Title: Annual Summary Report for the Los Alamos National Laboratory Technical Area 54, Area G Disposal Facility Fiscal Year 2017

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Annual Summary Report for the Los Alamos National Laboratory Technical Area 54, Area G Disposal Facility Fiscal Year 2017

Presented By: Pete Maggiore, LANL Member

Los Alamos Field Office

MAY 2018 LFRG BUSINESS MEETING

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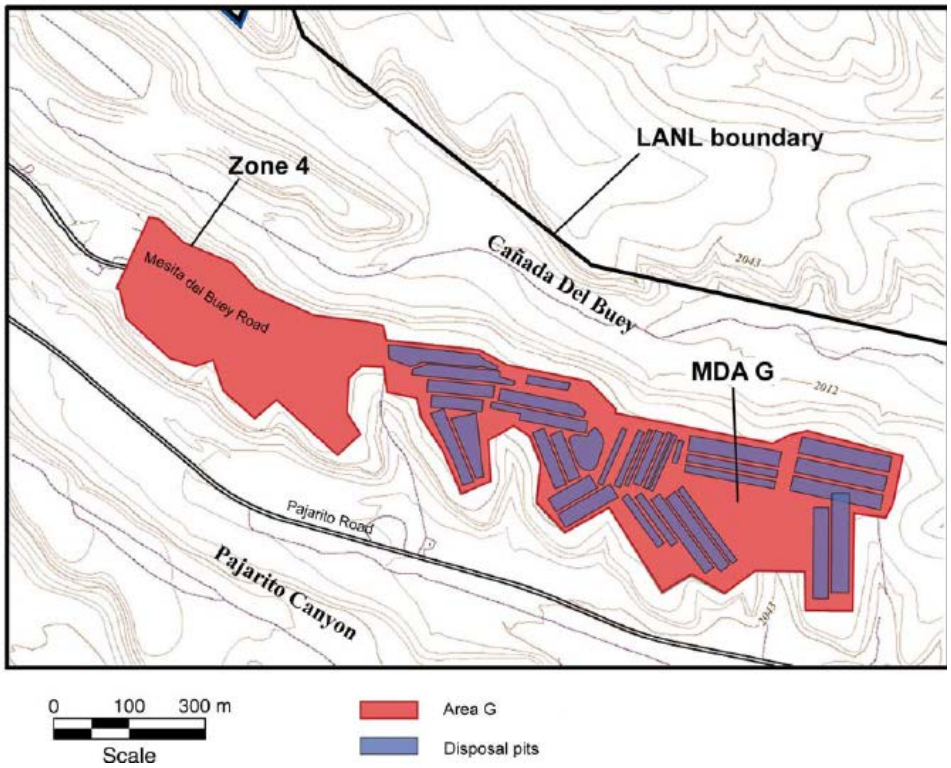
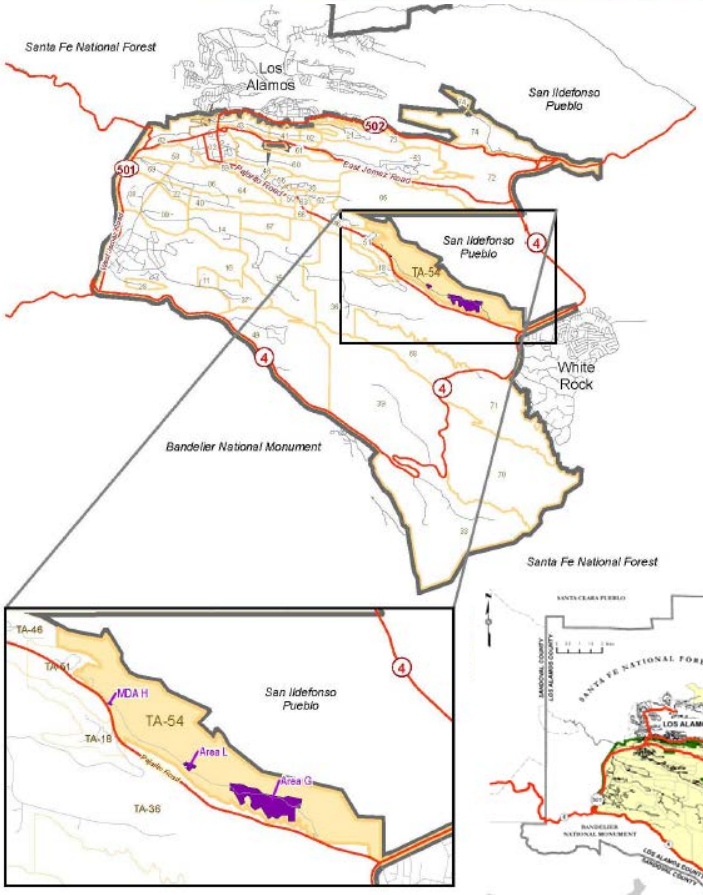
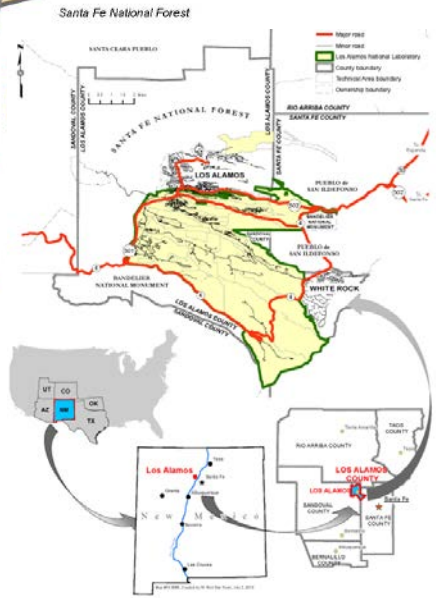
Topic 2: Overview of Site







Topic 2: Overview of Site

- **Contract change from NNSA ownership to DOE-EM ownership is happening now (May 2018)**
- **New contractor transfer of responsibility in progress**
- **Collaboration will be necessary to ensure the PA/CA combined model is used for all dose calculations**

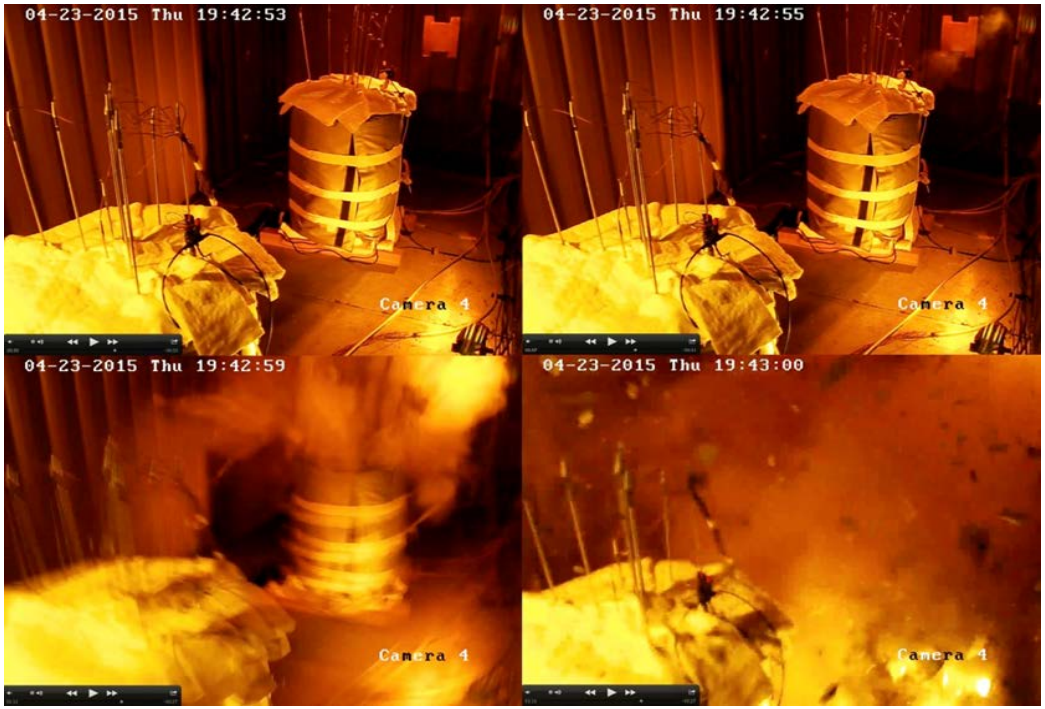
Topic 2: Overview of Site

- Disposal operations at the facility have used approximately 65 ac of the 100-ac site
- Remaining Pit 38x volume of approximately 2000 m^3 and seven shafts are currently open.

Aboveground View and Underground Disposal Units at MDA G

Topic 2: Overview of Site

- Completed RNS waste drum treatment.



Topic 3-4: Changes Potentially Affecting the PA/CA,DAS, or RWMB

Summary of UDQE's and R&D work:

A) Two SA's completed in FY17 : two in draft form

B) Open UDQE's. Dome 224, Pit 25.

C) Following changes to inventory and assumptions based on LANL enduring waste management strategy (2017).

D) To ensure a clean break during the contract change, this years ASR assumes no additional waste after 9/30/2017.

E) Expansion Zone 4 has been removed from the projected inventory.

F) The site closure date has been modified from 2044 to 2035.

G) R&D – Erosion to 10,000 yrs. Cliff retreat. Focused groundwater flow in Pit 38x.

Topic 3-4: Changes Potentially Affecting the PA/CA,DAS, or RWMB

Two Special Analyses completed in 2017: 2 DRAFTS

1. Potential underreporting of Am-241 inventory for nitrate salt waste
– The nitrate salt waste was generated through liquid evaporation from 70 to 80
– The SA determined that no waste in MDA fits the profile of the underreported waste
– No action is needed for buried LLW at G

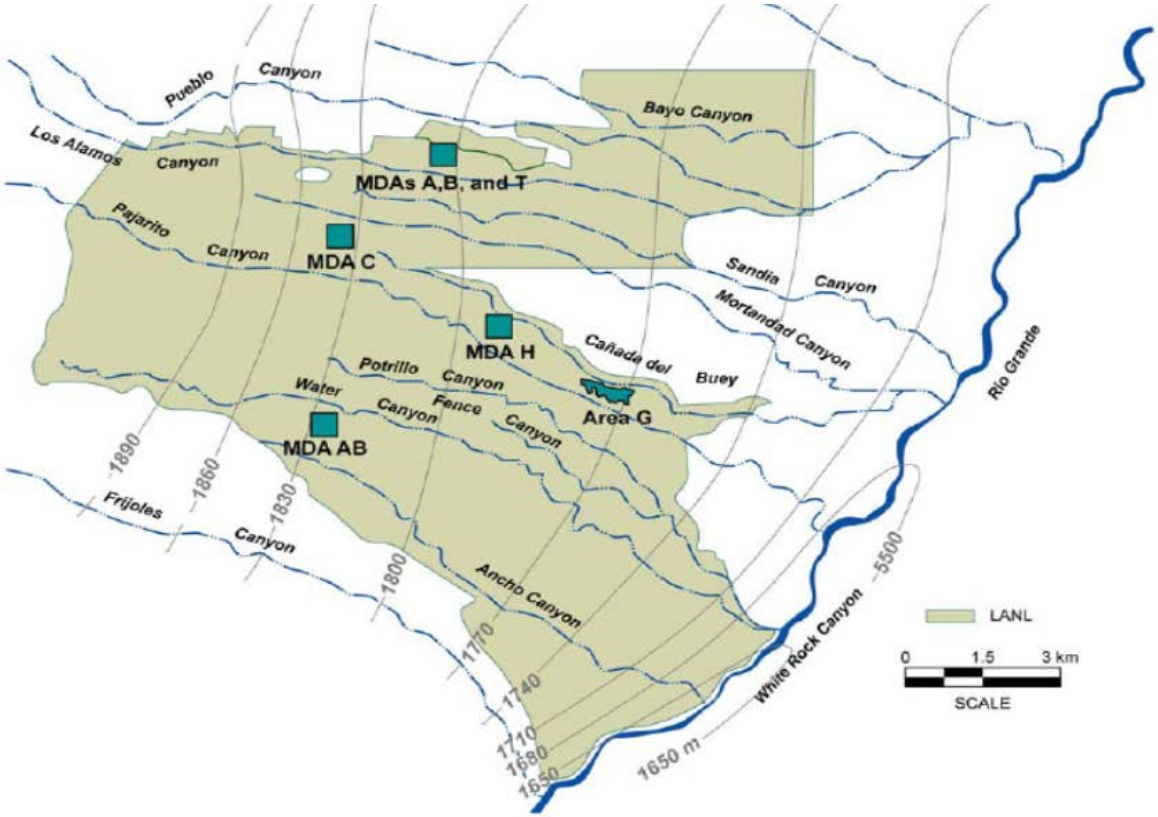
2. Fort St. Vrain drum disposal
– SA concluded that these drums could be safely disposed of in Pit 38x
– Inventory has been added to the PA/CA
– Saved LANL an estimated 7.5M$

3. DRAFT Pit 25 unconventional cover erosion and enhanced infiltration
– Three biointrusion covers differ from the PA/CA assumed operational covers
– Enhanced infiltration into the underlying waste was analyzed
– The SA recommends a corrective action, such as grading and additional cover material, to slow erosion and infiltration through the waste

4. DRAFT Dome 224 removal will eventually require moisture sampling

Topic 3-4: Changes Potentially Affecting the PA/CA,DAS, or RWMB

- **Composite Analysis Update: Alternate Source Evaluation**
  - Included MDAs A, AB, B, C, H, J, L, and T; Cañada del Buey; and Pajarito Canyon;
  - Releases from the alternate sources unlikely increase the exposures estimated for releases from Area G significantly.



Topic 5: Table from Chapter 9.2.2

Table 2-1 Potential Changes Affecting the PA, CA, DAS or RWMB

Disposal Facility or Unit	UDQE number or reason for change	Change, Discovery, Proposed Action, New Information description	Evaluation Results	Special Analysis number (if applicable)	PA,CA,DAS or RWMB Impacts
R&D on Pit 38 infiltration from excess water	Observations of Pit 38 spraying and run-off/ponding initiated this R&D effort	Excess water in Pit 38 drives increased flow rates toward groundwater	New residence time distribution flowpaths capture this process. Dose remains below 4 mrem/yr at 1000 yrs.	N/A	Impacts the PA/CA by increasing the projected dose of 14C .

Topic 5: Table from Chapter 9.2.2

Table 2-1 Potential Changes Affecting the PA, CA, DAS or RWMB

R&D on erosion to 10,000 yrs	Part of ongoing R&D work suggested by DOE/LFRG	We were guided to examine how erosion behaves to 10,000 yrs.	Erosion to 10,000 years does not expose waste using current assumptions	N/A	No impact on PA/CA because of the current 1000 yr analysis limit
R&D on cliff retreat	Part of ongoing R&D work suggested by DOE/LFRG	New data on isotopic signals from boulder faces	New analysis suggests cliff retreat is relatively slow	N/A	No impact on PA/CA
Expansion Zone 4	Change in disposal assumption	Planning for expansion of LLW disposal in TA-54 Zone 4 has been terminated	Lower dose predictions, especially in reaches only accessed by Zone 4, where dose goes to zero.	N/A	Impacts the PA/CA, RWMB, and DAS

Topic 5: Table from Chapter 9.2.2

Table 2-1 Potential Changes Affecting the PA, CA, DAS or RWMB

All of MDA G	Change in disposal assumption	Site closure will move from 2044 to 2035.	Slightly higher dose predictions for tritium	N/A	Impacts the PA/CA, RWMB, and DAS
All of MDA G	Change in disposal assumption	No new waste will be disposed of at MDA G after September 30, 2017.	Lower dose predictions.	N/A	Impacts the PA/CA, RWMB, and DAS
All of MDA G	UDQE_SA_16_001	Potential under-reporting of AM-241	No under-reporting was found	UDQE_SA_16_001	No impact on PA/CA, RWMB, or DAS
Pit 38	UDQE_SA_17_001	Disposal of Ft. St. Vrain reactor waste in Pit 38.	No impact to the site was found.	UDQE_SA_17_001	Little impact to the PA/CA

Topic 5: Table from Chapter 9.2.2

Table 2-1 Potential Changes Affecting the PA, CA, DAS or RWMB

Pit 25	UDQE_16_002 DRAFT	Discovery of a test cover containing	No immediate impact to dose was found.	UDQE_SA_16_ 002	No impact on PA/CA.
Dome 224	UDQE_16_005 DRAFT	Plans to remove this dome initiated research into a plan to sample for increased water	Plans are on HOLD for now because Dome 224 houses tritium waste forms that are too dangerous to move.	N/A	No impact on PA/CA, RWMB, or DAS

Topic 5: Table from Chapter 9.2.2

Table 2-1 Potential Changes Affecting the PA, CA, DAS or RWMB

Pit 38	UDQE proposed but never assigned	Calculations for proposed tritium canister disposal in Pit 38		N/A	No impact on PA/CA, RWMB, or DAS
Fix Goldsim Gas Diffusion	N/A	Fixed –ve sign on temperature dependent Henry's Law	Changed gas doses slightly	N/A	Minimal impact to dose from gasses
Organic C-14	N/A	Fixed model issue to account for organic C-14	Recovered to original model intent		Minimal change to dose

Topic 6: Cumulative effects of change

Table 3-1
Exposures for Members of the Public: FY2017 ASR vs. FY 2016 ASR

Exposure Scenario and Location	Perform Objective (mrem/yr)	Peak Mean Dose (mrem/yr)					
		Performance Assessment			Composite Analysis		
		FY 2017 ASR Results	FY 2016* ASR Results	Change in Dose Projection (%)	FY 2017 ASR Results	FY 2016* ASR Results	Change in Dose Projection (%)
Atmospheric							
LANL Boundary	10	1.5E–01	1.7E–01	-12	2.3E–01	2.4E–01	-4
Area G Fence Line	10	1.7E-03	2.7E–03	-37	5.1E–01	5.1E–01	0
All Pathways–Canyon							
Catchment CdB1	25/30[a]	4.8E–01	5.0E–01	-4	7.8E–01	8.1E–01	-4
Catchment CdB2	25/30	9.6E-01	1.0E+00	-4	1.7E+00	1.8E+00	-3
Catchment PC0	25/30	0	2.5E-04	-100	0	2.5E-04	-100
Catchment PC1	25/30	2.2E–02	2.4E–02	-7	1.45E–01	1.2E–01	+21
Catchment PC2	25/30	1.7E–02	1.9E–02	-11	8.0E–01	6.5E–01	+23
Catchment PC3	25/30	1.2E–01	1.2E–01	0	2.9E–01	2.4E–01	+21
Catchment PC4	25/30	2.2E–01	2.2E–01	0	2.7E–01	2.7E–01	0
Catchment PC5	25/30	3.0E–01	3.0E–01	0	2.4E+00	2.4E+00	0
Catchment PC6	25/30	1.6E–01	1.6E–01	0	2.8E+00	2.8E+00	0
Groundwater Pathway Scenarios							
All Pathways–Groundwater	25/30	6.6E-03	7.1E–03	-7	6.3E-03	6.8E–03	-7
Groundwater Resource Protection	4	1.1E-02	1.2E–02	-8	NA	NA	NA

Topic 6: Cumulative effects of change

Table 3-2

Projected Radon Fluxes: FY2017 ASR vs. FY 2016 ASR

Waste Disposal Region or Pit	Peak Mean Flux (pCi/m^2/s)		
	FY 2017 ASR Results	FY 2016* ASR Results	Peak Mean Flux % difference
Region 1	1.1E-06	1.1E-06	0
Region 2	---[a]	---[b]	---[b]
Region 3	0.0E+00	0.0E+00	0
Region 4	2.6E-02	2.6E-02	0
Region 5	8.1E-05	8.2E-05	-1
Region 6	2.8E-03	2.8E-03	0
Region 7	1.3E+01	1.3E+01	0
Region 8 (i.e. .Zone 4)	0	1.8E-03	-100
Pit 15	1.4E+01	1.4E+01	0
Pit 37	2.7E-01	2.7E-01	0
Pit 38	3.8E-01	1.1E+00	-65
Entire Facility	3.8E-01	4.2E-01	-10

Topic 6: Cumulative effects of change

Table 3-3

Projected Intruder Exposures: FY2017 ASR vs. FY 2016 ASR

Disposal Units and Exposure Scenario	Performance Objective	Peak Mean Dose (mrem/yr)		Change in Dose Projection (%)
		FY 2017 ASR Results	FY 2016* ASR Results	
MDA G Pits				
Intruder-Construction	500 mrem	3.6E+00	3.9E+00	-8
Intruder-Agriculture	100 mrem/yr	2.5E+01	2.7E+01	-7
Intruder-Post-Drilling	100 mrem/yr	1.2E+01	1.2E+01	0
MDA G Shafts				
Intruder-Construction	500 mrem	4.7E+00	4.8E+00	-2
Intruder-Agriculture	100 mrem/yr	8.7E+01	8.3 E+01	+5
Intruder-Post-Drilling	100 mrem/yr	1.3E+01	1.1E+01	+18
Zone 4 Shafts				
Intruder-Construction	500 mrem	0.0E+00	3.7E+00	-100
Intruder-Agriculture	100 mrem/yr	0.0E+00	8.6E+01	-100
Intruder-Post_Drilling	100 mrem/yr	0.0E+00	1.1E+01	-100

Topic 7: Disposal Receipt Review

- **Disposal Receipt Review:**
  - **1 Pit (38x) and Seven shafts remain open**

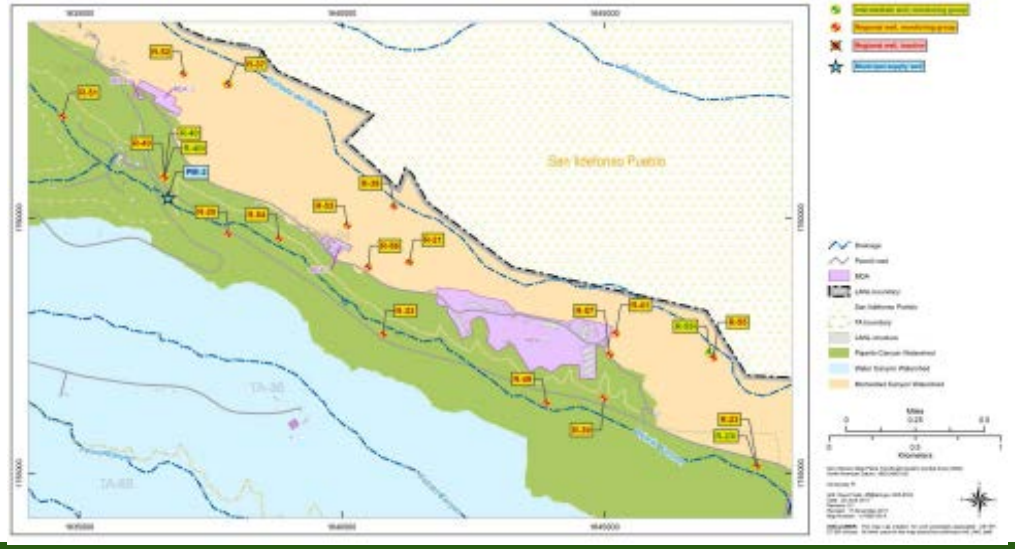
Pit/Shaft Number	Operational Period	Length/Width/Height (Pit) or Diameter/Depth (m)	Liner	Volume (m^3)	Waste Volume (m^3)
Pit-38x	2013-present	93/18/13	Unlined	12000	~10000
Shaft-159	1989-present	0.61/14	Corrugated metal pipe, asphalt covered	4.	0.32
Shaft-165	2004-present	0.91/18	Corrugated metal pipe, asphalt covered	12.	3.1
Shaft-169	2004-present	0.91/18	Corrugated metal pipe	12.	1.7
Shaft-170	2004-present	0.91/18	Corrugated metal pipe	12.	2.3
Shaft-300	2004-present	2.4/6.7	Corrugated metal pipe	31.	0.81
Shaft-301	2004-present	2.4/6.7	Corrugated metal pipe	31.	2.5
Shaft-370	1999-present	4.9/18.	Unlined	340.	19.

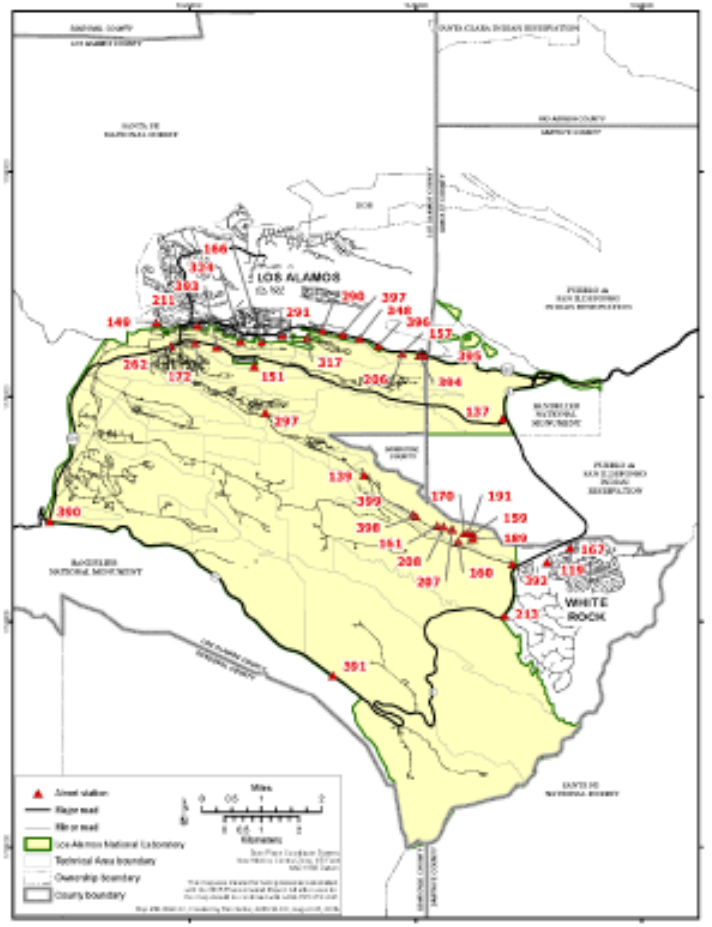
Topic 7: Disposal Receipt Review

- **Disposal Receipt Review:**
  - **Disposal records in FY 2017 show less waste was disposed than previous projections;**
  - **The expected disposal trends do not compromise the ability of the disposal facility to safely contain the waste disposed;**
  - **All doses and radon fluxes projected by the PA and CA remained within performance objectives.**

Topic 8: Monitoring

- **Monitoring**
  - Environmental Surveillance: Ambient Air Sampling Meteorological Monitoring Surface water Monitoring Groundwater Monitoring. 0.025 mrem/yr max dose (tritium in White Rock)
  - Subsurface Moisture Monitoring
  - The history of data is not long enough to validate the PA/CA forecasts



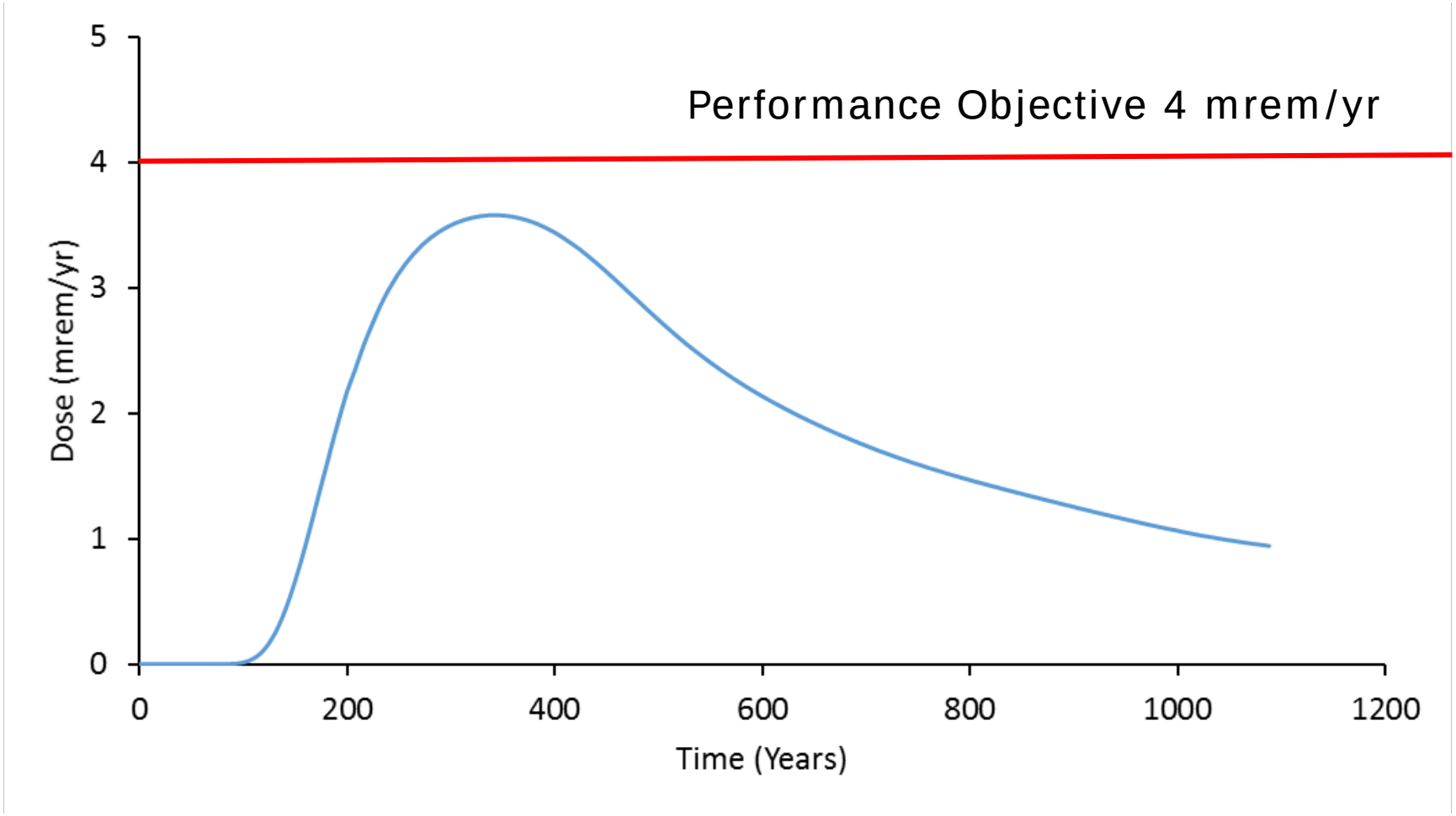


Topic 9: Research and Development

- **Research and Development - Groundwater Modeling:**
  - Validated the model by comparison to moisture monitoring data following the 13” rainfall in September 2013
  - Carbon-14 drives the groundwater dose based on the simulations
  - Preliminary data indicate that inclusions of the 1000 yr-return rainfall water led to a significant change in the predicted dose for both the All Pathways and Groundwater Protection scenarios
  - Future work will include less conservative assumptions
  - Report on R&D:

“Groundwater Modeling and Predictions of C-14 Transport from Pit 38 at Material Disposal Area G” LA-UR-18-23491

Topic 9: Research and Development



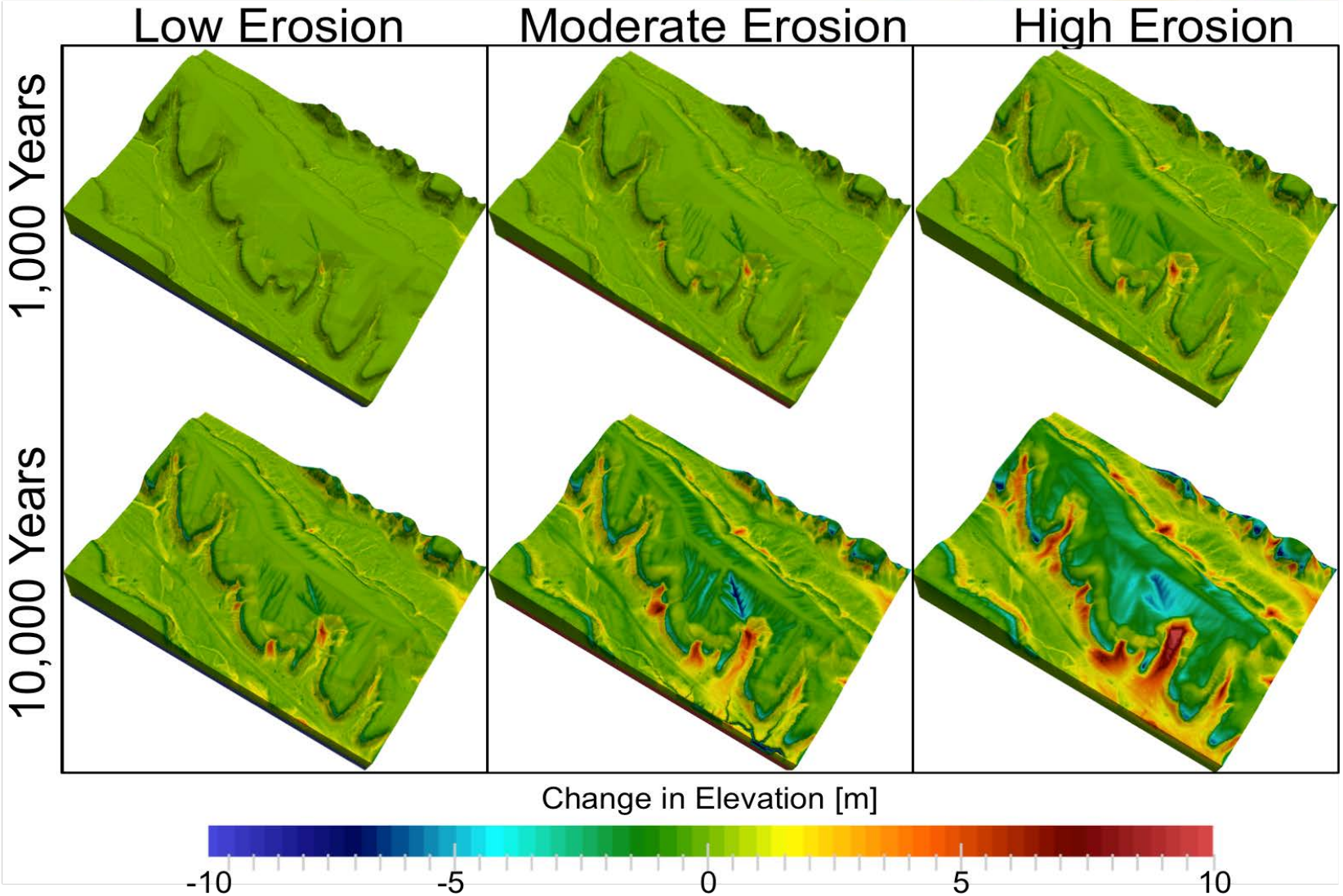
Conservative ^{14}C Dose projections over 1,000 years for groundwater pathways computed with the CA model.

Topic 9: Research and Development

- **Research and Development – Erosion to 10,000 yrs:**
  - Uncertainty in erosion parameters
  - Cover appears to perform well given assumptions
  - Next steps are to include long term erosion in the PA/CA dose calculations
  - Assumptions of the erosion modeling could use more investigation
  - Report on R&D:

"Updated Erosion Analysis for Material Disposal Area G, Technical Area 54, Los Alamos National Laboratory" LA-UR-18-23419

Topic 9: Research and Development



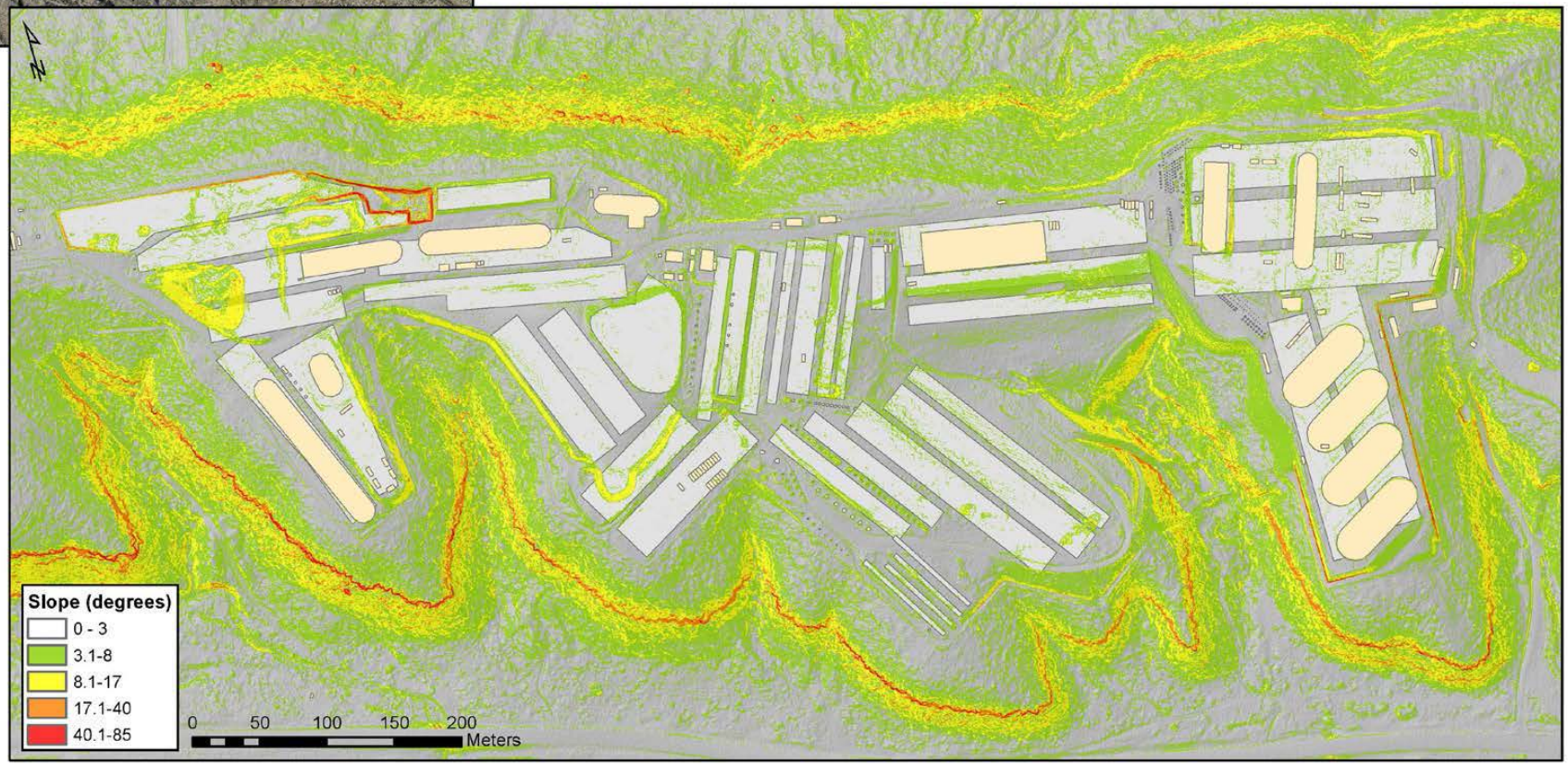
Topic 9: Research and Development

- **Research and Development - Cliff Retreat:**
  - Characterized the mechanism and rates of cliff retreat along the edges of Area G using data gathered from the 2014 photo-documentation campaign.
  - Cosmogenic dating analysis is ongoing, which will provide insight into the long-term stability of the cliffs, and the timeframe of the cliffs in their current geometry
  - Future work: statistical analyses to determine the rate and distribution patterns and incorporate the data into the erosion model to evaluate potential impacts on long-term performance
  - Report on R&D:

Cliff Retreat Characterization at Technical Area 54, Los Alamos National Laboratory, Los Alamos, NM

LA-UR-18-xxxx

Slope angles surrounding MDA G. Green represents shallow-dipping slopes; red indicates steeper slopes (>23°).



Topic 9: Research and Development

Reference	Method	Erosion Rate per 10,000 years
Purtymun and Kennedy (1971)	Not specified	140 cm
Poths and Goff (1990)	He and Ne cosmogenic dating	18 cm (densely welded units) 28 cm (less densely welded units)
Albrecht et al. (1993)	Be and Al cosmogenic dating	1 cm (densely welded units) 11 cm (less densely welded units)
This study	C-14 cosmogenic dating	145.5 cm (densely welded units, median value) Range of 27.6 to 347.7 cm (densely welded units)
This study	Average canyon widening measurements	1.95 m

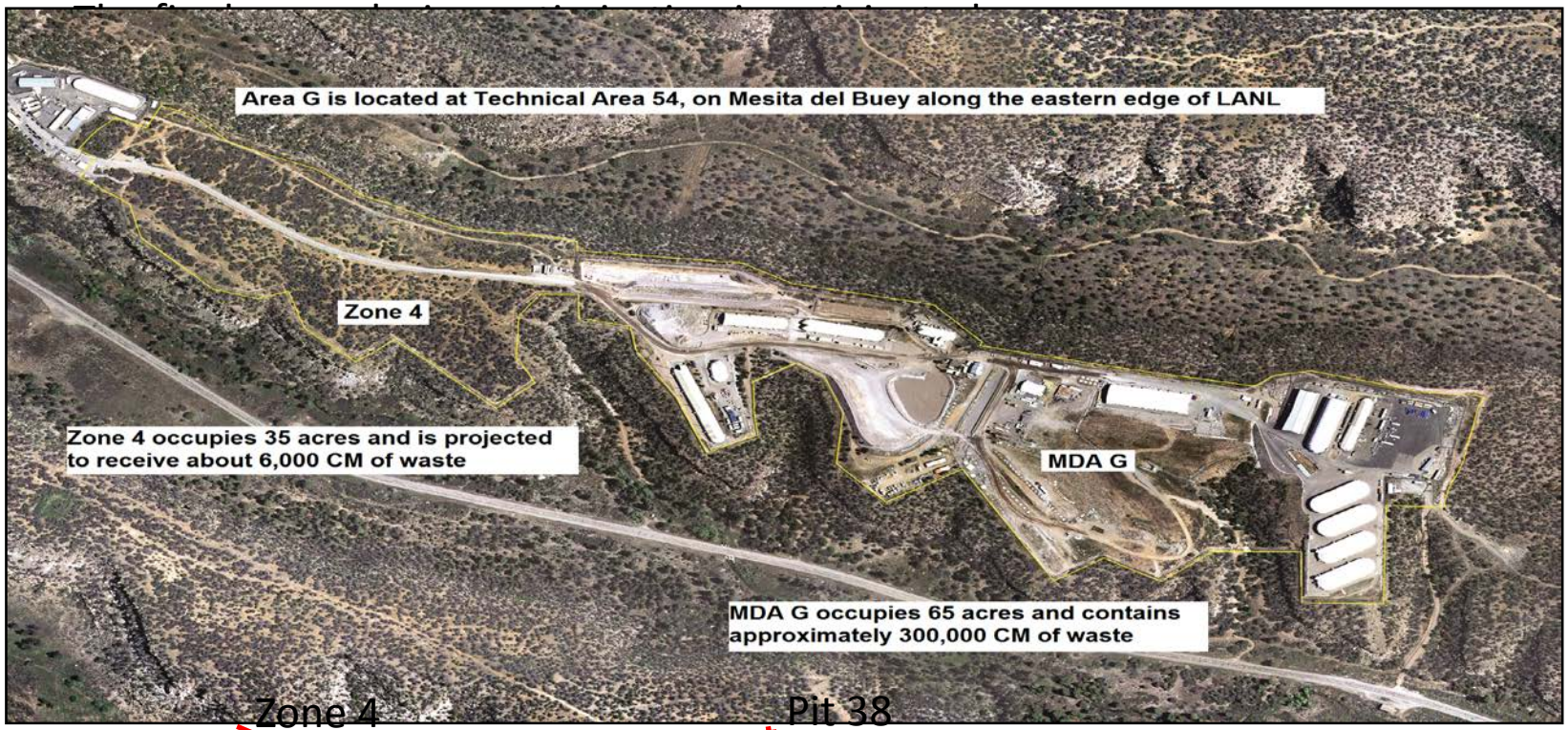
Comparison of erosion rates per 10,000 years for various dating techniques.

Topic 10: Planned or Contemplated Changes

- **No changes to the Monitoring Plan, Maintenance Plan, Land Use Plan**
- **Implemented updated processes, systems, and procedures for operations**
  - **Waste characterization and documentation**
  - **Waste certification and verification**
  - **Waste packaging and transportation**
- **WAC was modified in March 2018. Language added to ASR to ensure that WAC changes are captured**
- **New PA/CA assumptions**
  - **No waste added after Sept. 30, 2018**
  - **No expansion into Zone 4**
  - **Closure in 2035 changed from 2044**

Topic 10: Planned or Contemplated Changes

– Pit 38 and existing shafts may be reserved for disposal of specific wastes that are difficult to transport off site. New PA/CA calculations will be required for any new inventory



Issue 11: Status of DAS Conditions, Key and Secondary Issues

- Progress was made for several secondary issues identified by the LFRG; none of them were fully resolved and closed in FY 2016
- The increase in off-site shipments and the cessation of pit disposal will lead to significantly less disposed waste than the previous PA/CA forecasts
- The assumptions and conclusions of the 2009 approved PA/CA remain valid at present : Groundwater fast path remains below 4 mrem/yr
- All conditions for continued disposal of LLW at Area G are met

LLW Disposal Operations in Pit

LLW Disposal Operations in Shaft

Issue 12: Certification of the Continued Adequacy of the PA, CA, DAS, and RWMB

- No Current Need for DAS/PA/CA/SA review
- Focused groundwater dose has changed significantly and a new SA will determine if this needs LFRG input
- Need for HQ assistance/guidance