlights from 2010: SPPTS (continued)



Selected Highlights from 2010: SPPTS (continued)



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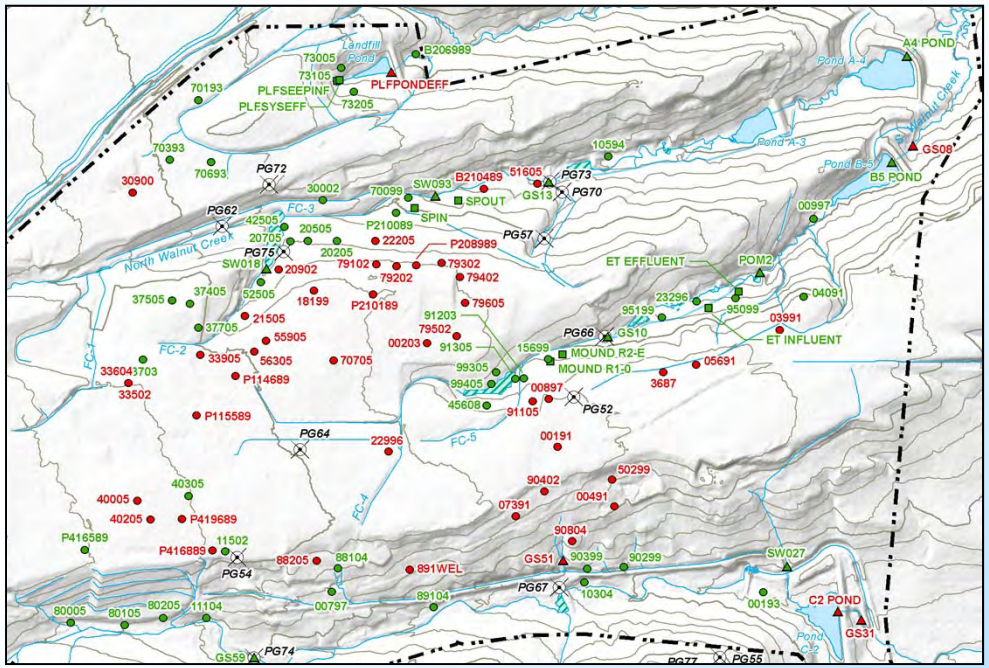
Selected Highlights from 2010: SPPTS (continued)

- Biofouling in Original Cell 1
  - Media (sawdust with 10 percent ZVI) and plumbing are inaccessible
  - Clogging observed in early 2010
    - Evaluated potential maintenance actions
    - Physical means (i.e., Roto-Rooter) not feasible due to inaccessibility and configuration of plumbing
    - Chemical means assessed
    - Used diluted bleach solution in spring
    - Results suggested biomass was killed, but unable to flush from system – clogs remained
    - Installed auxiliary Cell 1 influent distribution gallery to augment original plumbing
      - Also clogged quickly: biological plus chemical precipitates
      - Attempts to clear did not produce lasting results (1 to 2 days)
- Continue to assess path forward and operation

Selected Highlights from 2010: Other Plumes

Other groundwater contaminant plumes and areas of interest include

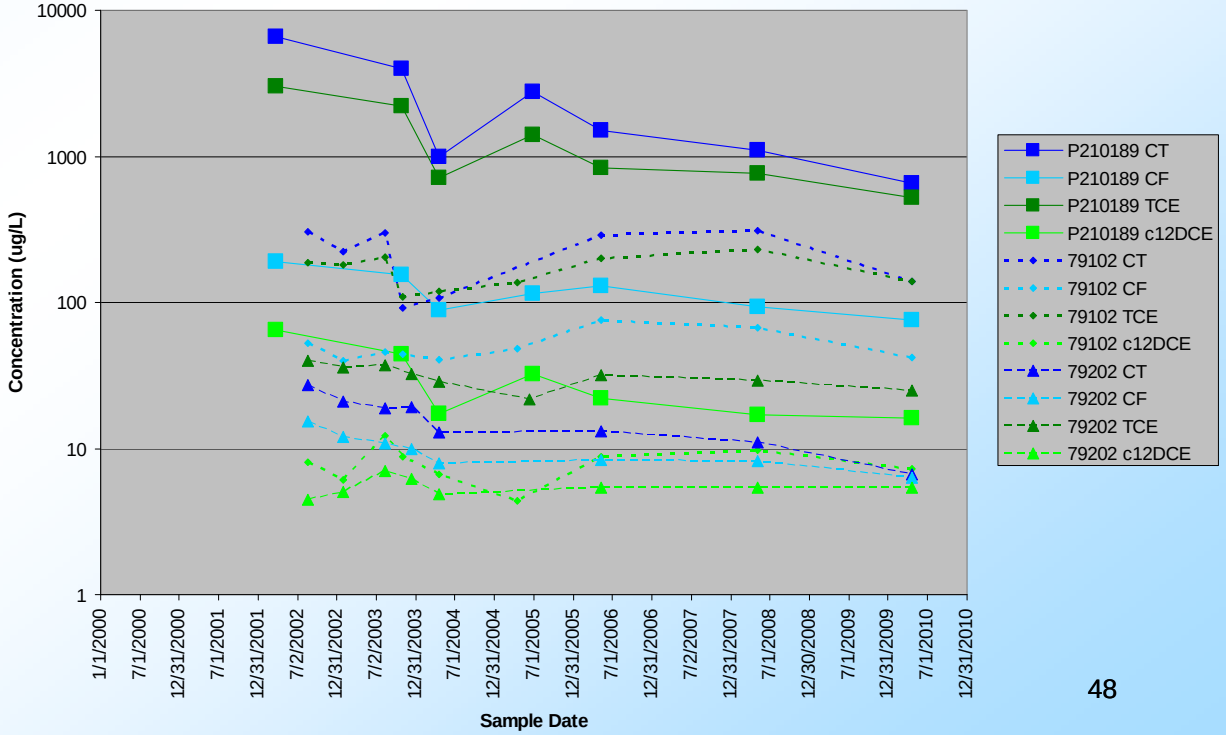
- Solar ponds-area VOC plume
- 903 Pad/Ryan's Pit plume
- IA plume
- Vinyl chloride plume
- IHSS 118.1 plume
- PU&D yard plume
- OU1 plume
- Other areas of interest
  - Former B991
  - Hillside south of former B991
  - Former B881
  - Former B771
  - Former B371
  - AOC well B206989 (No Name Gulch)
- See Annual Report for information beyond that included in this presentation



Selected Highlights from 2010: Solar Ponds-Area VOC Plume

Source-area Evaluation wells sampled in 2010

- Concentrations generally consistent with previous data
- Several decreasing trends identified
- VOCs not detected farther downgradient (Evaluation well 22205, Sentinel well P210089, AOC well 10594)



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Selected Highlights from 2010: 903 Pad/Ryan's Pit Plume

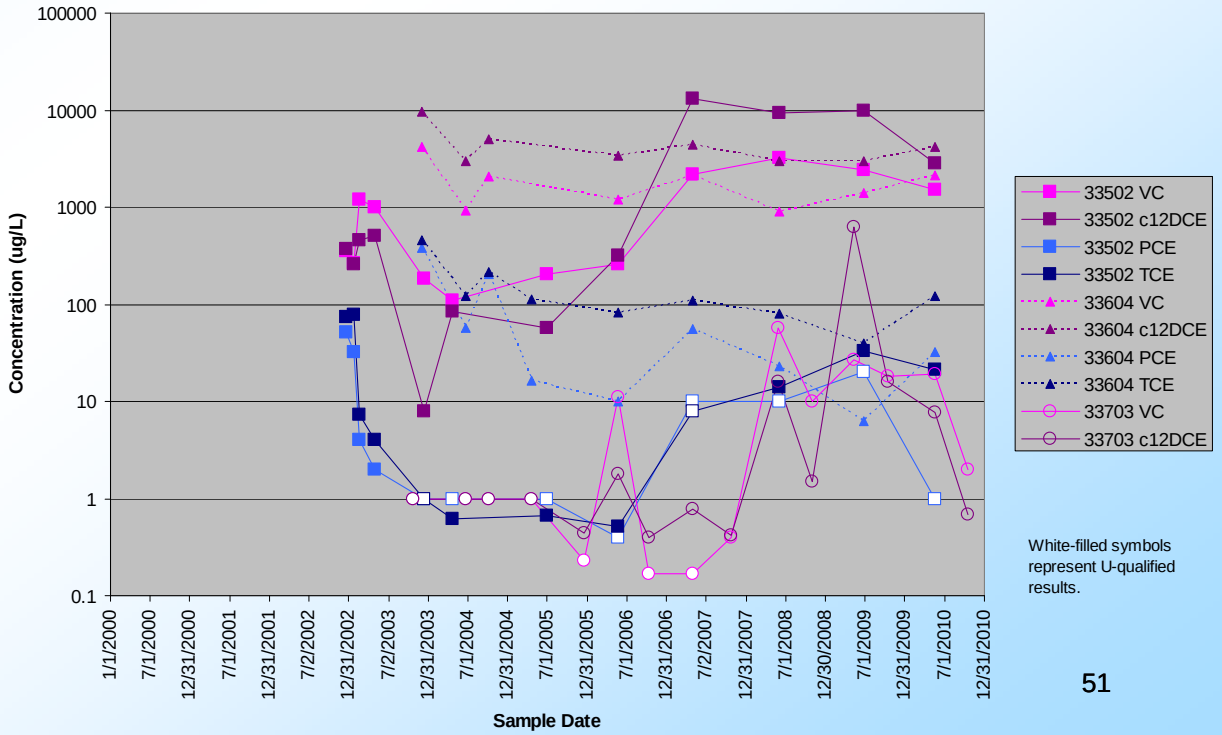
- Results from source-area Evaluation wells generally consistent with previous data
  - 903 Pad groundwater: primarily carbon tetrachloride and PCE
  - Ryan's Pit groundwater: primarily TCE
  - 07391 (Ryan's Pit) produces samples with highest VOC concentrations
- Heavy spring recharge allowed sampling of Sentinel well 90299 (north side of SID) for the first time since 2007
- AOC wells 10304 and 00193 do not suggest impacts to surface water
- Several trends identified, see Annual Report for details

Selected Highlights from 2010: IA Plume

- Actually several small plumes, aggregated for convenience
- Southern portion
  - Evaluation well 40005 produces highest concentrations of VOCs
  - Results from 2010 consistent with previous data
  - With increasing distance south from 40005, concentrations decrease
  - Results for AOC well 11104 (at Woman Creek) do not suggest impact to surface water
- Northern portion
  - Biodegradation of VOCs is suggested at well 21505
    - Located between two other areas that support biodegradation
  - VOCs in Sentinel well 52505 and AOC well 42505 reduced vs. past years
  - VOCs in Surface Water Support location SW018 consistent with past years (all below RFLMA levels)
- Several trends calculated, see Annual Report for details

Selected Highlights from 2010: Vinyl Chloride Plume

- Source area results consistent with previous years
  - Concentrations of daughter products are higher, parent compounds lower
- Biodegradation appears to be continuing despite removal of overlying impervious surfaces (e.g., parking lots)
- Downgradient Sentinel well 33703 also reports daughter products
  - Well kinked, replaced early 2011



White-filled symbols represent U-qualified results.

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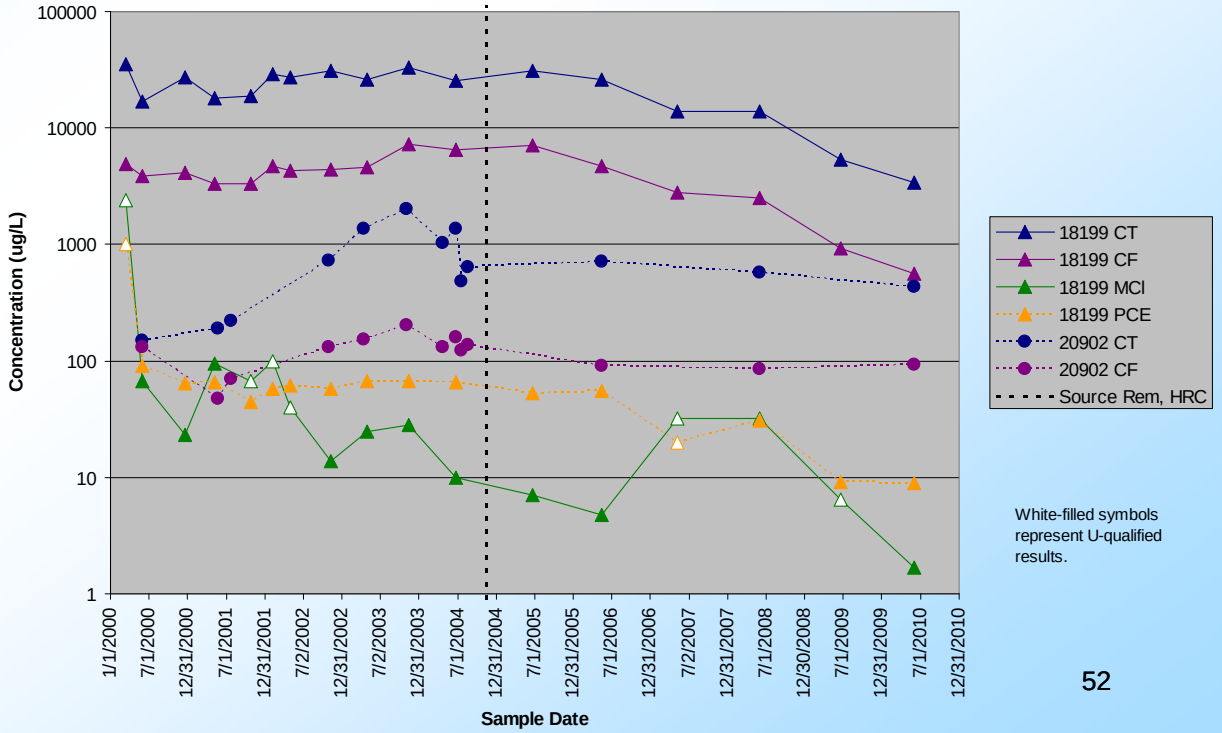
Selected Highlights from 2010: IHSS 118.1 Plume

- Results from source-area Evaluation well 18199 suggest carbon tetrachloride and chloroform (main contaminants) are decreasing
  - Decreasing trend does not yet meet statistical test
  - Degradation products are not increasing
- Downgradient Evaluation well 20902 does not show similar decreases
- Downgradient Sentinel wells (N of B771) do not suggest impacts from this plume



White-filled symbols represent U-qualified results.

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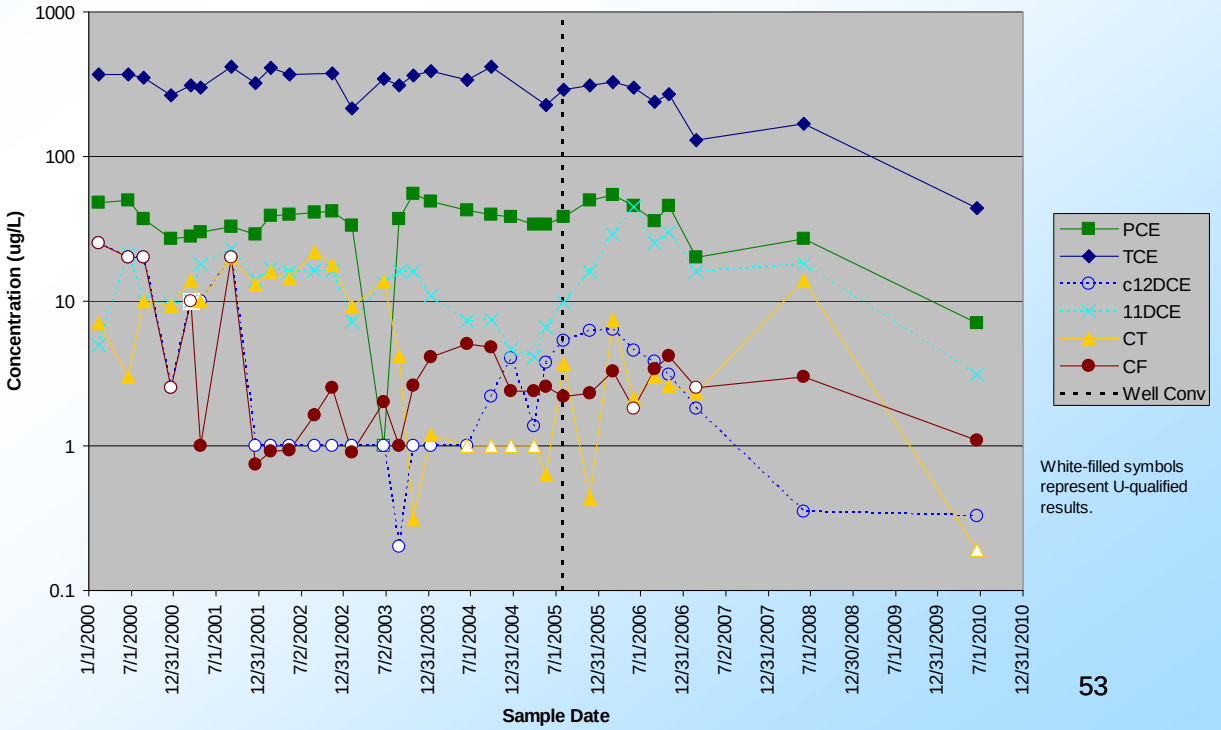
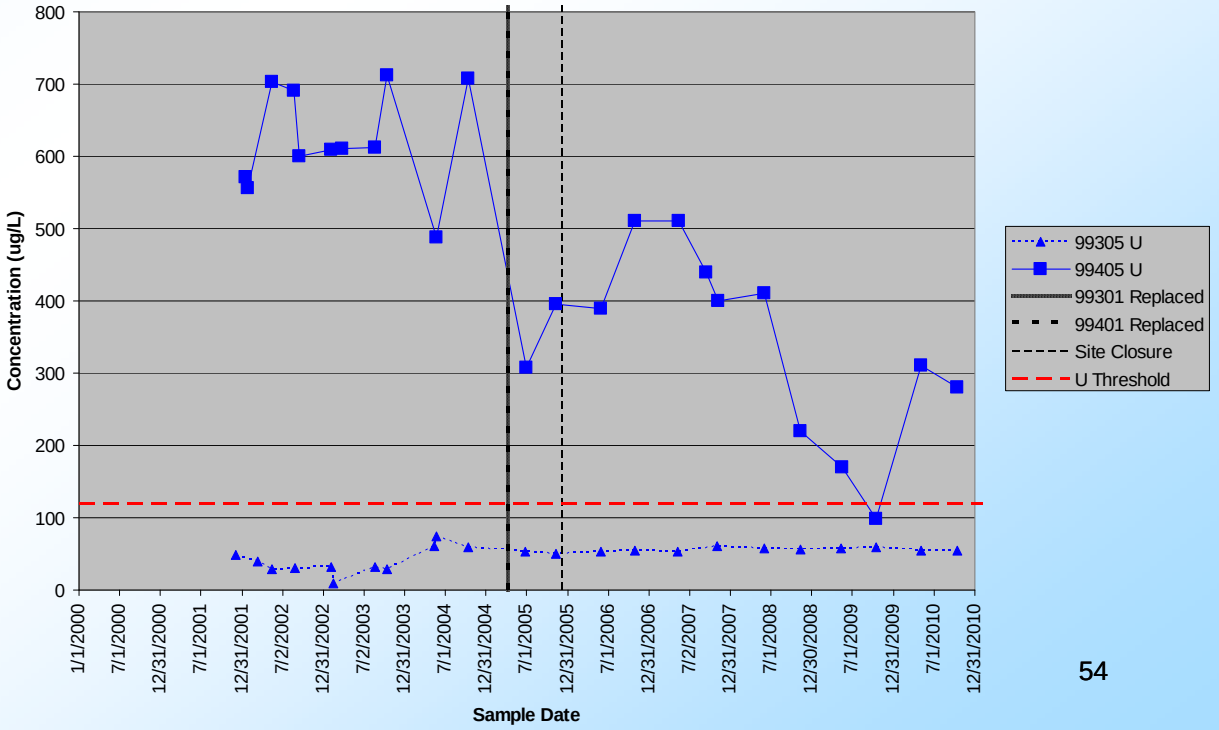
Selected Highlights from 2010: OU 1 Plume

- Source-area Evaluation well 891WEL
  - Main VOCs showed decreased concentrations in 2010
- Downgradient AOC well 89104 not impacted by plume



Selected Highlights from 2010: Other Areas of Interest

- B991 Uranium
  - Uranium concentrations at well 99405 rebounded somewhat in 2010
  - Still calculated to be on a decreasing trend
  - Repeatedly characterized as 99.9 percent to 100 percent natural (both wells)



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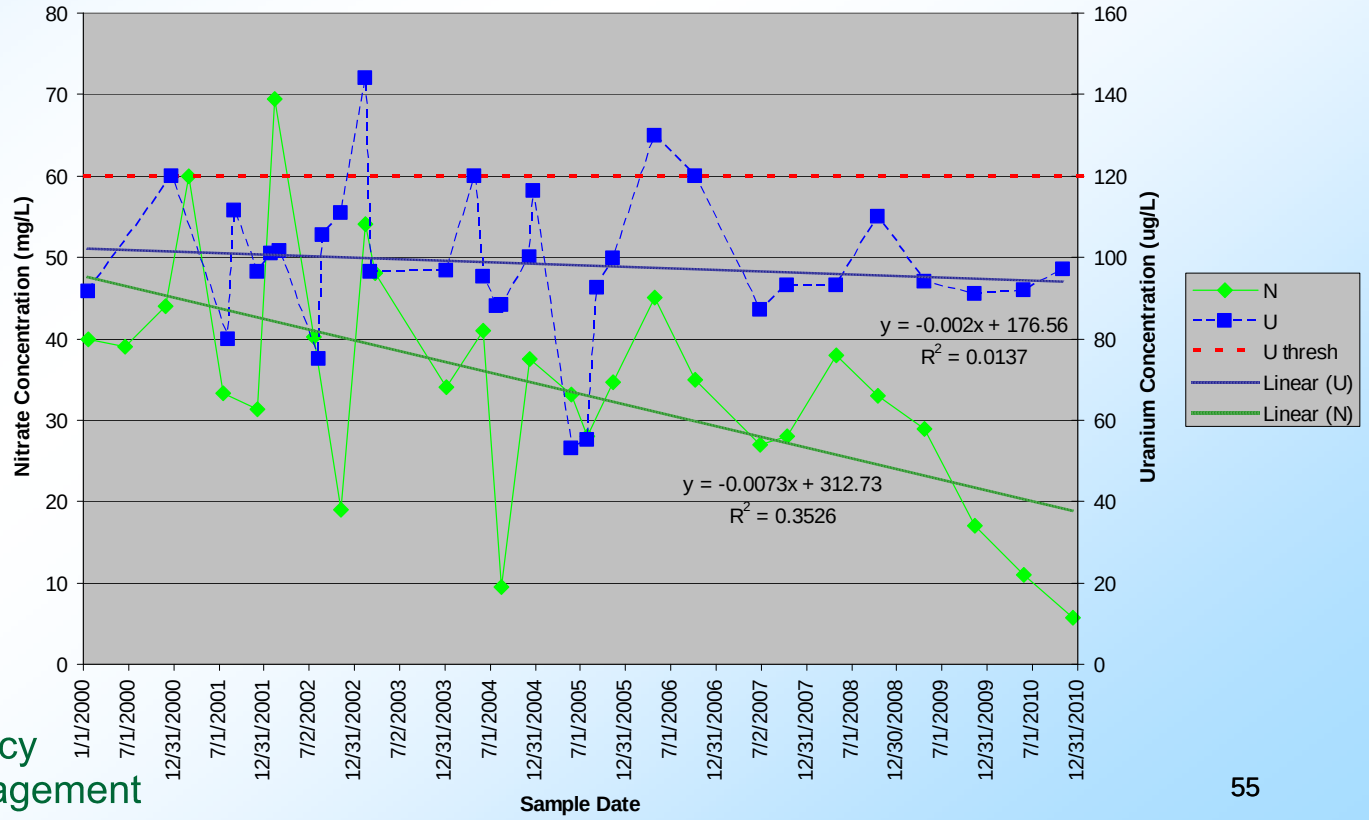
Selected Highlights from 2010: Other Areas of Interest (continued)

- AOC well B206989 (east of Landfill Pond dam)
  - Entered reportable condition for nitrate in 2007
  - Decreasing trend is calculated, is also visually apparent



Simple regression lines are shown at right; see Annual Report for required trending output

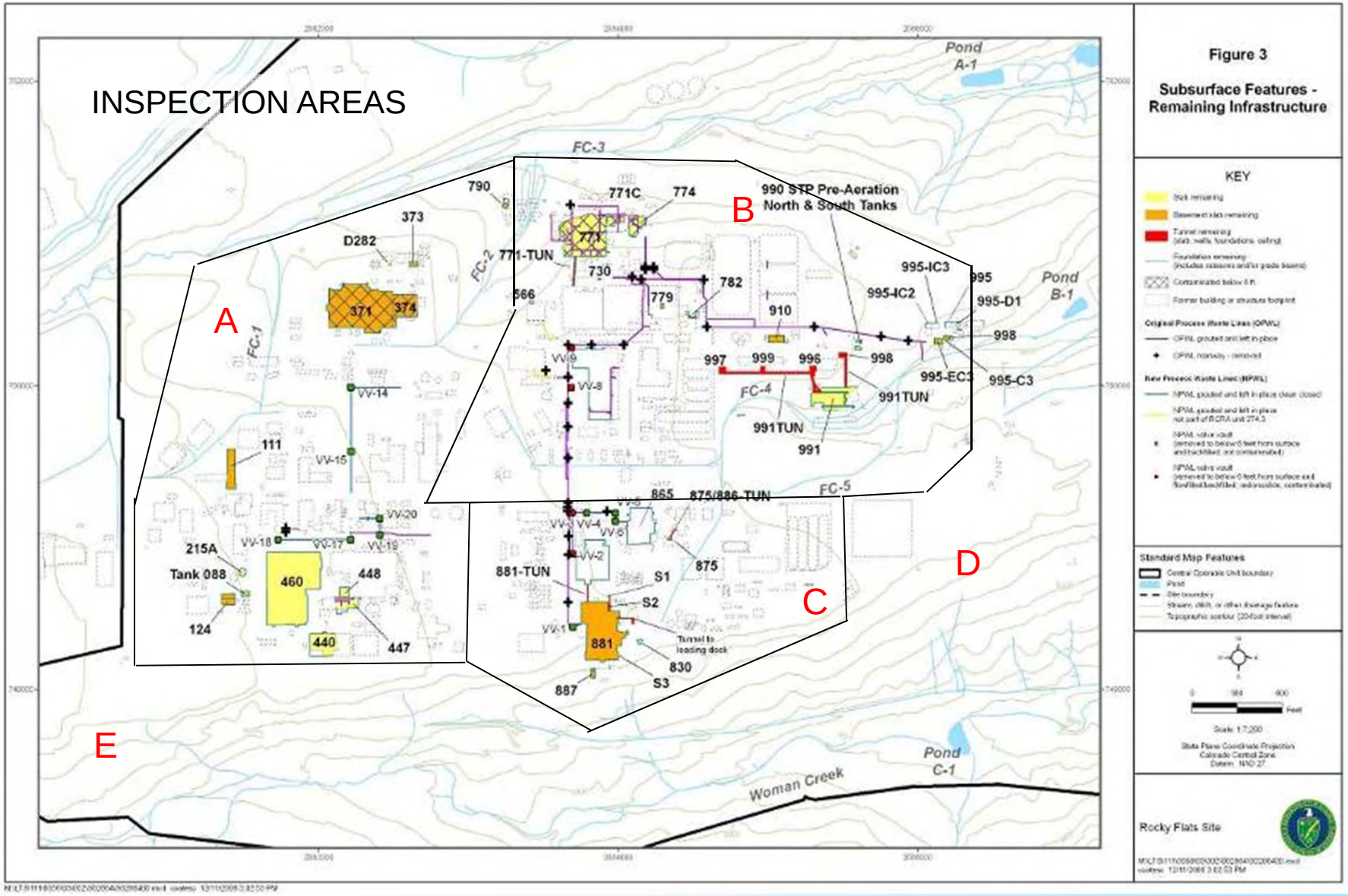
Questions?

Annual Site (Central OU) Inspection March 17, 2010

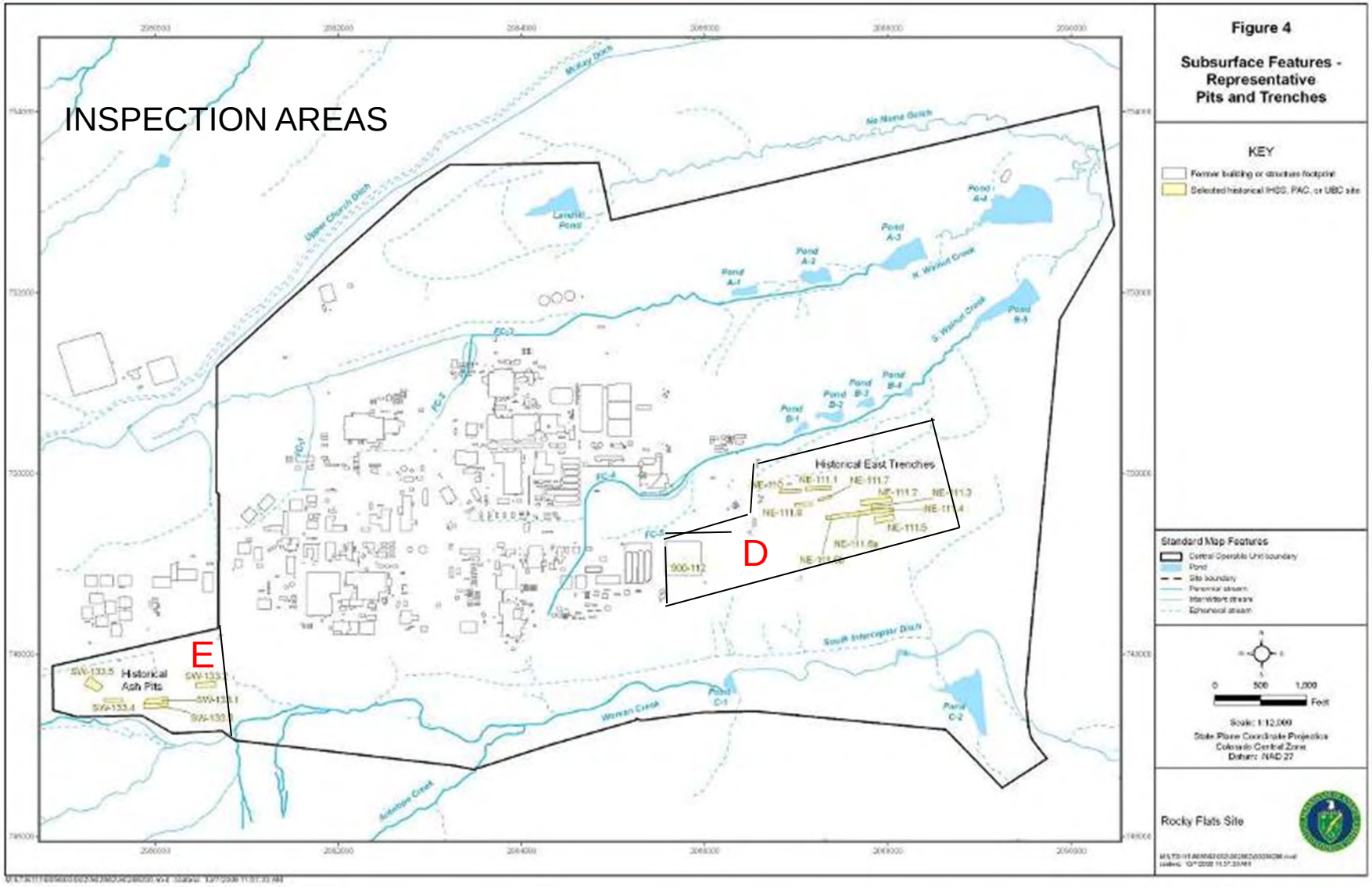
- Inspection and monitoring for evidence of significant erosion
  - Conduct visual observation for precursors of significant erosion
  - Evaluate proximity of any significant erosion to subsurface features
- Inspect effectiveness of institutional controls (ICs)
  - Determine effectiveness by any evidence of violation of ICs and determine whether required signs are in place
  - Verify that Environmental Covenant is in AR and on file with Jefferson County (verified March 19, 2010)
- Evidence of any adverse biological conditions observed during inspection

Annual Site (Central OU) Inspection March 17, 2010 (continued)

- Central OU divided into 5 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 through E) to observe conditions


INSPECTION AREAS
A
B
C
D
E
FC-1
FC-2
FC-3
FC-4
FC-5
Pond A-1
Pond B-1
Pond C-1
Woman Creek
771-TUN
771C
774
990 STP Pre-Aeration North & South Tanks
790
373
D282
371
374
730
782
779
910
995-IC3
995-IC2
995
995-D1
998
997
999
996
995-EC3
995-C3
991TUN
991
VV-14
VV-15
111
VV-20
VV-18
VV-17
VV-19
215A
Tank 088
460
448
124
440
447
865
875/886-TUN
875
881-TUN
S1
S2
881
Tunnel to loading dock
830
S3
887
Figure 3
Subsurface Features - Remaining Infrastructure
KEY
Standard Map Features
Rocky Flats Site

INSPECTION AREAS



Annual Site (Central OU) Inspection March 17, 2010 (continued)

- No significant erosion noted – minor holes, small animal evidence, and depressions identified
  - Very limited aerial extent – filled in
  - Debris and trash collected or flagged for pick up
- No adverse biological conditions noted
- No evidence of IC violations
- Signs in place

Update on WQCC Rulemaking

- Triennial review statewide Basic Standards and Methodologies 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 to 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

2010 Ecological Monitoring Summary

2010

2005

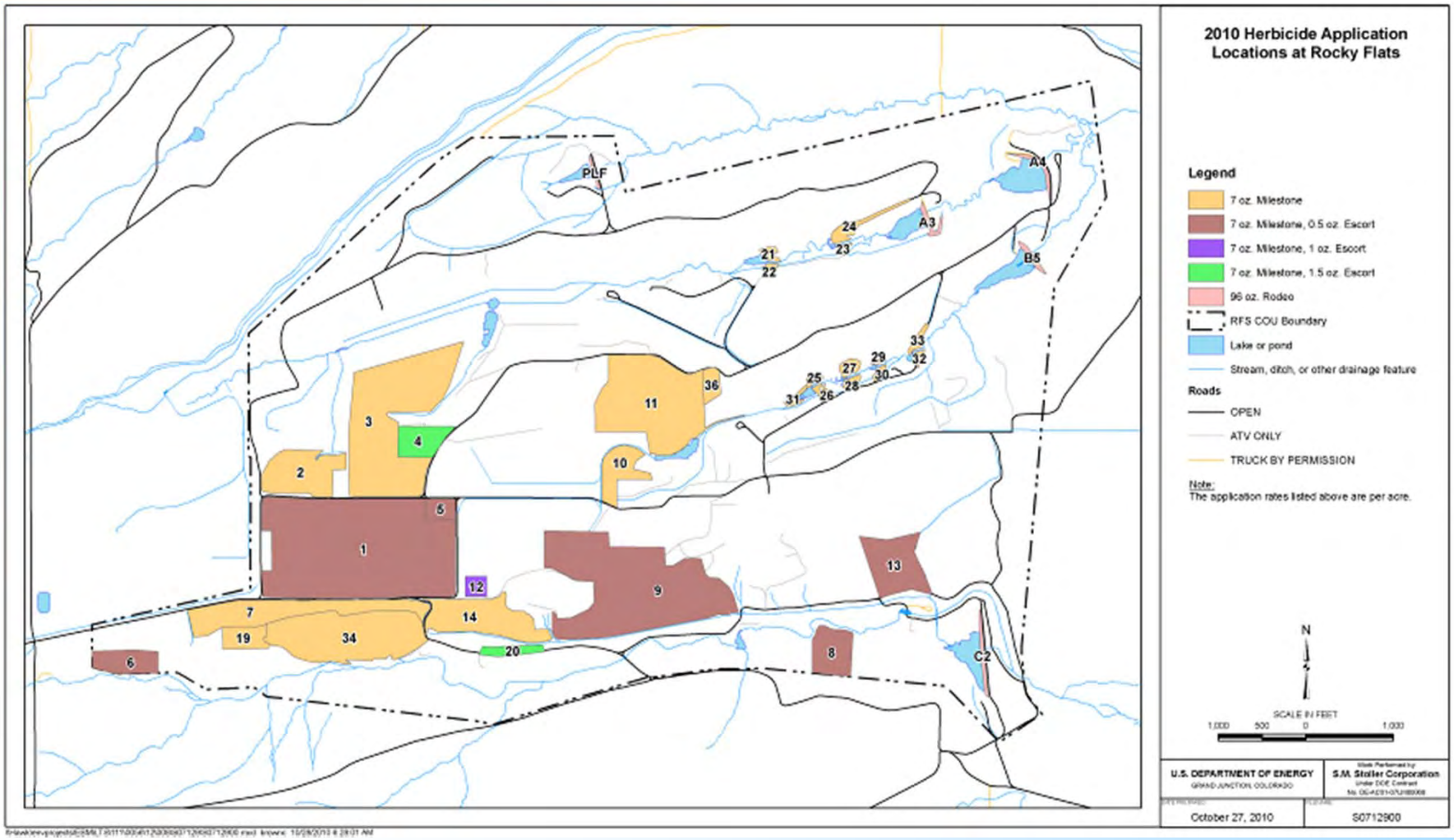
Project Assistance

- Project support for ecological issues was provided for the:
  - OLF projects
  - POC flume project
  - Roads project
  - Surface water configuration EA
  - SW027/903 lip hillside seeding and erosion controls
  - Mound Treatment System project
  - Annual Dam Mowing and Riprap Spraying project
  - Solar Ponds Plume Treatment System projects
  - Annual weed control efforts

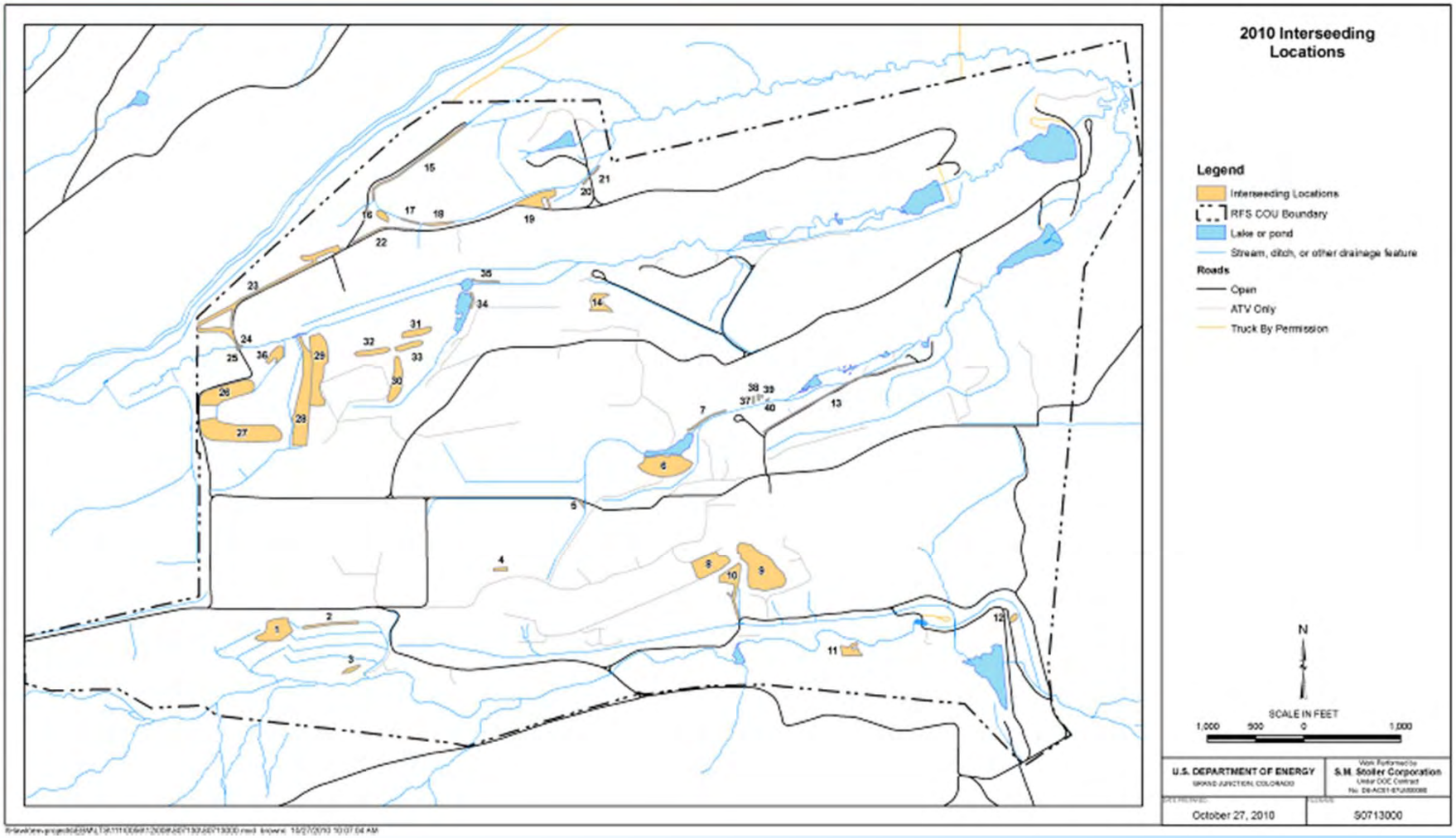
Ecological Monitoring

- OLF and PLF vegetation surveys
- Monthly weed surveys in the mitigation wetlands
- Revegetation monitoring
- Weed monitoring and mapping
- Preble's mouse mitigation monitoring
- Wetland mitigation monitoring
- Bluebird box monitoring

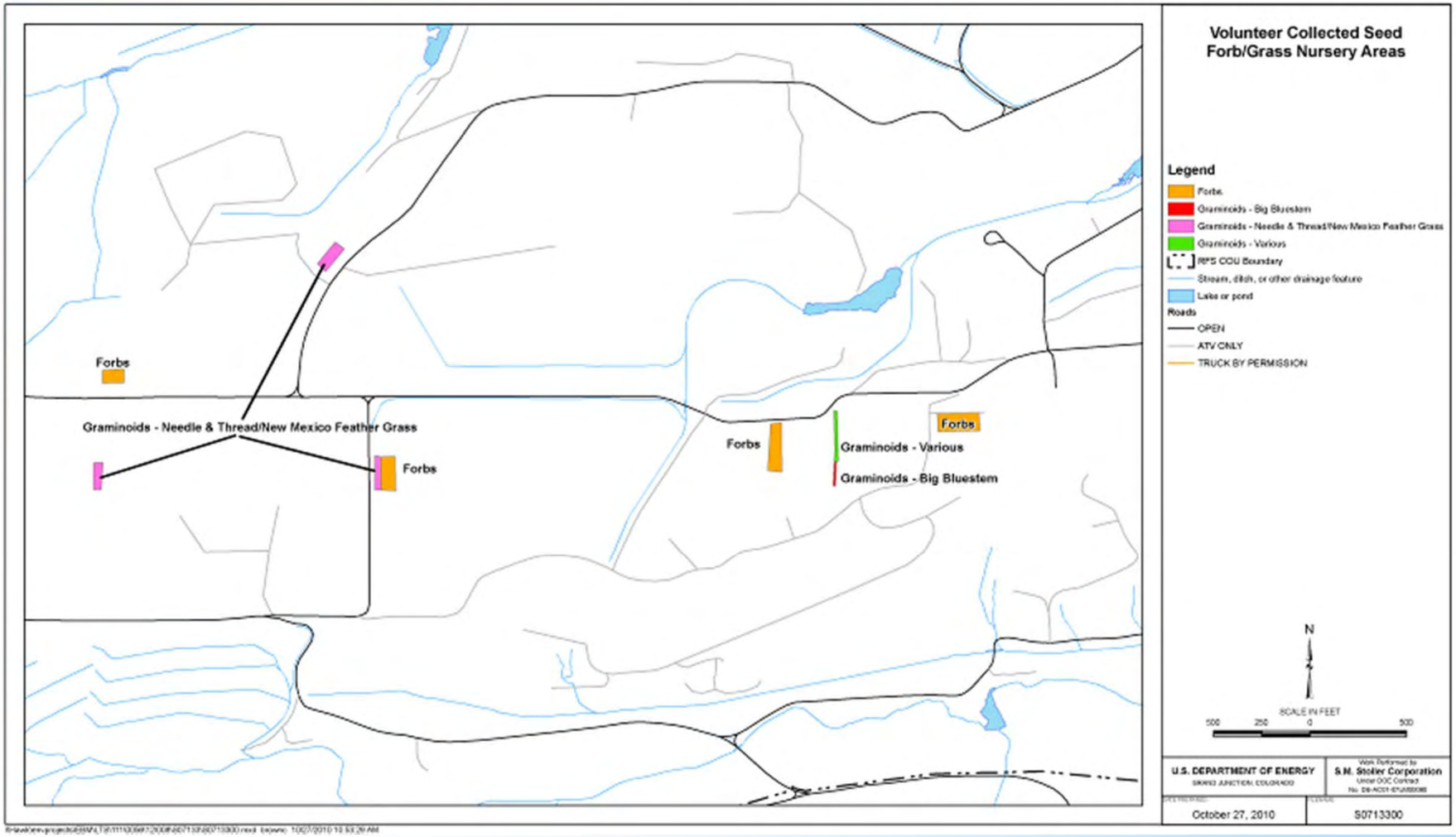
Weed Control



Revegetation Activities



Volunteer Seed Forb Nursery



2004
2010

2003
2010

2004
2010

2004

2010

2005
2010

2003

2010

2010 Wildlife Monitoring

- Prairie dogs – no active towns within COU
- Raptor nests
  - 2 Great Horned Owl nests – 4 young fledged
  - 1 Swainson's Hawk nest – 1 young fledged
  - 1 Red-Tailed Hawk nest – unknown status (not in COU)
- Bluebird nest boxes
  - No bluebirds using nest boxes yet
  - 5 boxes used by house wrens
  - 3 boxes used by tree swallows

Questions?

Site Operations – Calendar Year 2010

Site Operations - OLF

Original Landfill – Inspections

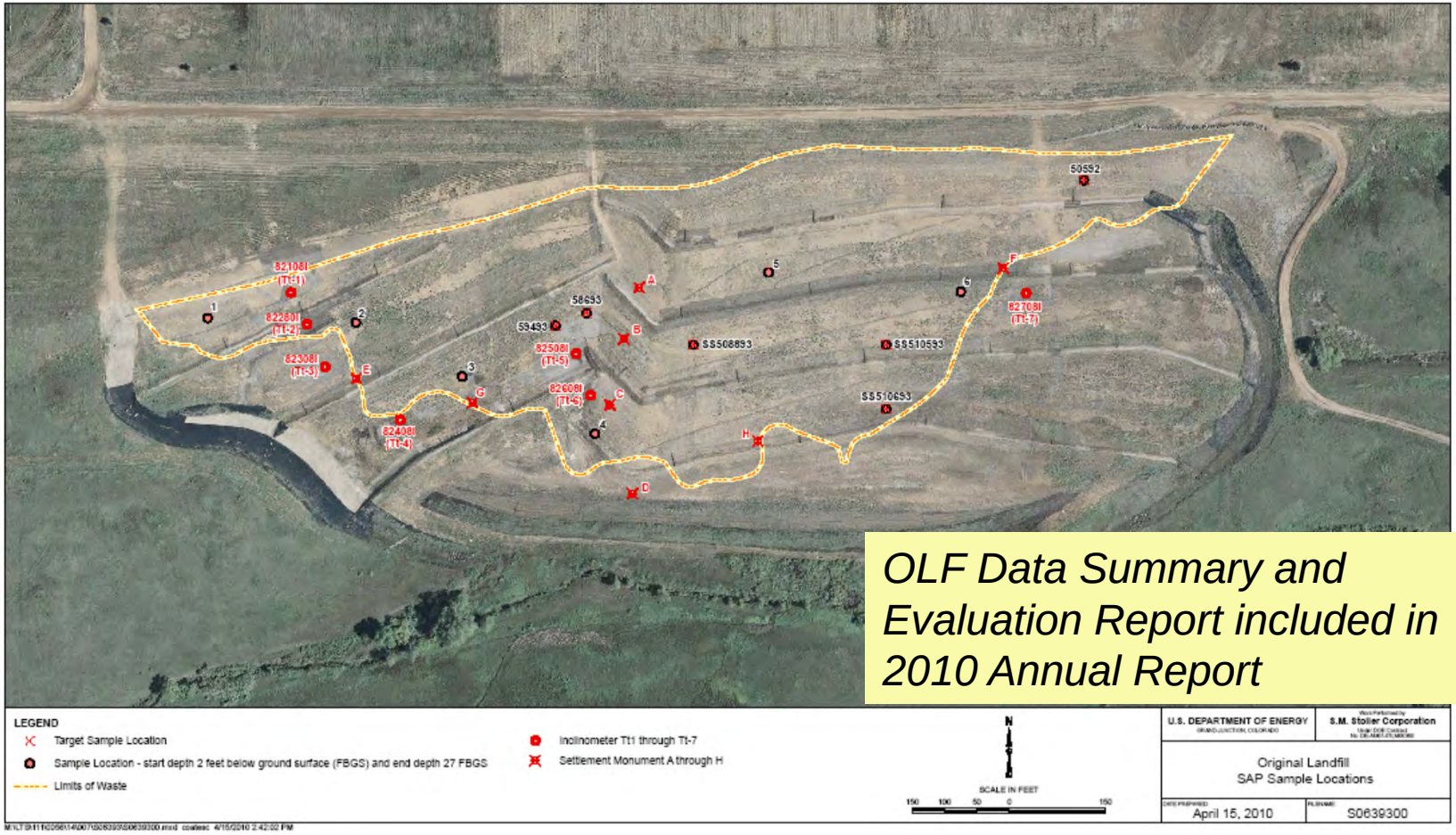
- 12 monthly inspections were performed in 2010
- Fourth quarter inspections were completed on October 28, November 30, and December 31, 2010
- Settlement monuments surveyed in March, June, September, and December – data are within the expected range per Monitoring and Maintenance Plan, which is between 1.34 and 2.86 feet depending on the location
- Surface cracking in the Berm 1 and Berm 7 locations indicated continued localized instability
  - Maintenance/repairs completed

OLF Features

OLF Inclinometers and Seep Evaluation

- Inclinometers were measured on October 28, November 18, and December 13, 2010
- Very little deflection was noted in the fourth quarter
- Review by geotechnical engineer – consistent with 2008 Geotechnical Report and 2009 inclinometer review
  - Localized slumping occurs as groundwater levels saturate organic layer near bedrock, as was observed after spring precipitation
  - Continue monitoring and implementing maintenance to fill and grade surface cracking
- Review by geotechnical engineer of impact on Berm 7 stability from saturation by seep runoff
  - Saturation from runoff did not impact berm stability

OLF Soil Sampling Project



OLF Data Summary and Evaluation Report included in 2010 Annual Report

OLF Soil Sampling Project DQOs

- Evaluate whether any analyte concentrations are above CDPHE screening levels or WRW PRGs
- 2010 data are generally similar to OLF IM/IRA data
  - Arsenic (100 percent of samples) and SVOC and PCB samples (6 to 44 percent of samples) greater than CSEVs or WRW PRGs
  - Several analytes above screening levels in OLF IM/IRA data were below CSEVs or WRW PRGs in the 2010 samples
    - Antimony
    - Copper
    - Tetrachloroethene
    - Trichloroethene
    - Iron less than WRW PRG
    - Chrysene less than WRW PRG
    - PCB Aroclor 1260 less than WRW PRG

OLF Soil Sampling Project DQOs (continued)

- Evaluate whether residual contamination levels are stable or have decreased
- The 2010 data showed decreases in concentrations for some analytes, compared to OLF IM/IRA data
  - Might have been caused by the mixing of some soils from the cutting, filling, and contouring work in closing the OLF
- 2010 SVOC and PCB results greater than screening values or WRW PRGs are from samples deeper than 7 feet below ground surface
- Targeted surface soil sample location SS510593 at 7 to 12 feet below ground surface — SVOCs about an order of magnitude higher than the OLF IM/IRA data maximum

OLF Soil Sampling Project DQOs (continued)

- Evaluate risk if subsurface soils become exposed to the surface
- Based on comparison to surface soil WRW PRGs, risk from residual contaminants is within the normally acceptable remedy risk range of 10^{-6} to 10^{-4}
- Other than arsenic, only one sample in OLF localized instability area exceeded WRW PRGs
  - Aroclor 1254 at OLFS-02 in 2 to 7 feet below ground surface (1,930 µg/kg vs. 1,349 µg/kg)

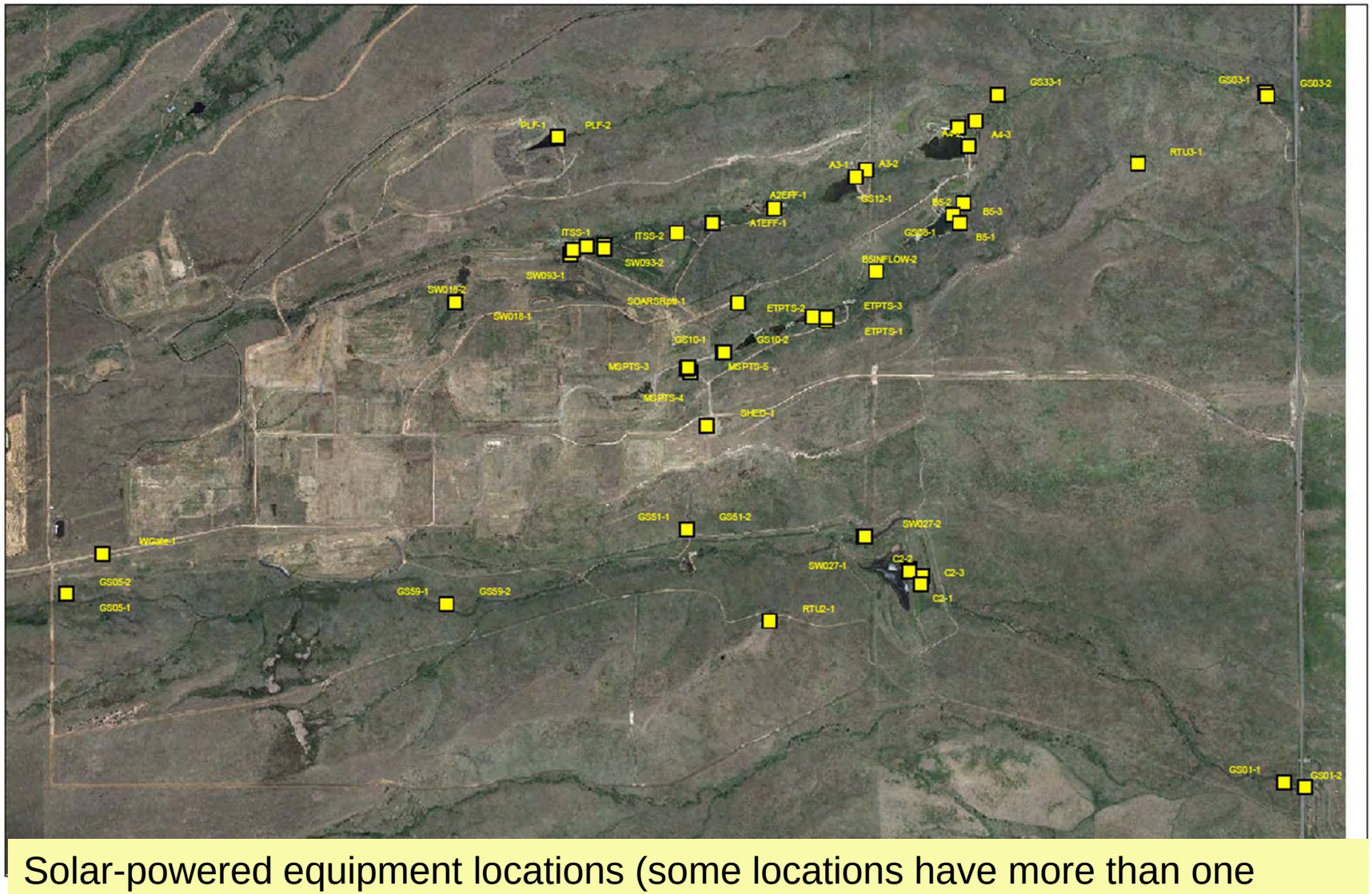
Site Operations - PLF

Present Landfill – Inspections and Surveys

- Four quarterly inspections were completed in 2010
- The fourth quarter inspection was completed on November 23
- The settlement monument surveys were completed in December 2010

Rocky Flats – Off the Grid

- 60 photovoltaic solar power units generate more than 13 kilowatts
- 12-volt, 24-volt, 48-volt, and 36-48 varied-voltage systems



Solar-powered equipment locations (some locations have more than one piece of photovoltaic solar energy-generating equipment).

Questions?