

United States Environmental Protection Agency (USEPA)

Background Study for Santa Susana Field Laboratory (SSFL)

Update

December 9, 2010



Radiological Background Study Objectives

- ▣ The purpose of the Background Study is to determine the level of “ambient or background” radioactivity found in soil.
- ▣ The results of the Background Study will be compared to radiological data collected at the SSFL to determine the extent of radiological contamination.



Project Schedule

Activity	Planned Date
Laboratory Analysis Completion	December 2010 – January 2011
Data Validation Completion	January 2011
Tech Memo	January 2011
Stakeholder Meetings	January 2011 – February 2011



Goals of Today's Meeting

1. Present Potential Statistical Approaches
 2. Present examples of 2 Radionuclides
 3. Discuss possible applications
- We are not making decisions or reaching final conclusions until all validated data are available

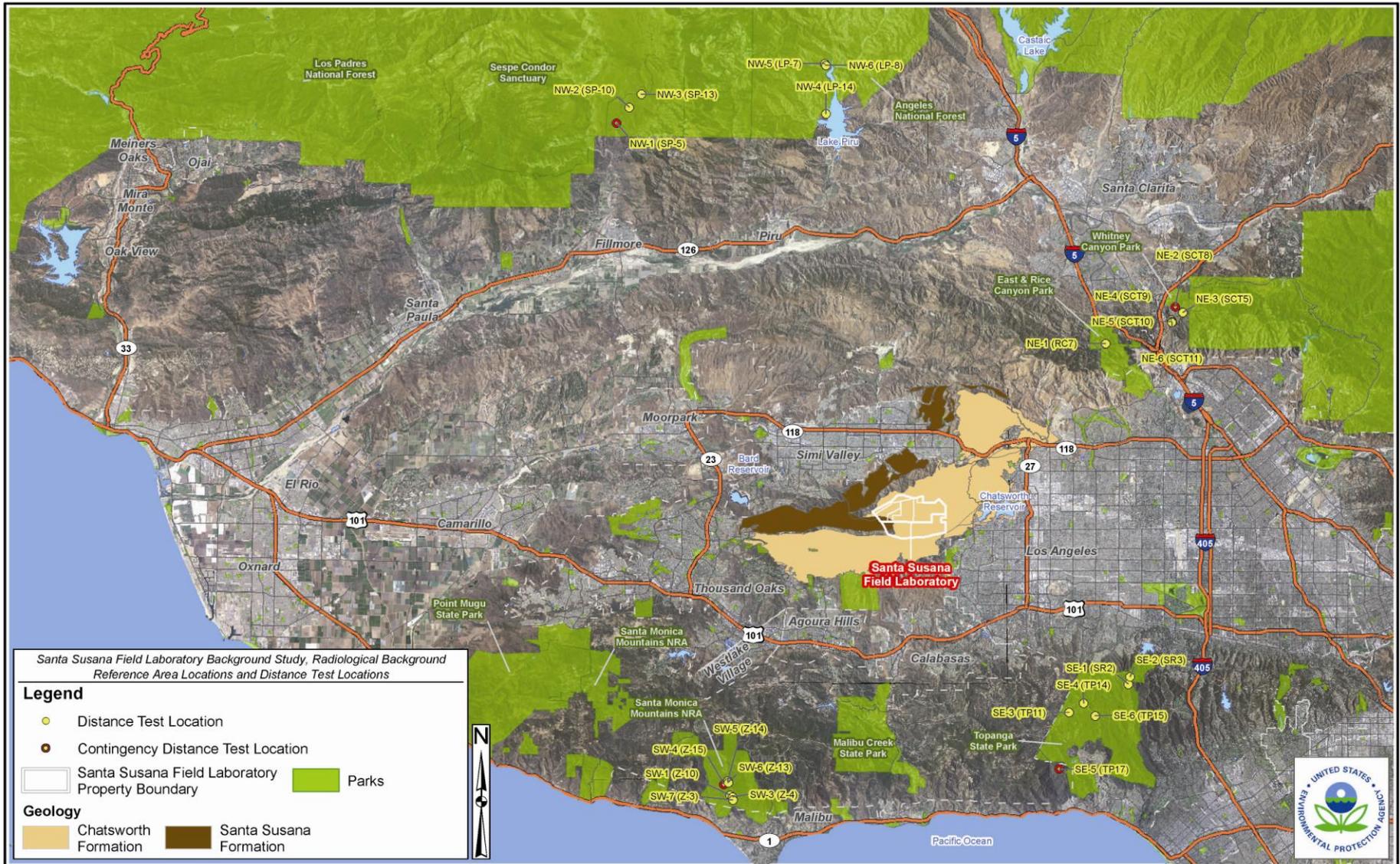


Statistical Analysis Overview

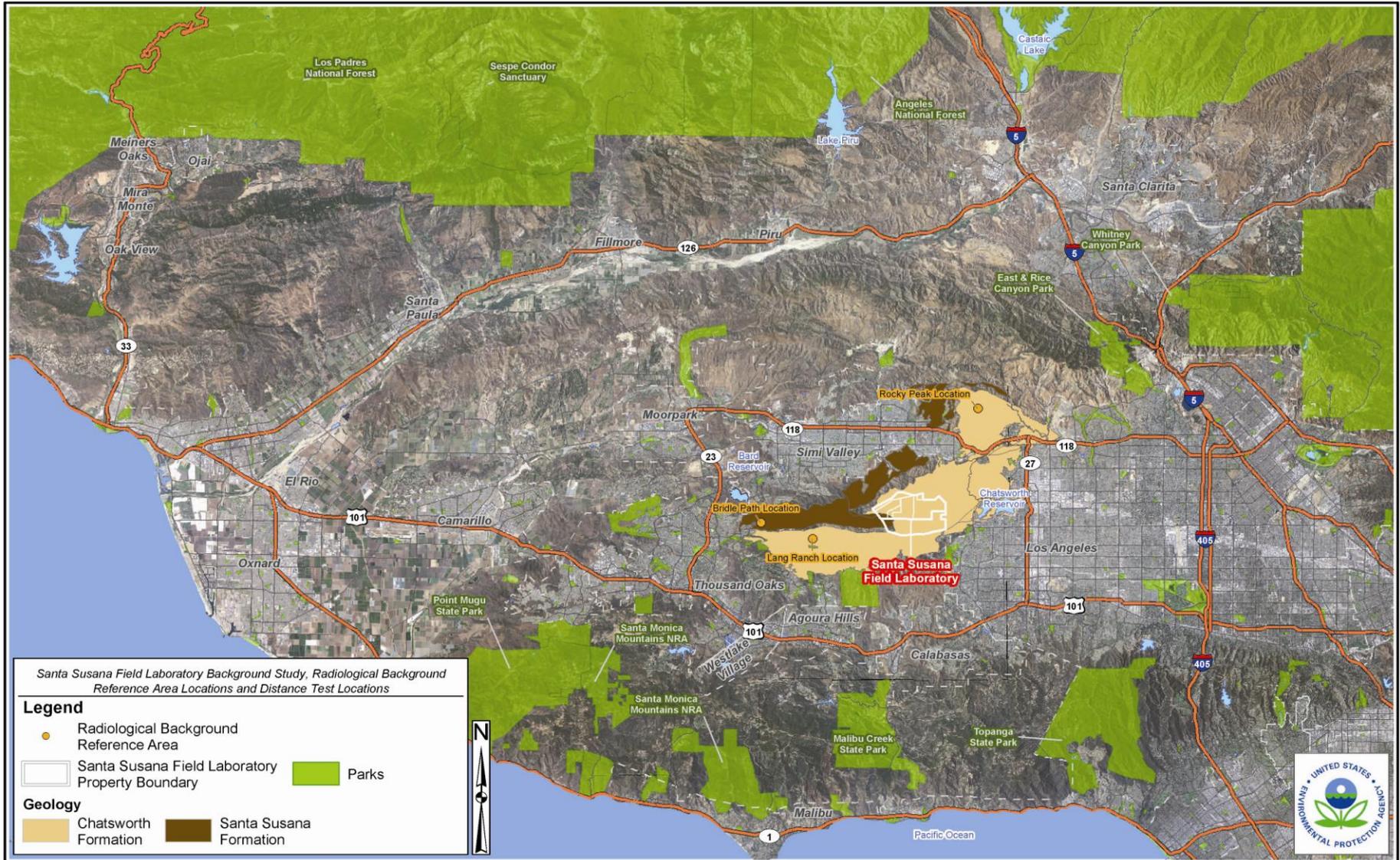
1. Comparison of Radiological Background Reference Areas (RBRAs) to Distance Test Location (DTLs)
2. Determining if Individual Data Sets can be Merged
 - Based on formation
 - Based on depth
3. Determining Background Threshold Values (BTVs)



Distance Test Locations



RBRAs



Comparison of RBRAs to DTLs

See Handout

- ▣ 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 will be compared to the analytical data from the DTLs.
- ▣ If the analytical data from the RBRAs are comparable to the analytical data from the DTLs, then the RBRAs can be considered “Background Locations”.



Determining if Individual Data Sets can be Merged

- ▣ There will be six individual data sets.
 1. **Lang Ranch**
 - Surface and subsurface
 2. **Rocky Peak**
 - Surface and subsurface
 3. **Bridal Path**
 - Surface and subsurface

- ▣ EPA will statistically compare all these data sets to each other to determine if they are similar enough to be merged together.



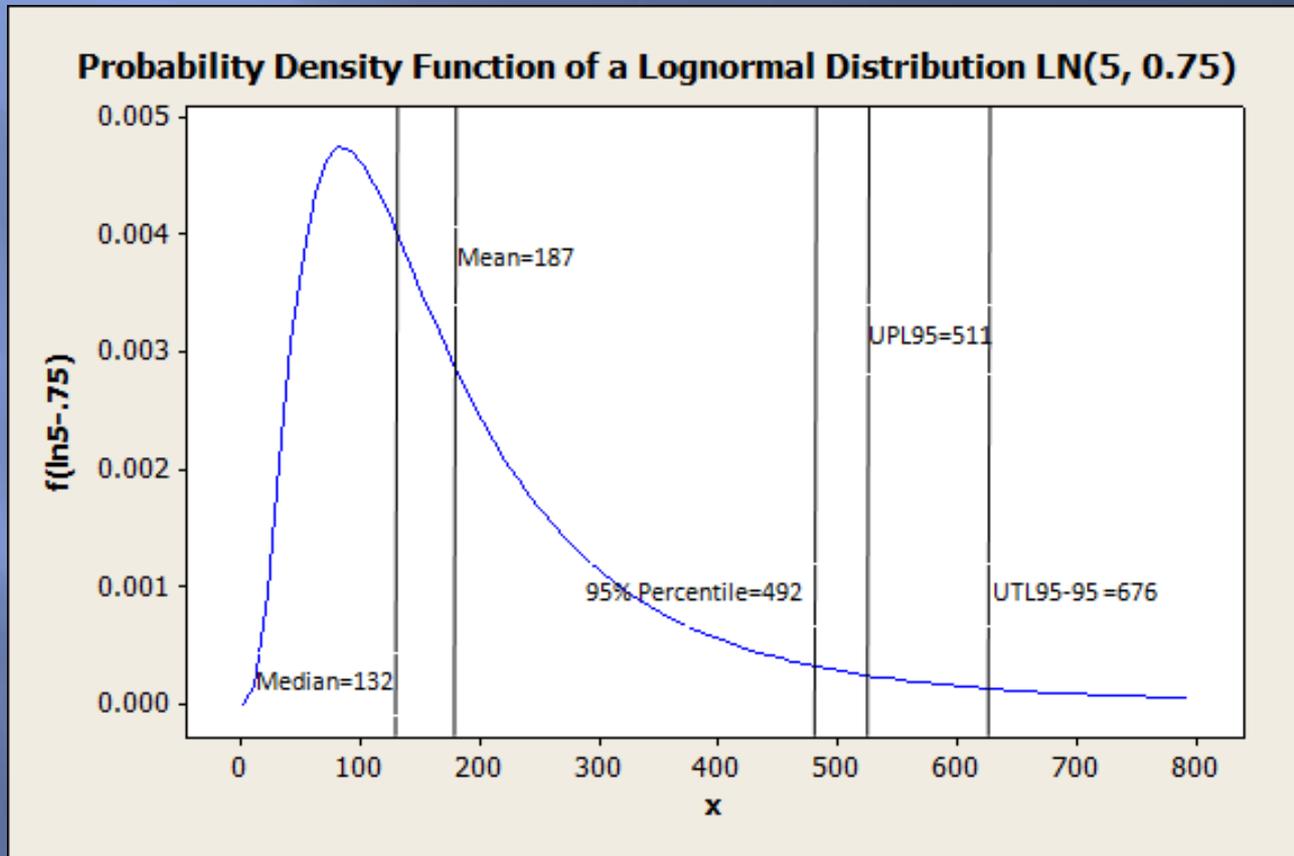
Determining Background Threshold Values (BTVs)

- ▣ Once EPA has determined the applicable data sets, BTVs will be calculated. There may be as many as 4 BTVs per analyte if data sets cannot be merged:
 1. **Chatsworth Formation**
 - Surface BTV and Subsurface BTV
 2. **Santa Susana Formation**
 - Surface BTV and Subsurface BTV

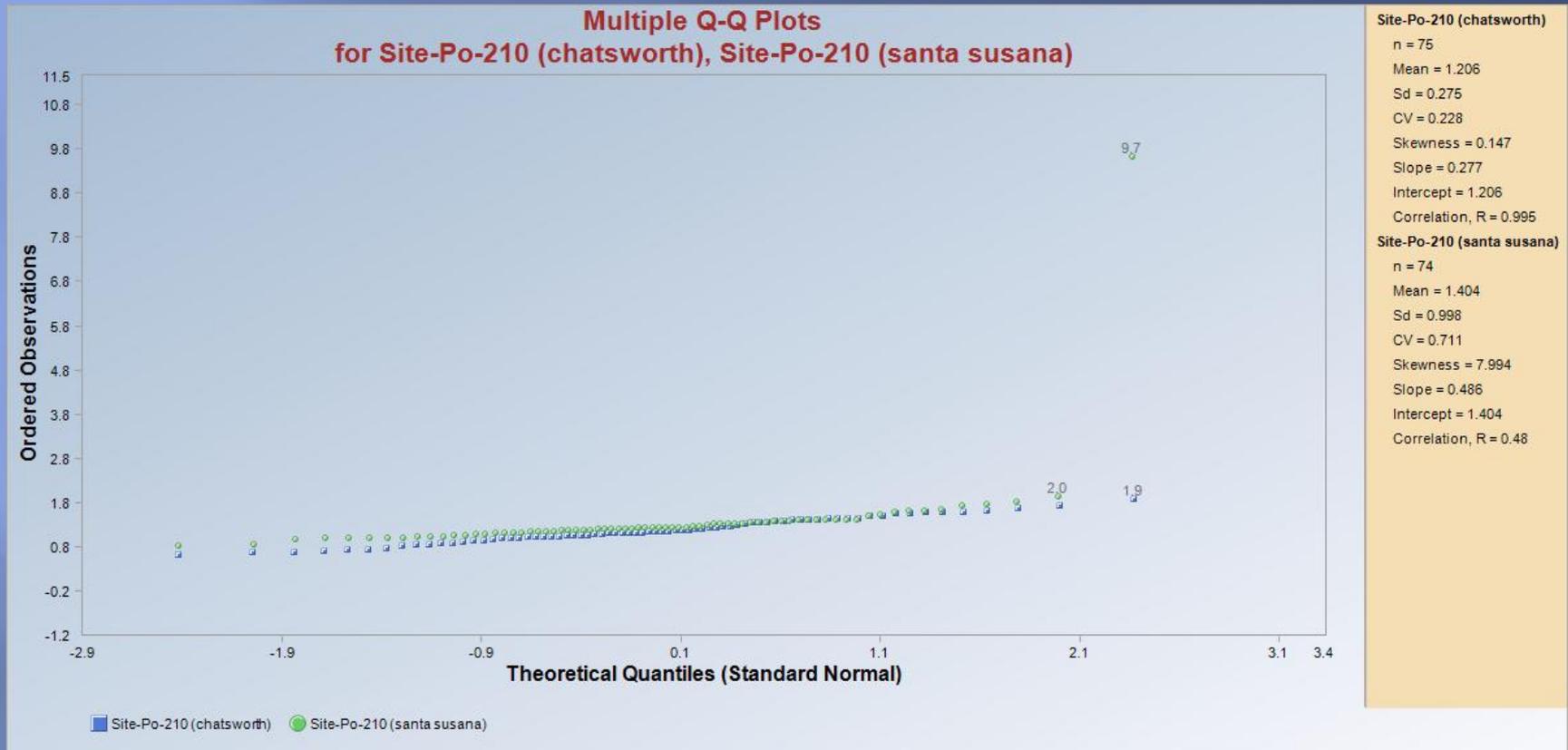
- ▣ BTVs will be presented in the Look-Up Tables as described in the AIP



Lognormal Probability Density Function with Mean 5 and SD 0.75 of Log-transformed Data



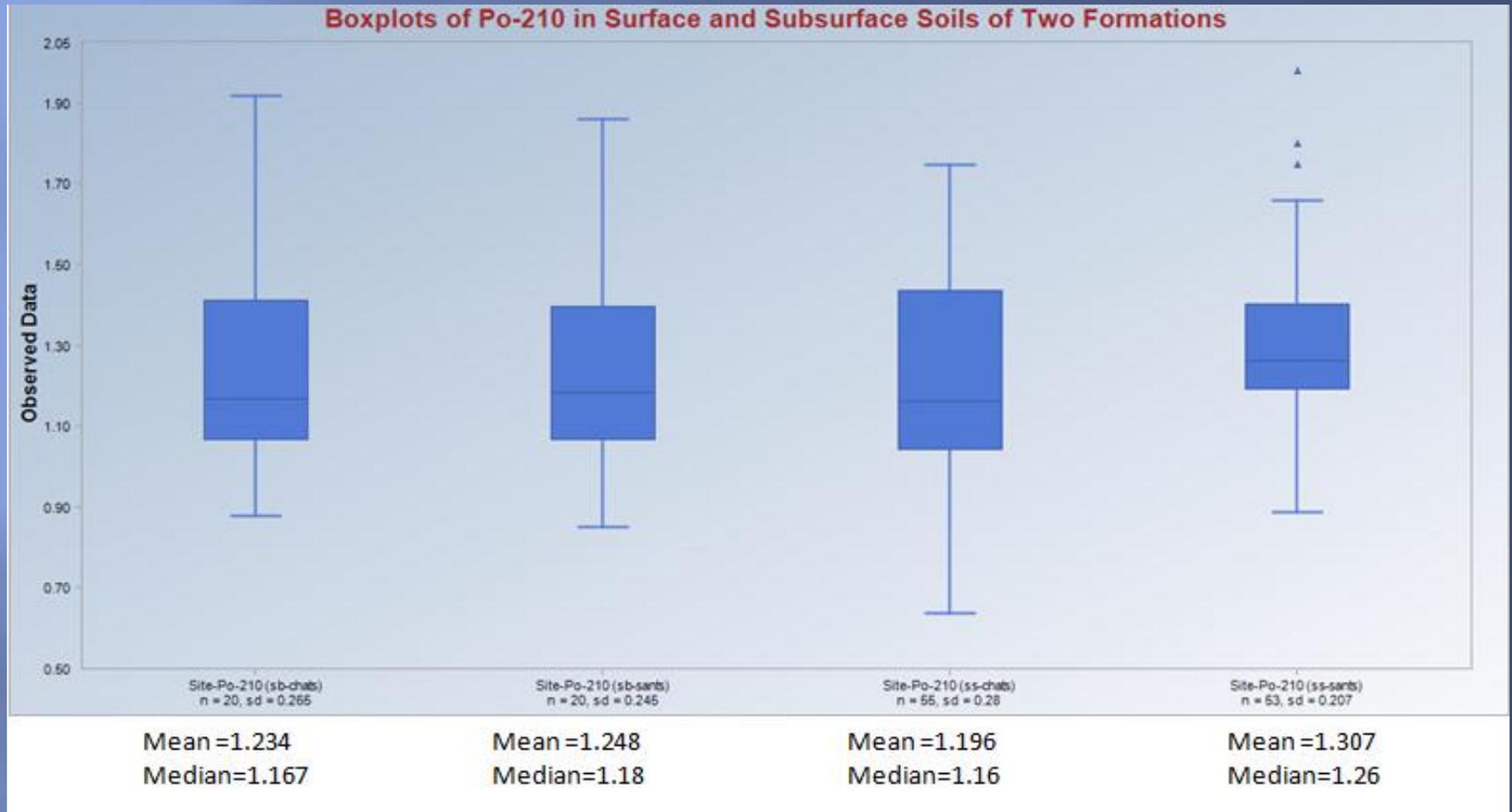
Polonium-210



Q-Q plots of Po-210 activity in two formations



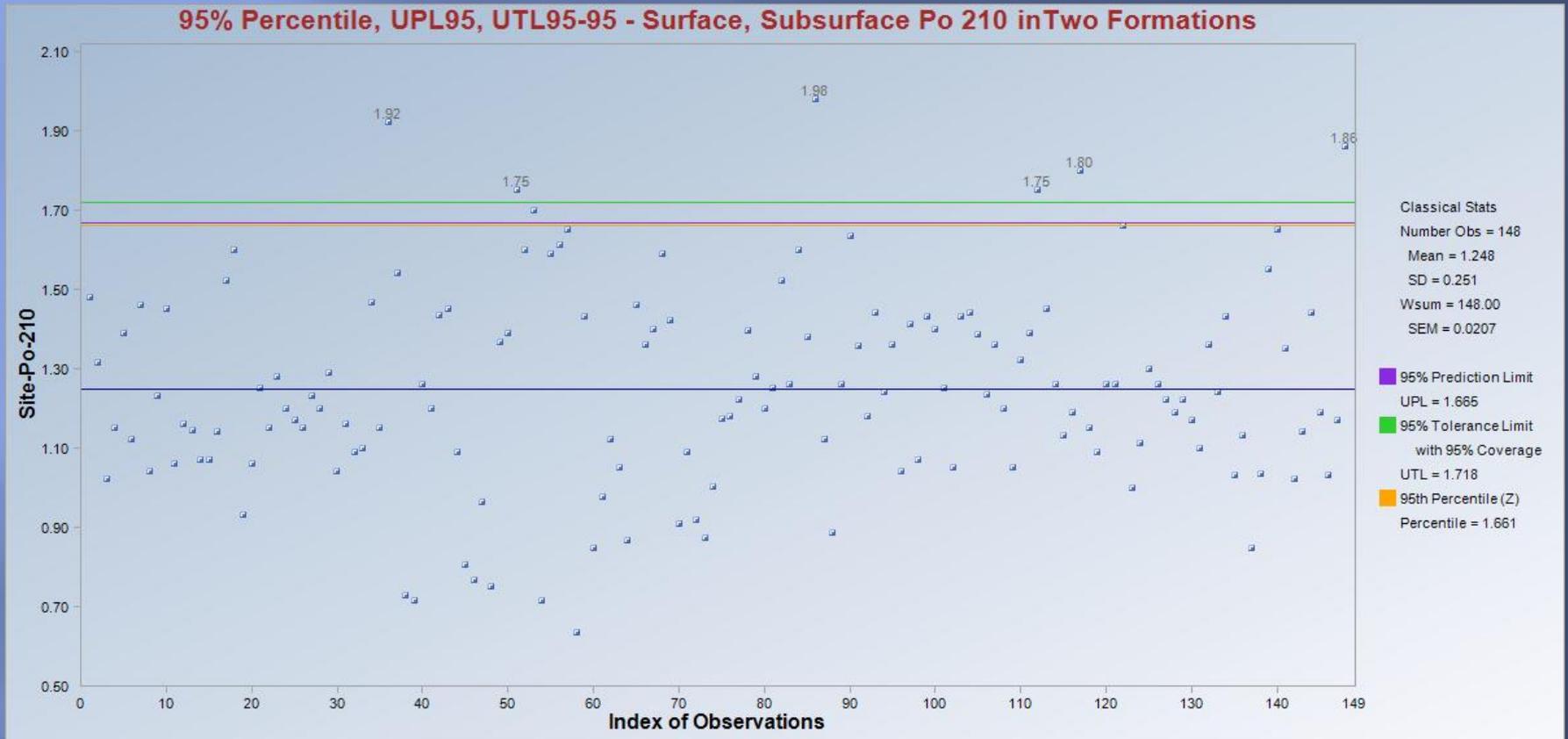
Polonium-210



Box plots comparing Po-210 activity in four strata



Polonium-210

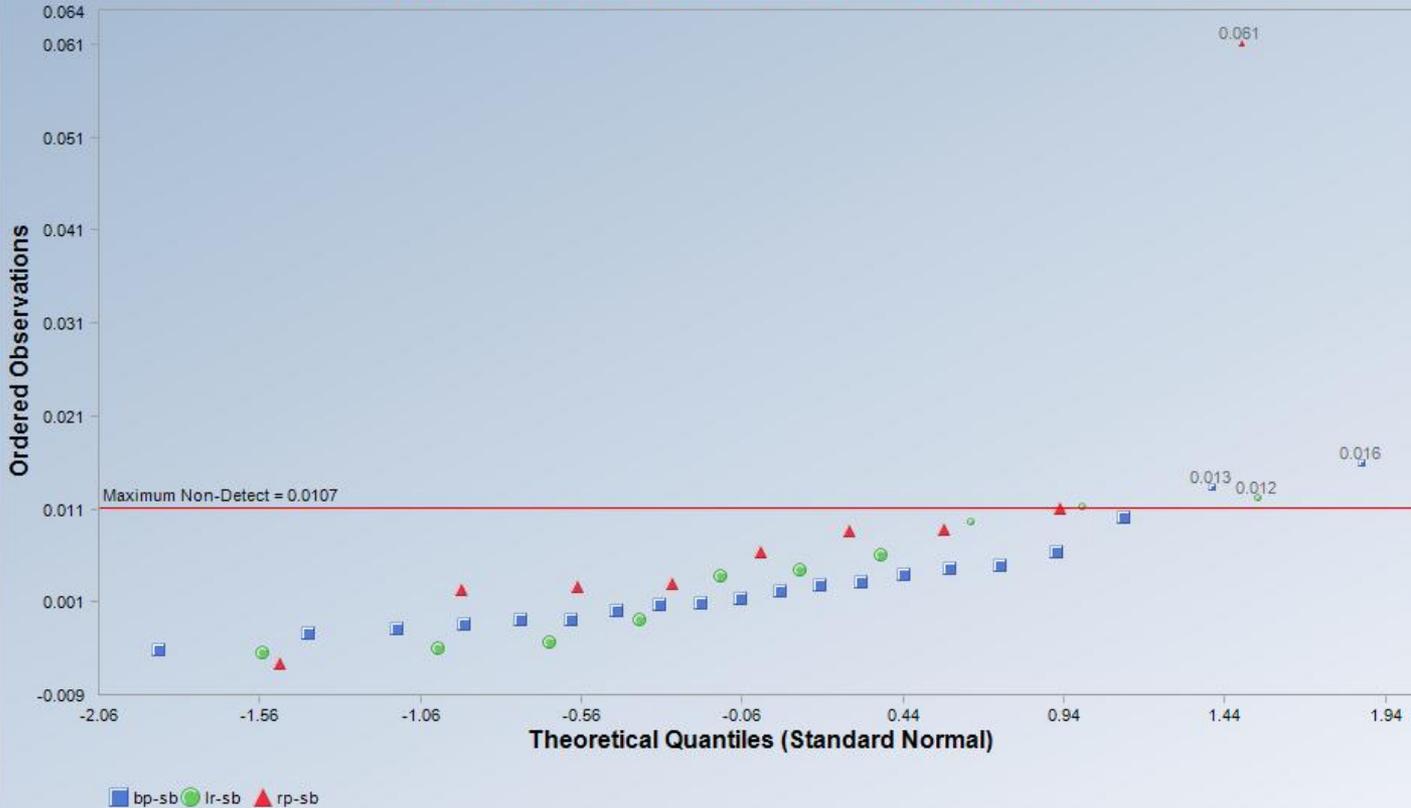


See Handout



Strontium-90

QQ Plot- Sr90 in Subsurface Soils- LR, RP, and BP

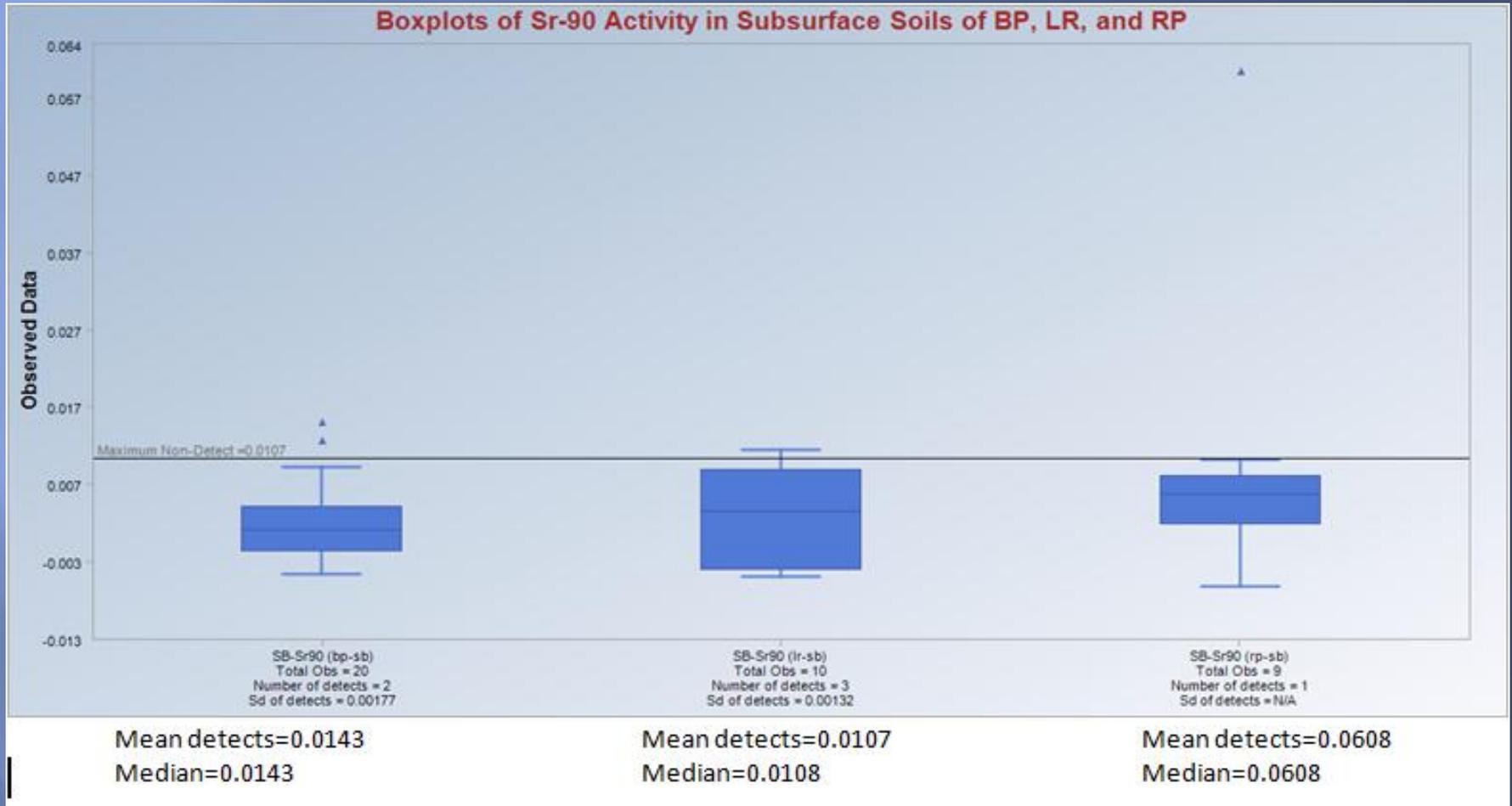


Statistics	
(Based on displayed data)	
(NDs = DL Values shown in Larger Fonts)	
SB-Sr90 (bp-sb)	
n	= 20
ND	= 18
Min	= -0.0045
Max	= 0.0155
Mean	= 0.00256
Median	= 0.00136
Sd	= 0.0046
CV	= 1.795
Skewness	= 1.724
Slope	= 0.00515
Intercept	= 0.00256
Correlation, R	= 0.949
SB-Sr90 (lr-sb)	
n	= 10
ND	= 7
Min	= -0.00481
Max	= 0.0119
Mean	= 0.00311
Median	= 0.00376
Sd	= 0.00693
CV	= 2.233
Skewness	= 0.0291
Slope	= 0.00657
Intercept	= 0.00311
Correlation, R	= 0.957

Q-Q plots of Sr-90 activity in subsurface soil samples (Bridal Path, Rocky Peak and Lang Ranch)



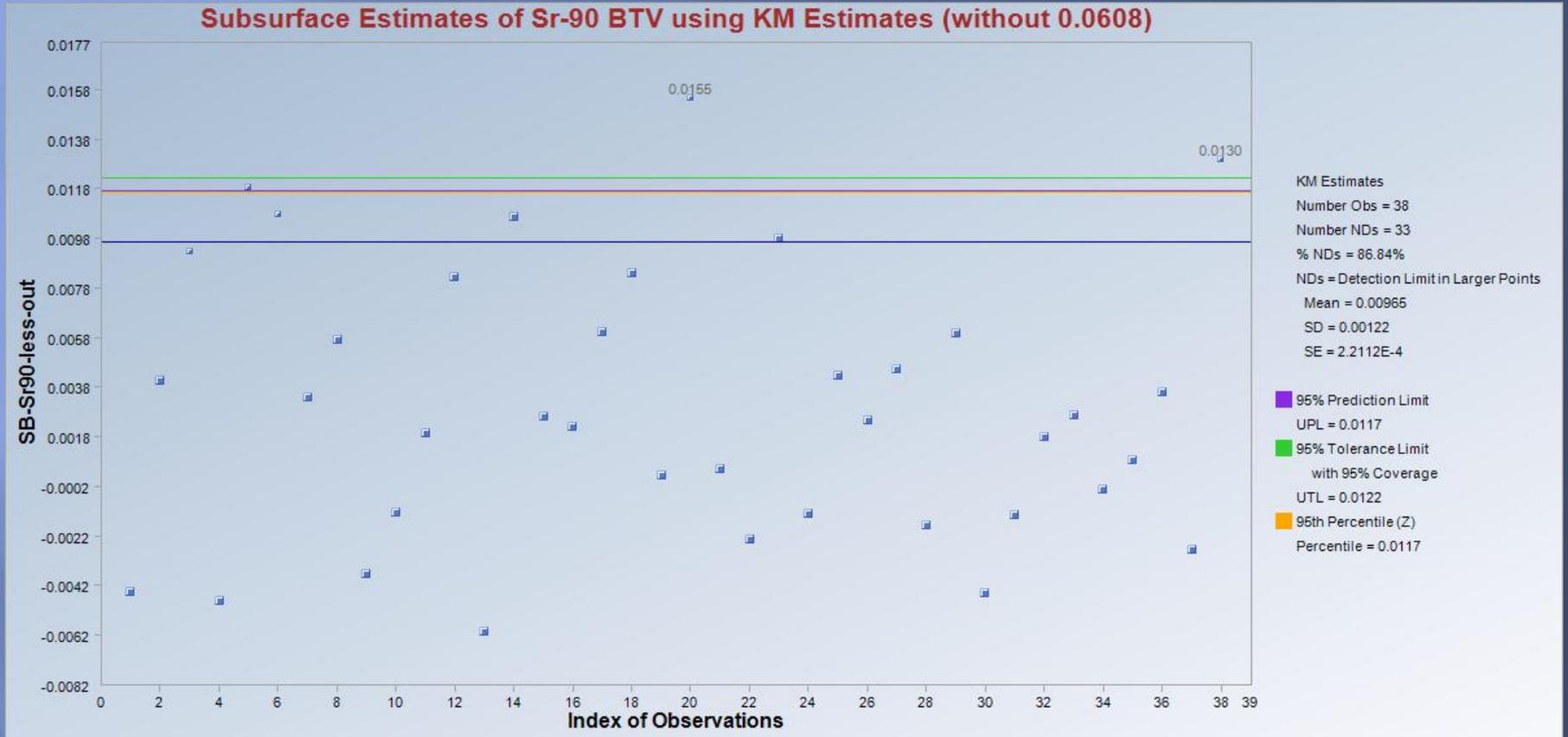
Strontium-90



Box plots comparing Sr-90 in subsurface soil samples



Strontium-90

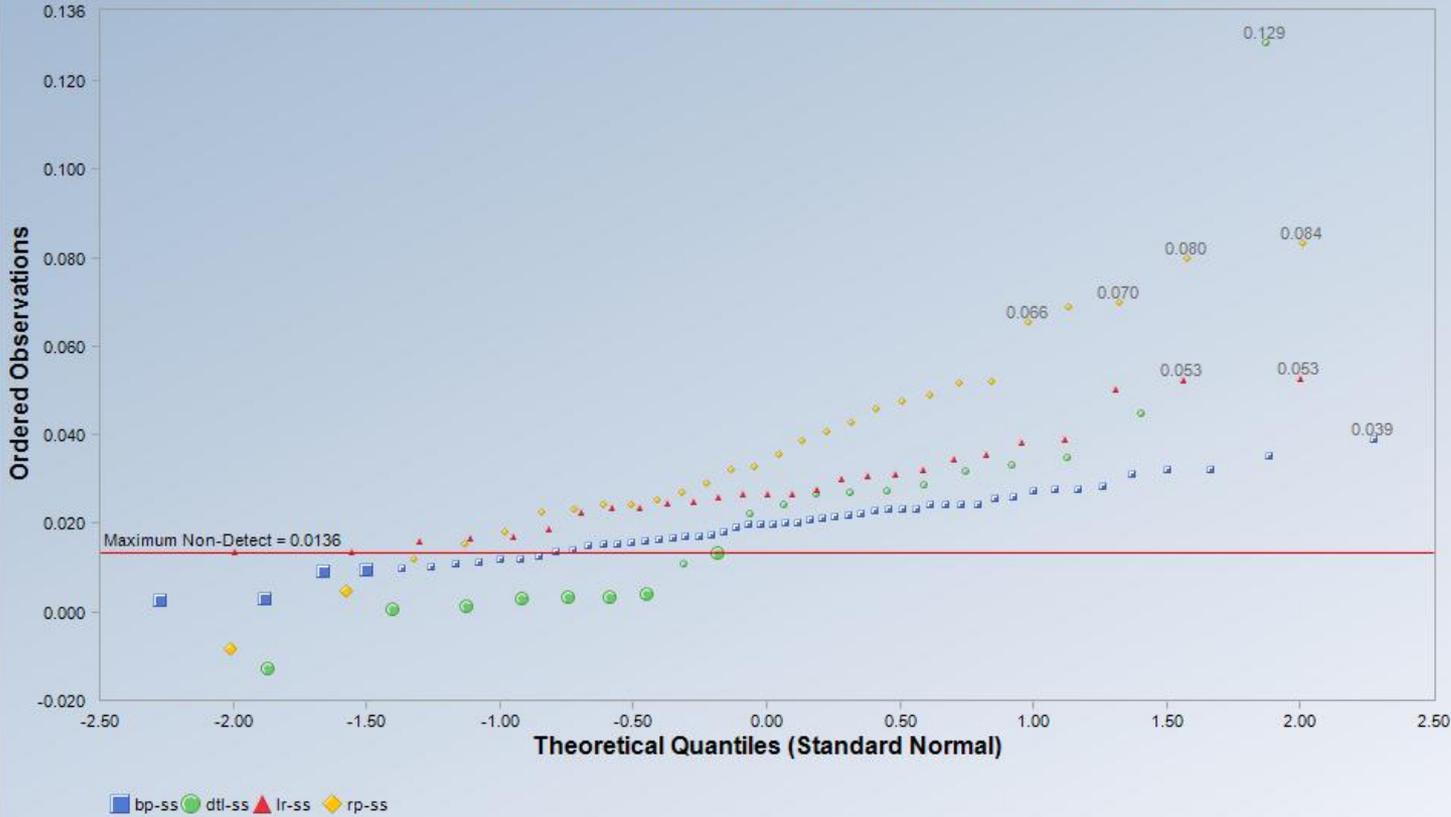


See Handout



Strontium-90

QQ Plot- Sr90 in Surface Soils- LR, RP,BP, and DTLs



Statistics
 (Based on displayed data)
 (NDs = DL Values shown in Larger Fonts)

SS-Sr90 (bp-ss)
 n = 54
 ND = 4
 Min = 0.00295
 Max = 0.0393
 Mean = 0.0199
 Median = 0.0202
 Sd = 0.0103
 CV = 0.515
 Skewness = 0.0585
 Slope = 0.00768
 Intercept = 0.0199
 Correlation, R = 0.996

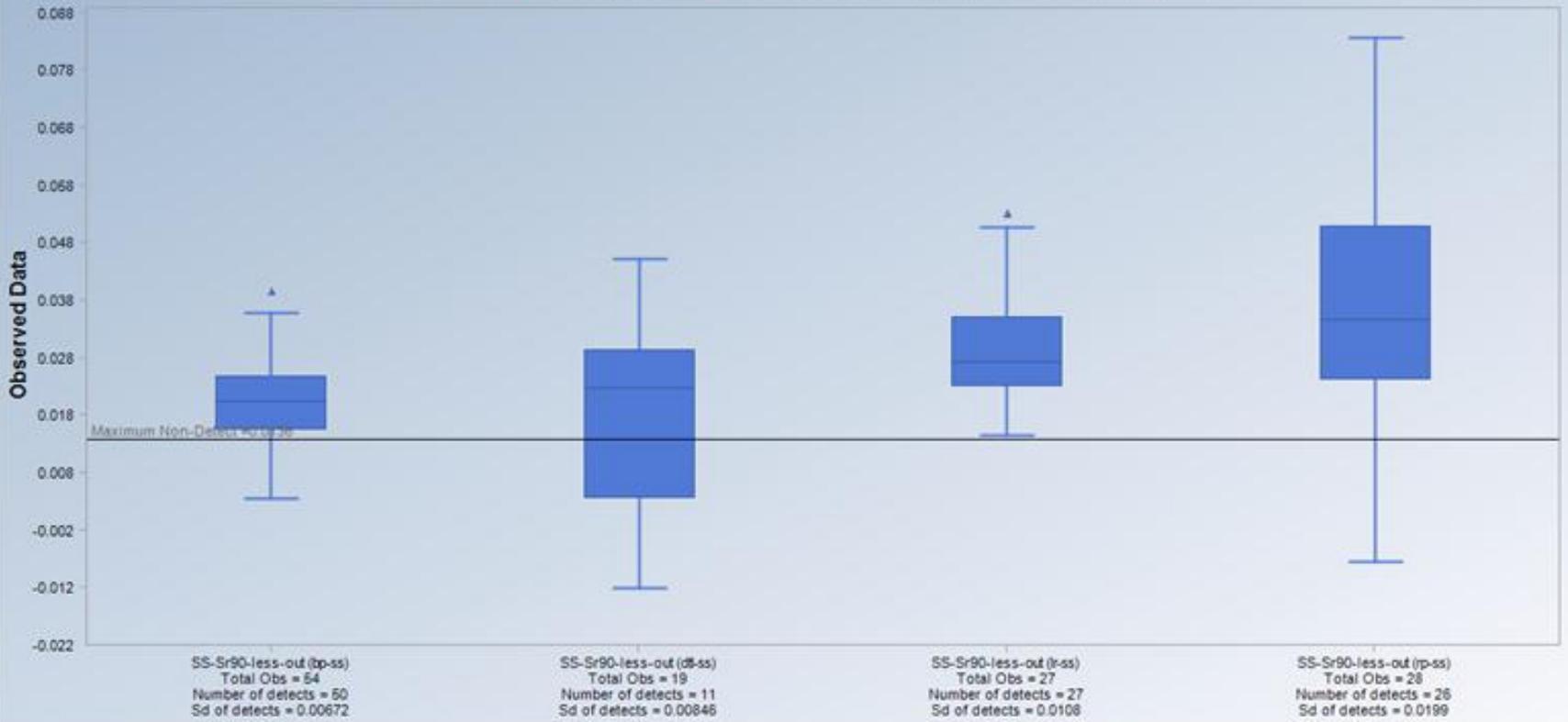
SS-Sr90 (dtl-ss)
 n = 20
 ND = 8
 Min = -0.0126
 Max = 0.129
 Mean = 0.0231
 Median = 0.0235
 Sd = 0.0195
 CV = 0.842
 Skewness = 8.748
 Slope = 0.0253
 Intercept = 0.0231
 Correlation, R = 0.996

Q-Q plots of Sr-90 activity in surface soil samples (Bridal Path, Rocky Peak and Lang Ranch, and DTLs)



Strontium-90

Boxplots of Sr-90 Activity in Surface Soils of BP, DTL, LR, and RP



Mean detects=0.021
Median=0.0206

Mean detects=0.0287
Median=0.0277

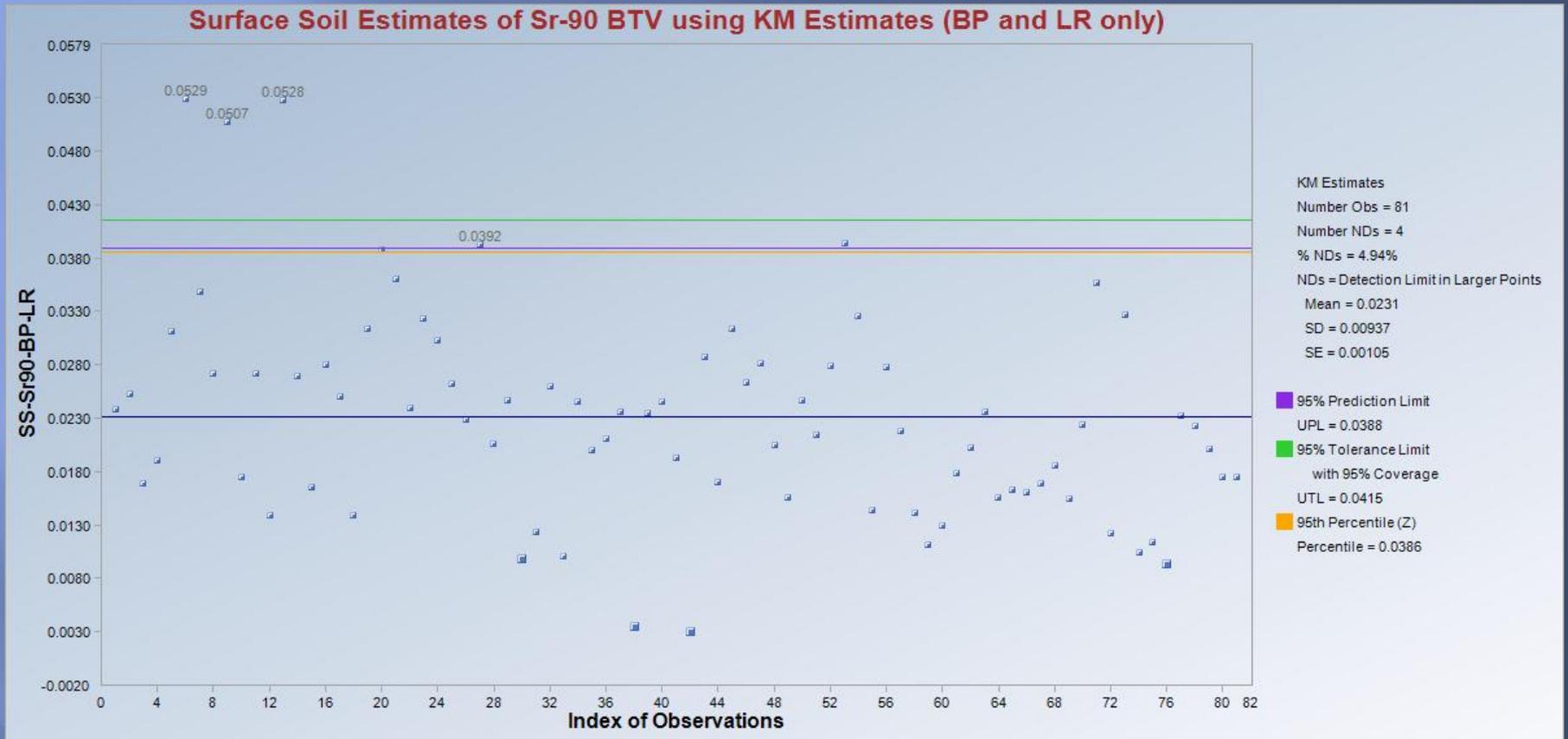
Mean detects=0.029
Median=0.0271

Mean detects=0.0409
Median=0.0374

Box plots comparing Sr-90 activity in surface soil samples



Strontium-90

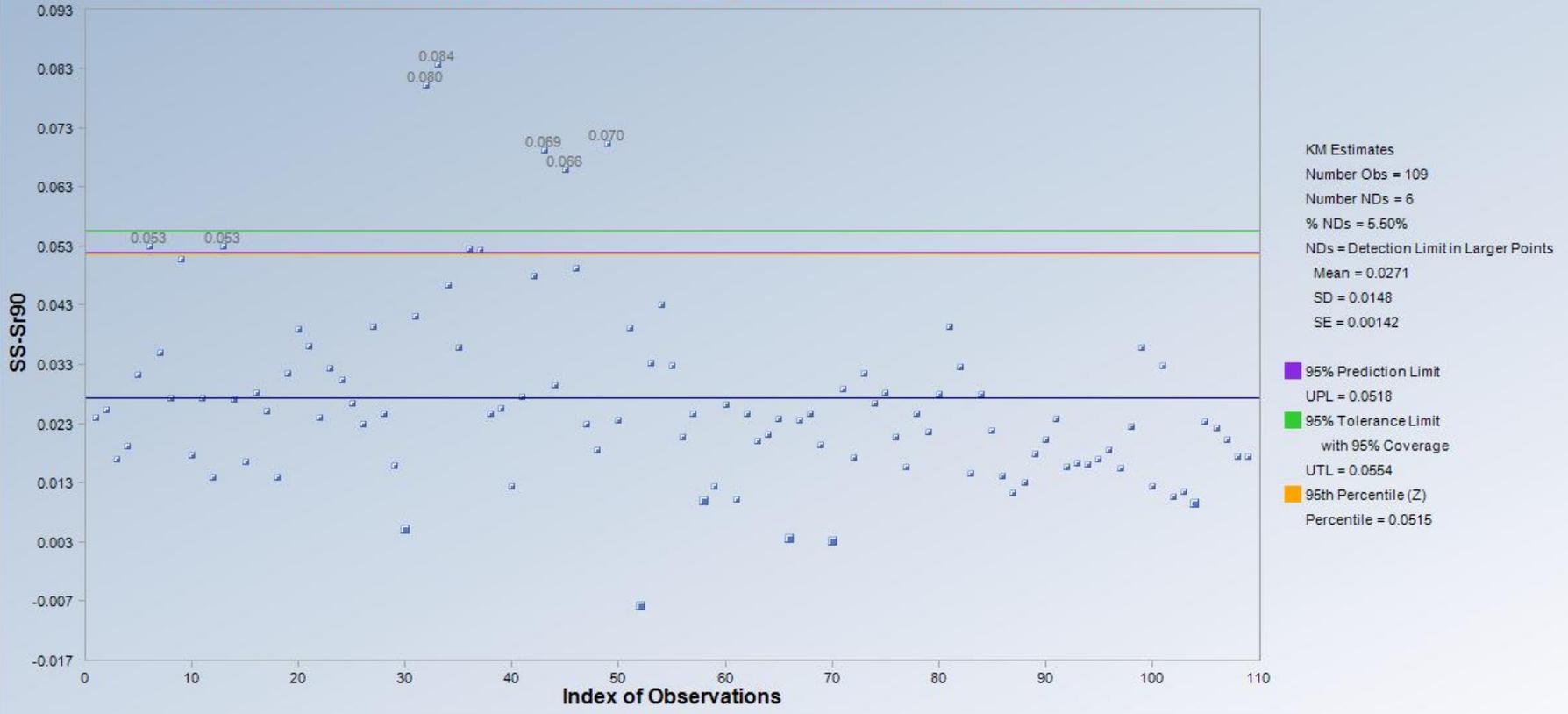


See Handout



Strontium-90

Surface Soil Estimates of Sr-90 BTV using KM Estimates (BP, LR, and RP)



See Handout



Application of BTVs

- ▣ Requirements of the AIP
 - Develop a Look-Up Table based on BTVs for each formation, surface and subsurface depths.
 - No averaging.
 - Compare individual discrete samples.

- ▣ Choosing the best statistic to represent the BTV
 - 95th percentile
 - 95% upper prediction limit (UPL95)
 - 95%-95% upper tolerance limit (UTL95-95)



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Gamma Radiation Scanning Status Update

December 9, 2010



Milestones Progress

- ✓ Initial project planning
- ✓ Final Gamma Radiation Scanning SAP
- ✓ RBRA data collection
- Equipment purchase/lease and preparation
- Detection system integration/testing
- Scanning survey of Study Area
- Continuous data evaluation and analysis
- Interim report preparation
- Final report preparation



Accomplishments

- ✓ September to November: Gamma scanned most of 5B and 5A, started scanning in 5D and 8
- ✓ September to November: Researched and developed preliminary designs for modified gamma scanning equipment for difficult terrain
- ✓ September to November: Nearly completed software tools to increase accuracy and efficiency of data collection and processing
- ✓ November: Completed Draft Sensitivity Report



Gamma Scanning Summary

Sub-Area	Size (acres)	Scanned (acres)	Inaccessible (acres)	Percentage Complete
5C	22	19	2	95%
5B	23	19	2	90%
5A	38	27	4	82%
5D	72	19	1	28%
8	58	13	9	39%
6	57	4	8	21%
7	16	1	3	24%
3	4	0	1	15%
BZ-NW	79	0	18	23%
BZ-NE	102	0	20	20%
Total	472	104	66	36%

Area Scanning Completed



Next Steps

- ▣ December – February:
 - Continue gamma scanning 5D and 8
 - Fill in gaps in 5C, 5B, and 5A
 - Finalize Sensitivity Report
 - Continue modified gamma scanning equipment designs and potentially construct equipment

- ▣ December – Indefinite Date: Conduct barometric pressure study on effects of changing weather conditions and background radiation

- ▣ December – February: Conduct soil moisture study on effects of changing soil moisture and gamma attenuation



Soil Investigation Status Update

December 9, 2010



Soil Sampling Update

Subarea 5C

- ▣ 162 out of 205 samples collected
- ▣ Projected completion by Dec 17

Subarea 5B

- ▣ Tech session held Nov 19
- ▣ FSP Addendum in EPA review
- ▣ Issue to Stakeholders on Dec 10
- ▣ Start surface soil sampling on Dec 8



Geophysical Survey Update

- ▣ Surveys complete in subareas 5C, 5B, and 5A
- ▣ 31 acres out of 89 acres surveyed to date
- ▣ Overall - 35% complete, 58 acres remain
- ▣ Survey in subarea 5D (12 acres) started on Dec 8



Groundwater, Surface Water, Sediment Status Update

December 9, 2010



Phase I

Groundwater Sampling

- ▣ 97 wells in the event (conducted 8/17/10 – 9/10/10)
 - 66 wells sampled
 - 19 wells were dry
 - 12 wells abandoned or damaged

- ▣ Tentative schedule for validated results
 - Initial 11 samples have been analyzed
 - Additional 55 sample results by late January 2011

- ▣ Tentative schedule for Phase I Technical Memo
 - February 2011



Surface Water, Seep, and Sediment Sampling

- ❑ Action items from the November 18, 2010 Stakeholder's meeting have been addressed and are presented in the Surface Water and Sediment Addendum.
- ❑ 40 surface water and 40 sediment sample locations have been mapped and revised figures have been uploaded onto the Sharepoint website.
- ❑ The Surface Water and Sediment Addendum has been posted to the Sharepoint website.
- ❑ Sediment sampling to begin December 13, 2010
- ❑ Surface Water and Seeps sampling pending sufficient rainfall



Phase II Groundwater Sampling Event

- Tentatively scheduled to begin February 22, 2011

- Sampling program will include the same wells as the Phase I event plus the Off-site wells.
 - Off-site wells in the Phase II sampling program will be listed in the Phase II FSP Addendum.
 - The off-site wells OS-21 (Runkle Canyon) and WS-09A (NASA) will be incorporated into the Phase II Off-site sampling program.



Upcoming Meeting

- ▣ Proposed next EPA Stakeholder meeting:
January 12, 2011 at the Radisson

