

United States Environmental Protection Agency (USEPA)

Radiological Background Study for Santa Susana Field Laboratory (SSFL)

SSFL Workgroup Meeting

September 8, 2011

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Agenda

1. Purpose of the study
2. How the study was designed and conducted
3. Use of statistical evaluation to determine Background Threshold Values(BTVs)
4. Summary of BTVs for key radionuclides
5. Management decisions impacting future clean up decisions
6. Background study results and analytical detection limits be used to develop DTSC Look-Up table



Why EPA did the Radiological Background Study

- ▣ In 2008 Congress directed DOE and EPA to complete a comprehensive radiological study at Area IV of SSFL
- ▣ In 2008 and 2009 DOE gave EPA funding to complete the radiological study independently
- ▣ The radiological background study is a key part of the comprehensive on-site study as the results from on-site soil sampling will be compared to background soil results to determine what should be cleaned up



Radiological Background Study Objectives

- ▣ The purpose of the Background Study is to determine the level of “ambient or background” radioactivity found in soil
- ▣ The Background Study Report will be used in part to assist the State of CA in developing Clean-Up Values for the Look-Up Table as required by the Administrative Order on Consent (AOC). DOE, NASA and DTSC are parties to this AOC



Background Locations Evaluation and Selection

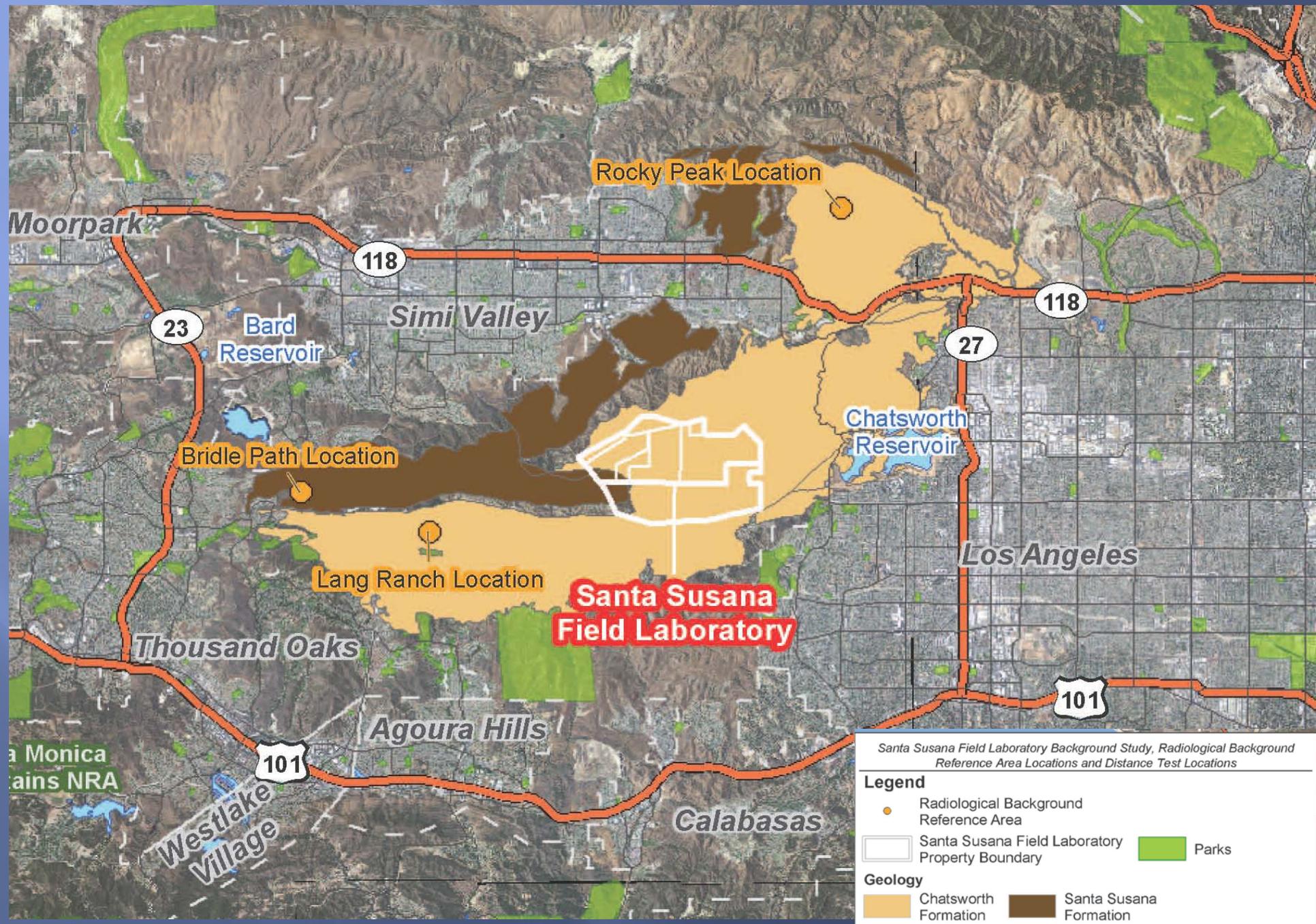
- ❑ Conducted with considerable assistance from community members
- ❑ Initially, over 200 locations in seven general areas were identified and considered
- ❑ Eleven locations were evaluated
- ❑ Three locations were selected for background sampling
- ❑ These areas are referred to as Radiological Background Reference Areas (RBRAs)



Radiological Background Reference Areas (RBRAs)

- ▣ Three locations were chosen for background sampling
- ▣ Two in the Chatsworth Formation and one in the Santa Susana Formation (Same geologic formations found at the SSFL)
- ▣ Conducted surface soil sampling, subsurface soil sampling, and gamma scanning at each location





Santa Susana Field Laboratory Background Study, Radiological Background Reference Area Locations and Distance Test Locations

Legend

- Radiological Background Reference Area
- Santa Susana Field Laboratory Property Boundary
- Parks

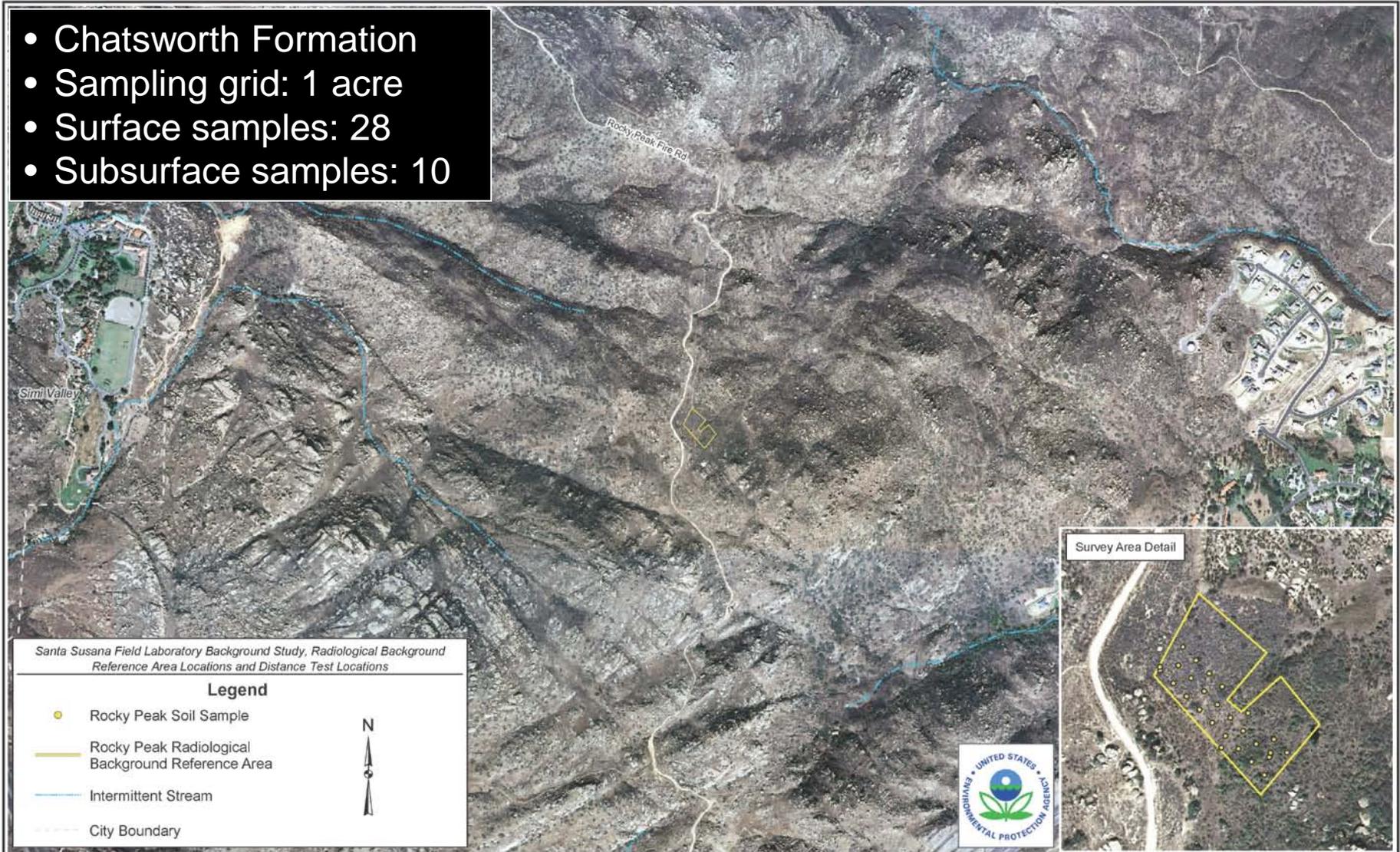
Geology

- Chatsworth Formation
- Santa Susana Formation

Rocky Peak RBRA

Rocky Peak Radiological Background Reference Area Sampling Grid

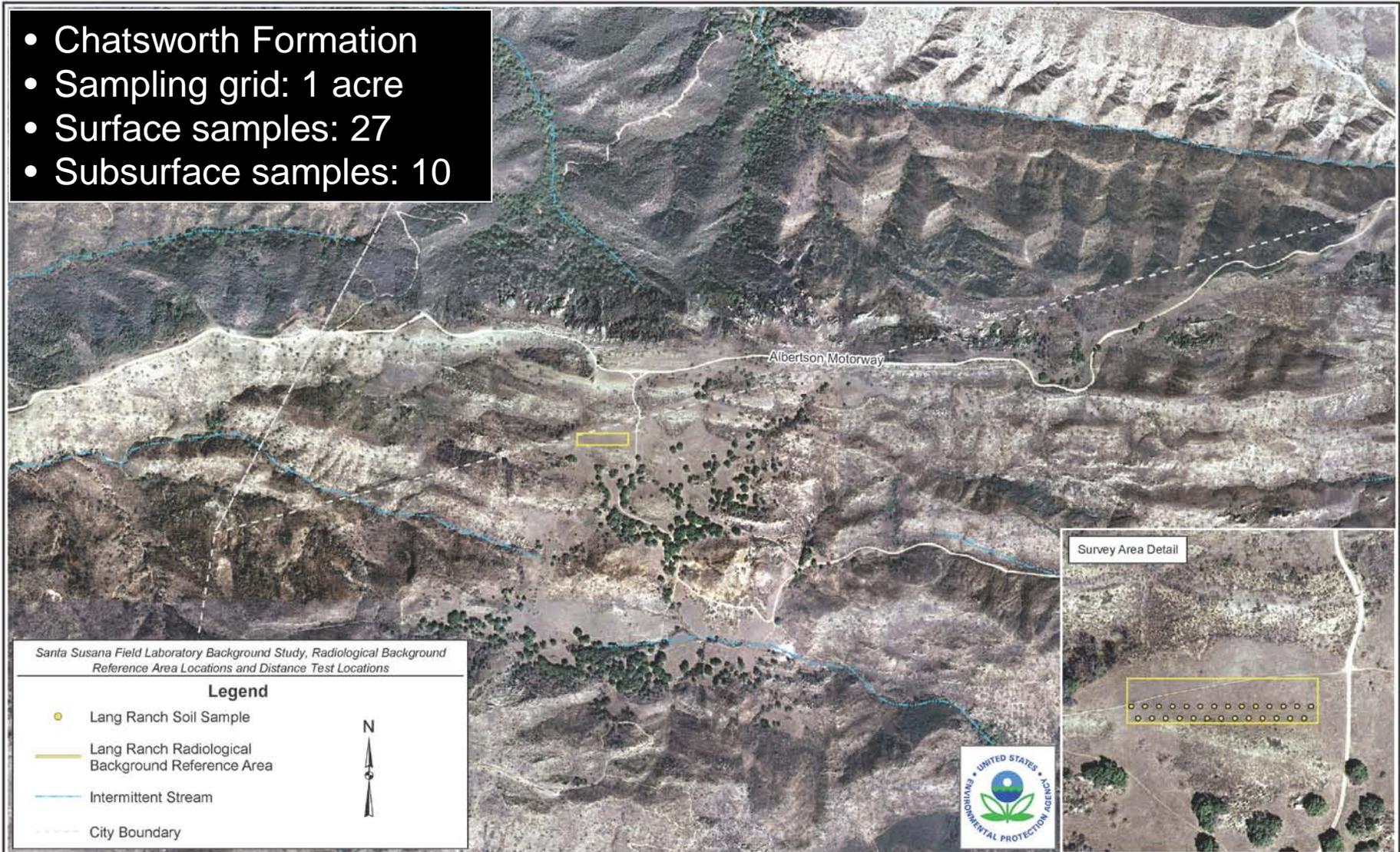
- Chatsworth Formation
- Sampling grid: 1 acre
- Surface samples: 28
- Subsurface samples: 10



Lang Ranch RBRA

Lang Ranch Radiological Background Reference Area Conceptual Sampling Grid

- Chatsworth Formation
- Sampling grid: 1 acre
- Surface samples: 27
- Subsurface samples: 10



Distance Test Locations (DTLs)

- ▣ Address concern that the three RBRAs were too close to the SSFL
- ▣ Collected 24 surface soil samples at distances at least 10 miles from the SSFL
- ▣ Compared sampling results to ensure that the three RBRAs were not contaminated by the SSFL



Radionuclides Tested

DISTANCE TEST LOCATIONS

- ▣ Cesium-137
- ▣ Cobalt-60
- ▣ Plutonium- 238
- ▣ Plutonium- 239/240
- ▣ Strontium-90

RADIOLOGICAL BACKGROUND REFERENCE AREAS

- ▣ All radionuclides at the DTLs and over 60 more



Develop Background Threshold Values (BTVs)

Comparison of RBRAs to DTLs

- ▣ Look at data distribution and identify outliers
- ▣ In order to determine if the RBRAs are representative of “Background” soils, the analytical data from the RBRAs was compared to the analytical data from the DTLs
- ▣ Since the analytical data from the RBRAs was comparable to the analytical data from the DTLs, then the RBRAs can be considered “Background Locations”



Develop BTVs

Determining if Individual Data Sets can be Merged

- There are six individual data sets
 1. **Lang Ranch**
 - Surface and subsurface
 2. **Rocky Peak**
 - Surface and subsurface
 3. **Bridle Path**
 - Surface and subsurface

- All these data sets were statistically compared to each other to determine if they are similar enough to be merged together



Background Threshold Values

- ▣ Once the applicable data sets were determined, BTVs were calculated

- ▣ Chose the best statistic to represent the BTV
 - Performed a statistical evaluation of each data set to calculate a number that represents many values
 - 95% Upper Simultaneous Limit (USL95)



Summary of Overall Radionuclide Results

- ▣ Eleven (11) radionuclides exhibited fewer than 5 detections in the background study samples
 - Due to the low number of detections, any statistical evaluation of the data of these radionuclides is suspect. A number such as the detection limit may be used in the Look-Up Table

- ▣ Fifty-three (53) radionuclides analyzed for the SSFL Background Study exhibited greater than or equal to 5 detections
 - For these 53 radionuclides, Background Table Values (BTVs) were calculated using the Upper Simultaneous Limit statistic



Summary of the Analyte Classifications from the Background Study Data

1. Radionuclides with less than 5 detections
2. Radionuclides with greater or equal to 5 detections
 - Radionuclides with one BTV from combined data
 - Radionuclides exhibiting differences Between surface soil and subsurface soil
 - Radionuclides exhibiting differences between geologic formations
 - Radionuclides exhibiting variability between RBRAs and datasets
3. Rejected Results(Total of 4)
 - Due to spectral interference

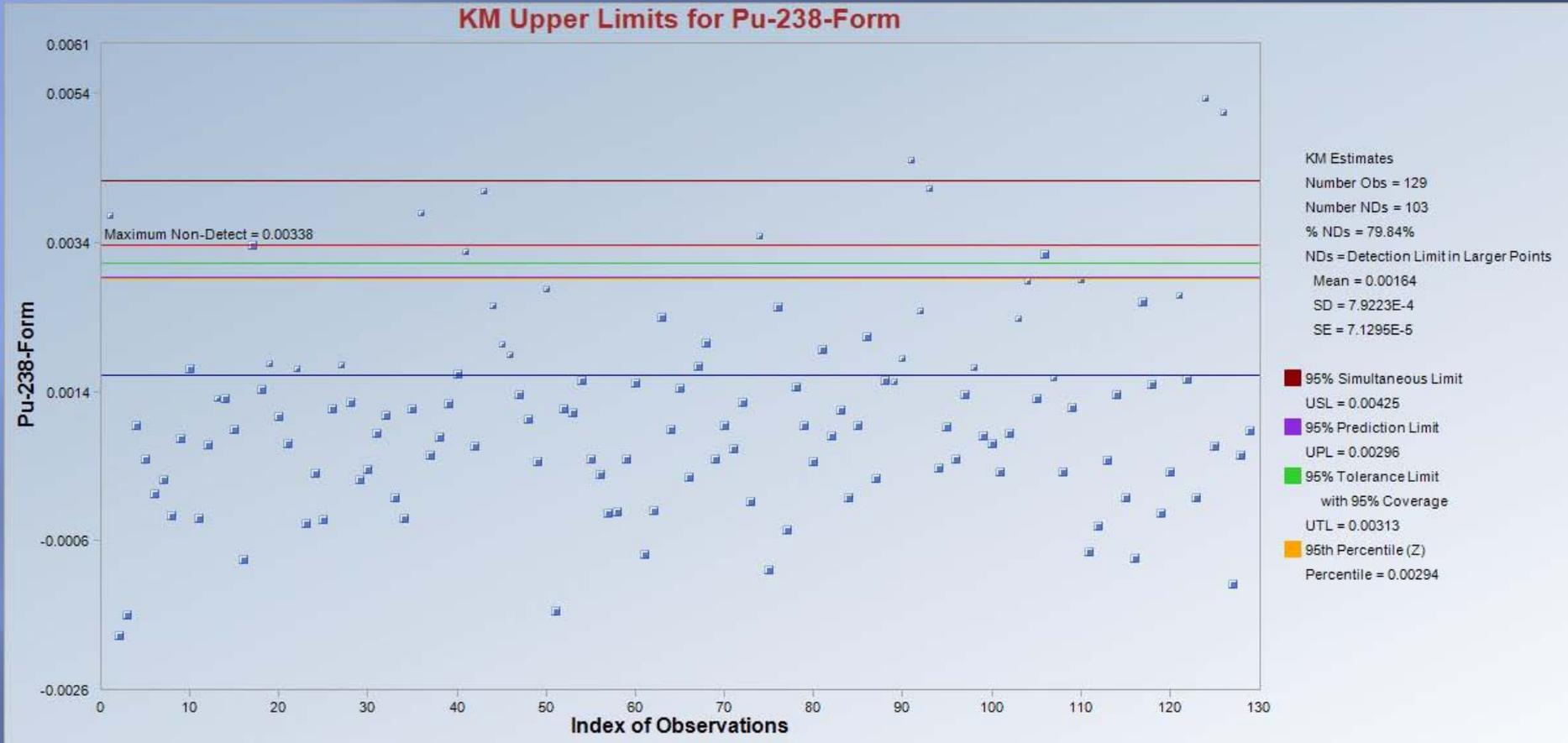


Comparison of Key Radionuclides Background Threshold Values (BTVs) to Previous Background Study Results

Analyte	BTV 1 (pCi/g)	BTV 2 (pCi/g)	Previous Background Studies Value Ranges (pCi/g)
Cesium-137	1.93E-01 (.193) (Surface soil)	8.03E-03 (.00803) (Subsurface soil)	1.5E-02 to 2.1E-01 (.015 to .21)
Plutonium-238	4.25E-03 (.00425) (All results)		3.5E-03 to 1.3E-01 (.0035 to .13)
Plutonium-239/240	1.42E-02 (.0142) (Surface soil)	2.09E-03 (.00209) (Subsurface soil)	2.5E-03 to 1.5E-02 (.0025 to .015)
Strontium-90	7.50E-02 (.075) (Surface soil)	1.31E-02 (.013) (Subsurface soil)	5.0E-03 to 1.3E-01 (.005 to .13)
Uranium-235/236	1.22E-01 (.122) (Santa Susana Formation)	1.25E-01 (.125) (Chatsworth Formation)	2.5E-03 to 1.0E-01 (.0025 to .1)

Plutonium-238

BTV Estimates for Pu-238 Activity using All Data



USL95 = 0.00425

Previous Background Values Range = 0.0035 – 0.13



Summary of Statistics from the Radiological Background Study Report

- ▣ Section 7.0 – Statistical Evaluation
- ▣ Section 8.0 – Determination of Background Threshold Values
- ▣ **Comments due: September 15, 2011**



Management Decisions for the Development of Look-Up Table Values

1. Use of the highest BTV when separate values were calculated for surface and subsurface soils
2. Use of combined BTVs when separate values were calculated for each geologic formation
3. Use of combined BTVs when separate values were calculated for each RBRA or dataset
4. Removal of some radionuclides



Schedule and Development of Look-Up Table

- ▣ The SSFL Radiological Background Study Report will be finalized after public review and after all stakeholder comments have been addressed
- ▣ EPA will consult with DTSC during the development of the Look-Up Table
- ▣ The Look-Up table will be available for public review and comment prior to finalization



Gamma Scanning Update



Gamma Scanning Current Objectives

- ❑ Currently conducting Gamma Scanning completed 100% of accessible surfaces in Area IV
- ❑ Continue Gamma Scanning using all equipment in the accessible surface areas of the Northern Buffer Zone (NBZ)
- ❑ Determine the presence of gamma radiation anomalies in surface soil



Current and New Gamma Radiation Scanning Technologies Developed for On-Site Use at SSFL

INCREASING SENSITIVITY

ERGS II

- Enhanced Radiation Ground Scanner II

DTGS

- Dual-Track Gamma Scanner

STGS

- Single-Track Gamma Scanner

WMGS

- Wheel Mounted Gamma Scanner

MMGS

- Mule Mounted Gamma Scanner

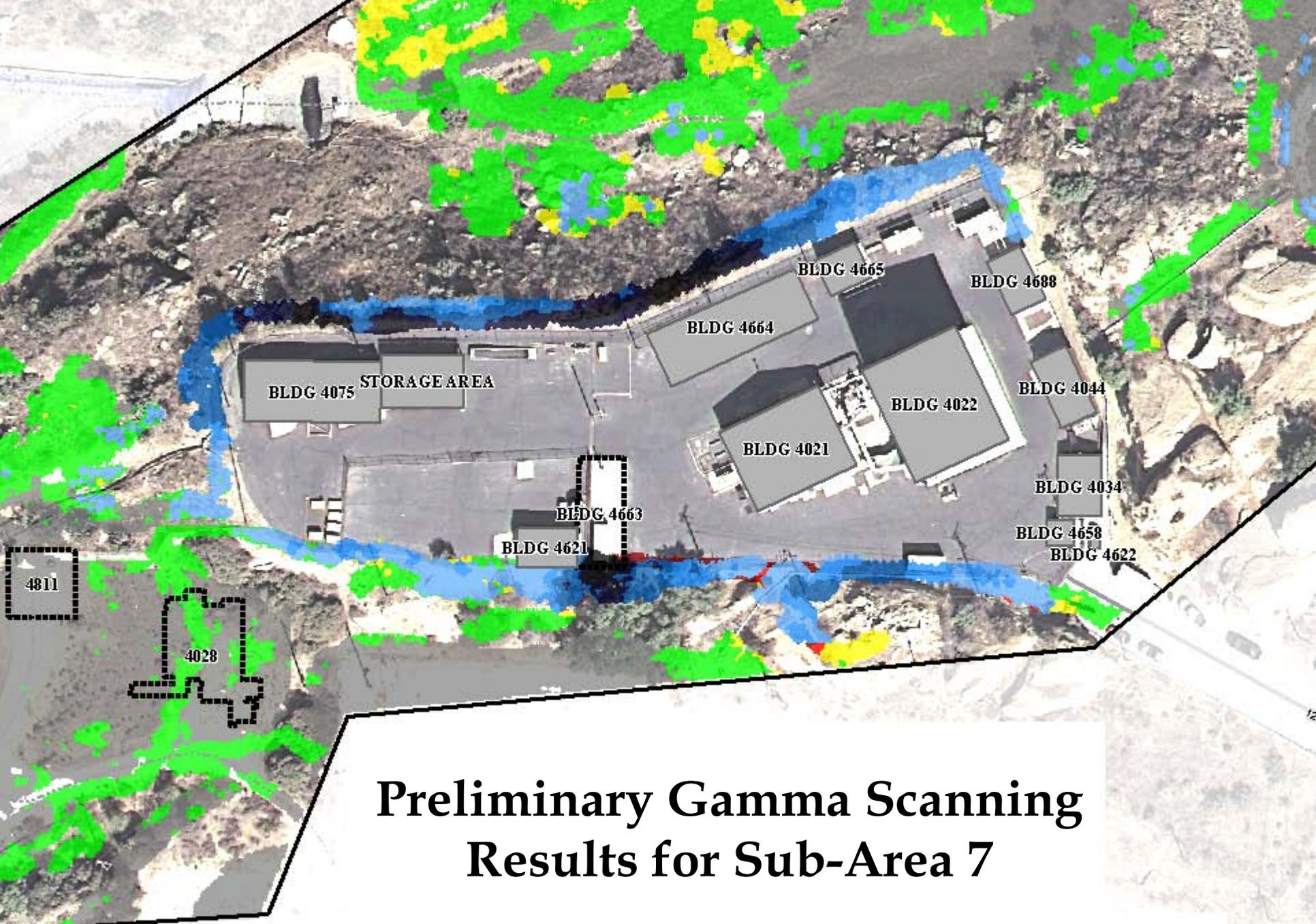
HHGS

- Hand Held Gamma Scanner



Gamma Scanning Status Updated August 29th 2011

Sub-Areas	Size (acres)	Accessible (acres)	Scanned (acres)	Percentage Complete
3	3.91	1.99	1.90	95.5%
5A	38.36	32.55	32.37	99.4%
5B	23.21	19.44	19.36	99.6%
5C	21.92	17.57	17.27	98.3%
5D-North	25.54	24.19	24.05	99.4%
5D-South	45.98	37.75	34.71	91.9%
6	57.26	43.18	42.24	97.8%
7	16.20	8.41	8.33	99.0%
8-North	35.31	21.89	21.14	96.6%
8-South	22.23	17.41	15.69	90.1%
NBZ-Priority 1	88.48	68.01	14.96	21.9%
NBZ-Priority 2	33.30	24.58	2.11	8.6%
Total	471.65	354.74	237.04	66.8%



Preliminary Gamma Scanning Results for Sub-Area 7

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