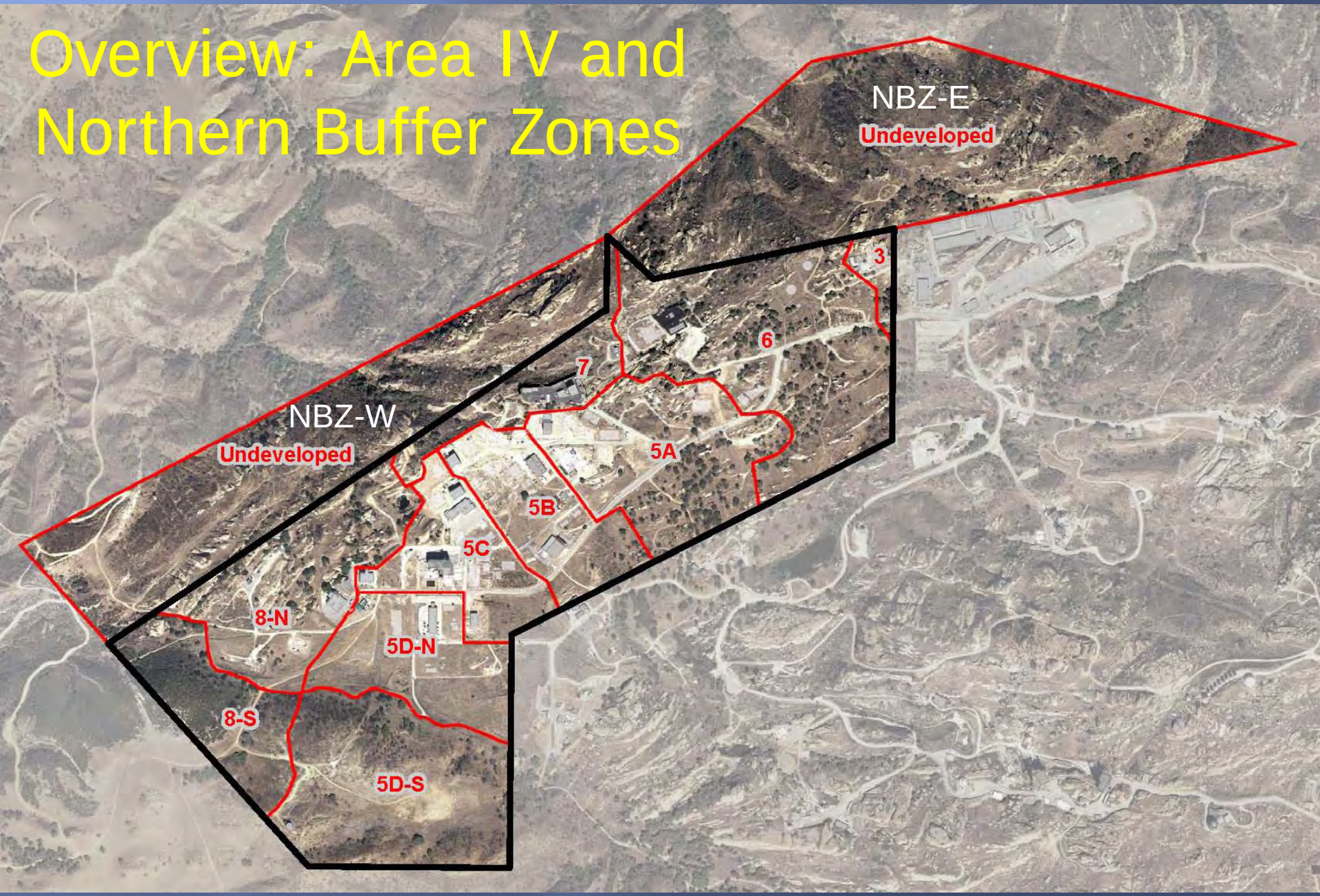
# Gamma Radiation Scanning Update

February 22, 2012

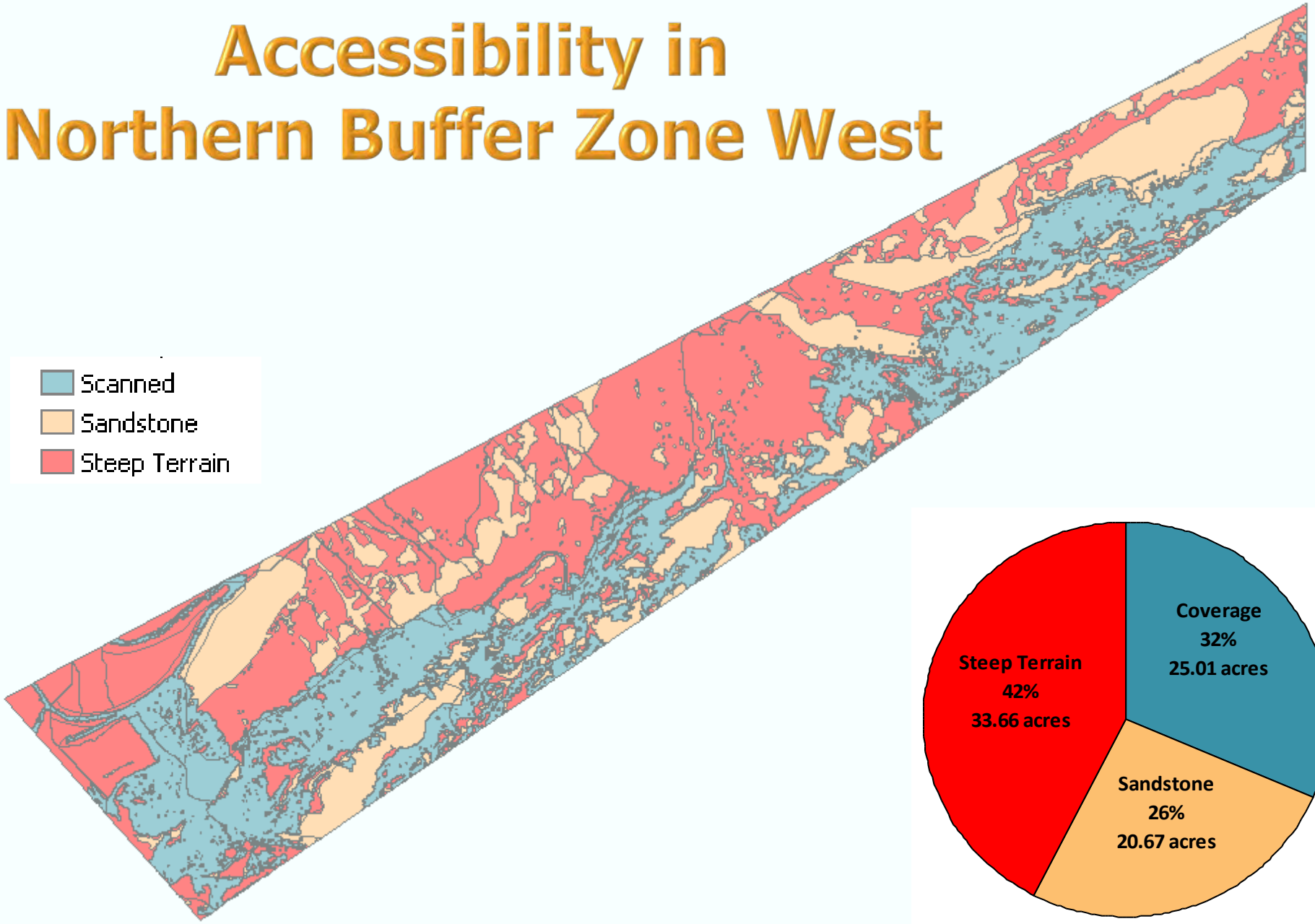
# Agenda

- Gamma Radiation Scanning Completed
- Scanning Coverage in Northern Buffer Zone (NBZ)
  - Scanned 100% of the accessible areas which:
    - Totaled 25% of the *entire NBZ*
    - 46 of 182 acres
  - Scanning was more limited than onsite areas due to very steep and rocky terrain and safety concerns.
- Identified, verified, and evaluated 27 of 27 PGRAYs
- Completed gamma scanning data evaluation

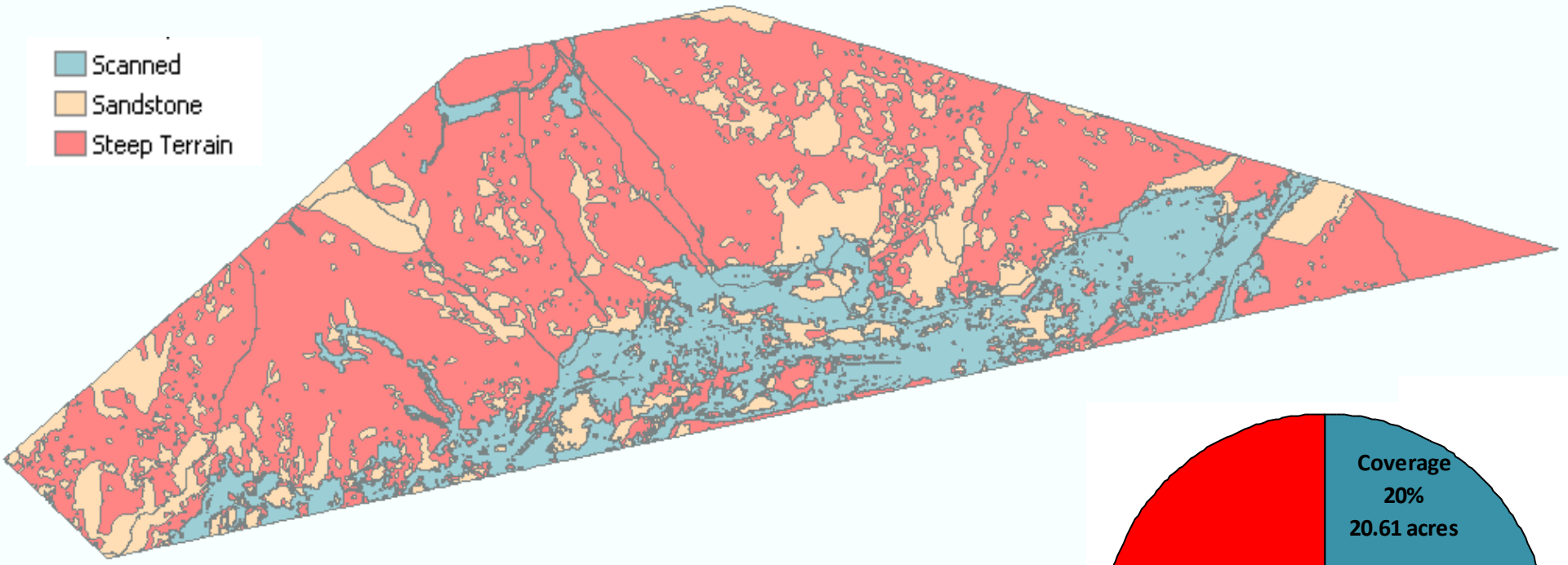
# Overview: Area IV and Northern Buffer Zones

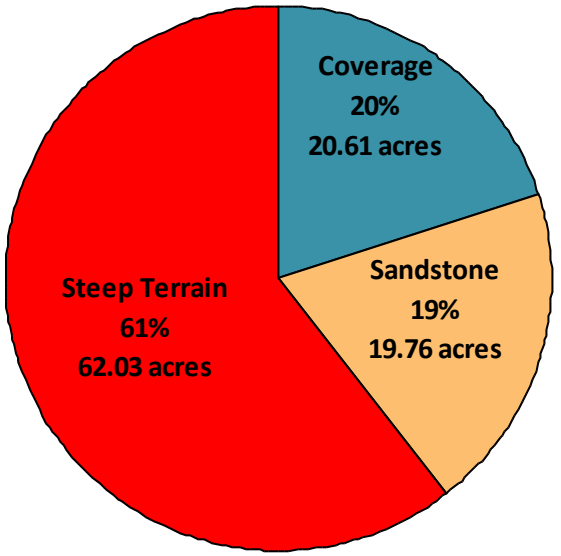


# Accessibility in Northern Buffer Zone West



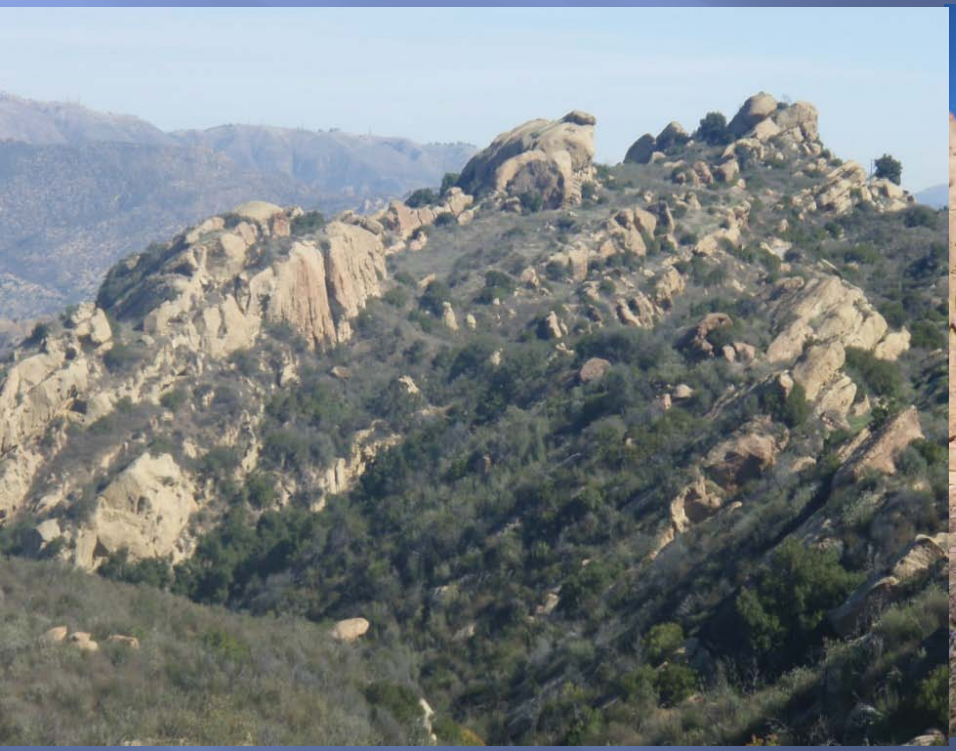
# Accessibility in Northern Buffer Zone East



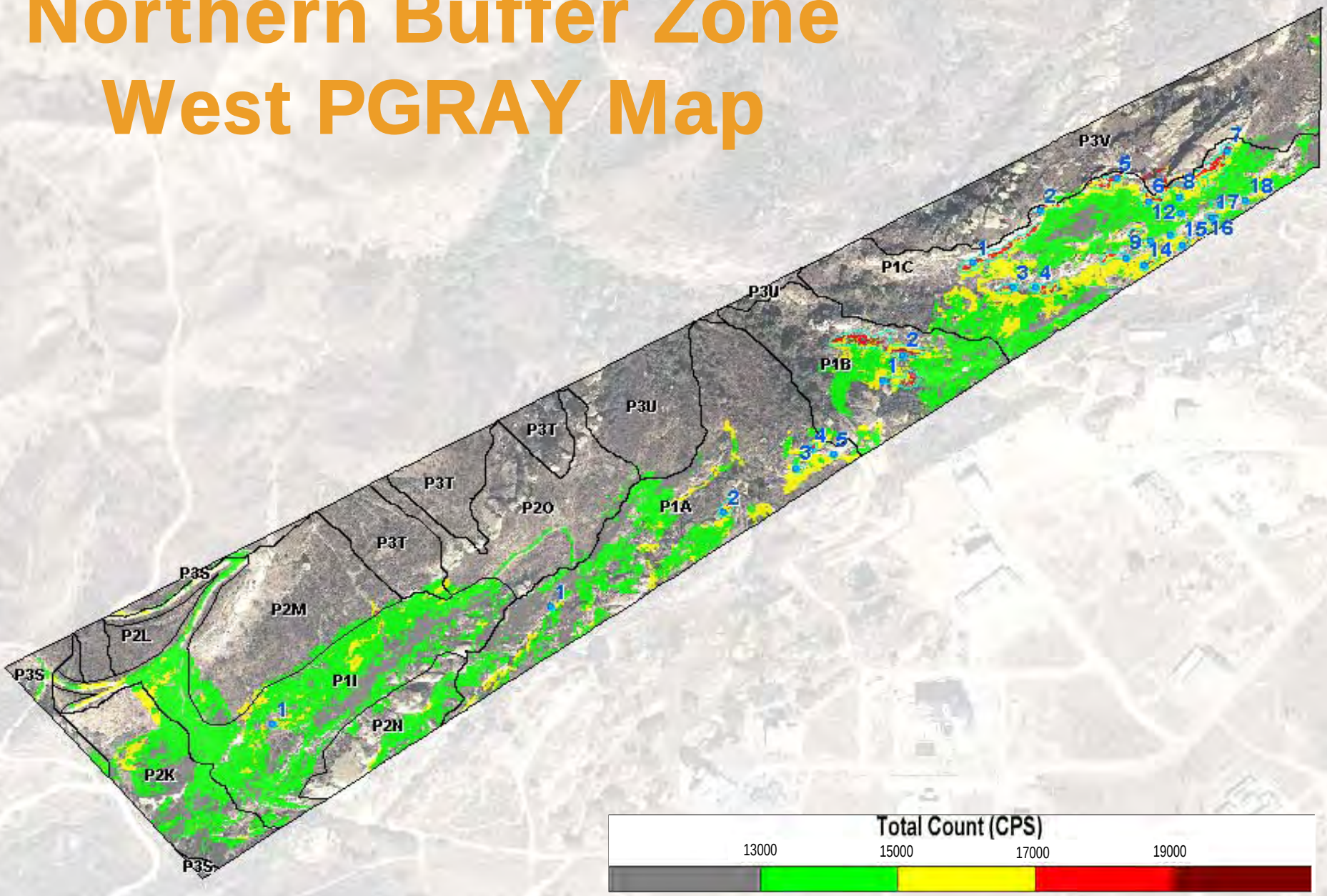
# Photographic Examples of Terrain

INACCESSIBLE

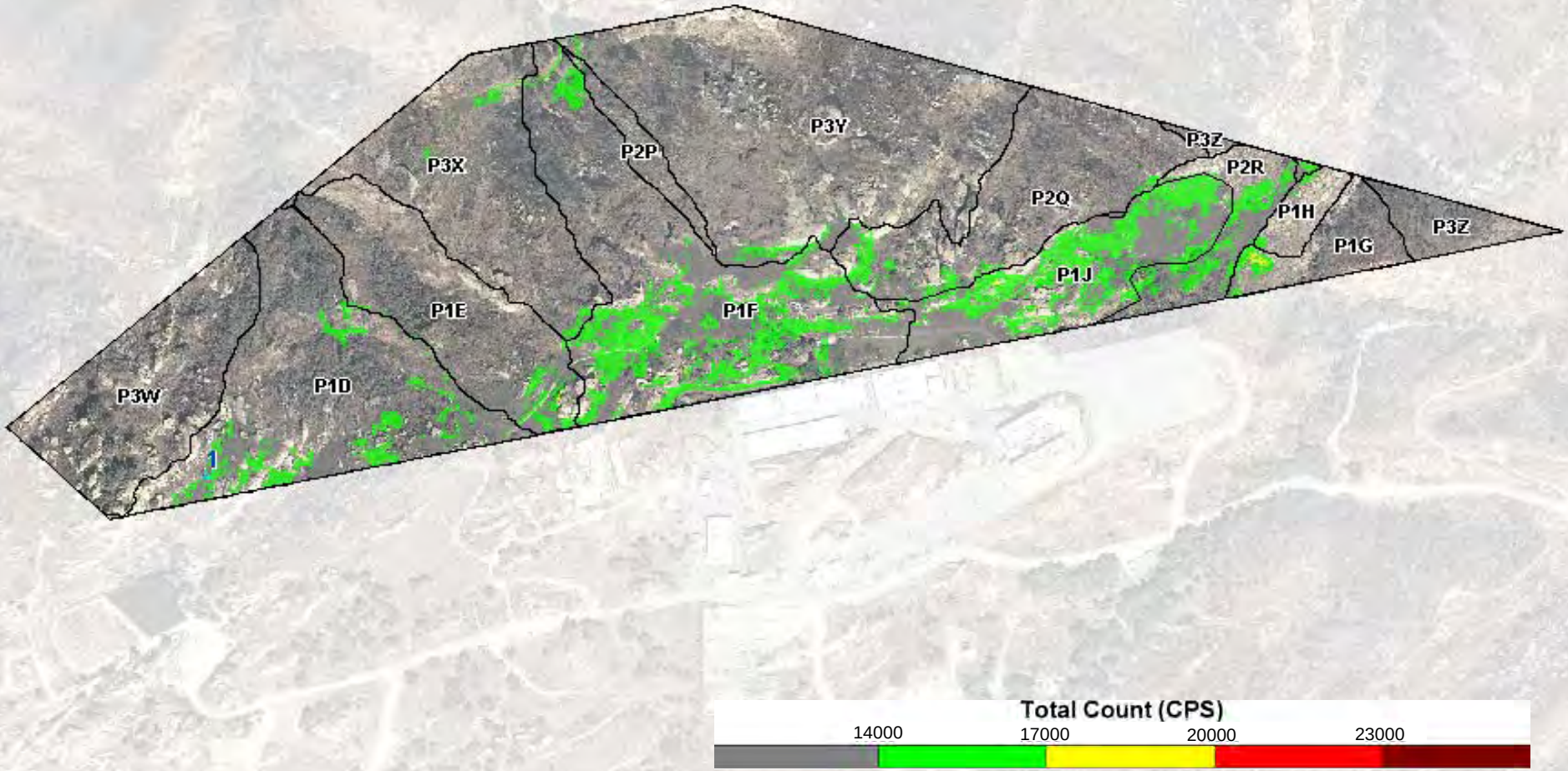


ACCESSIBLE

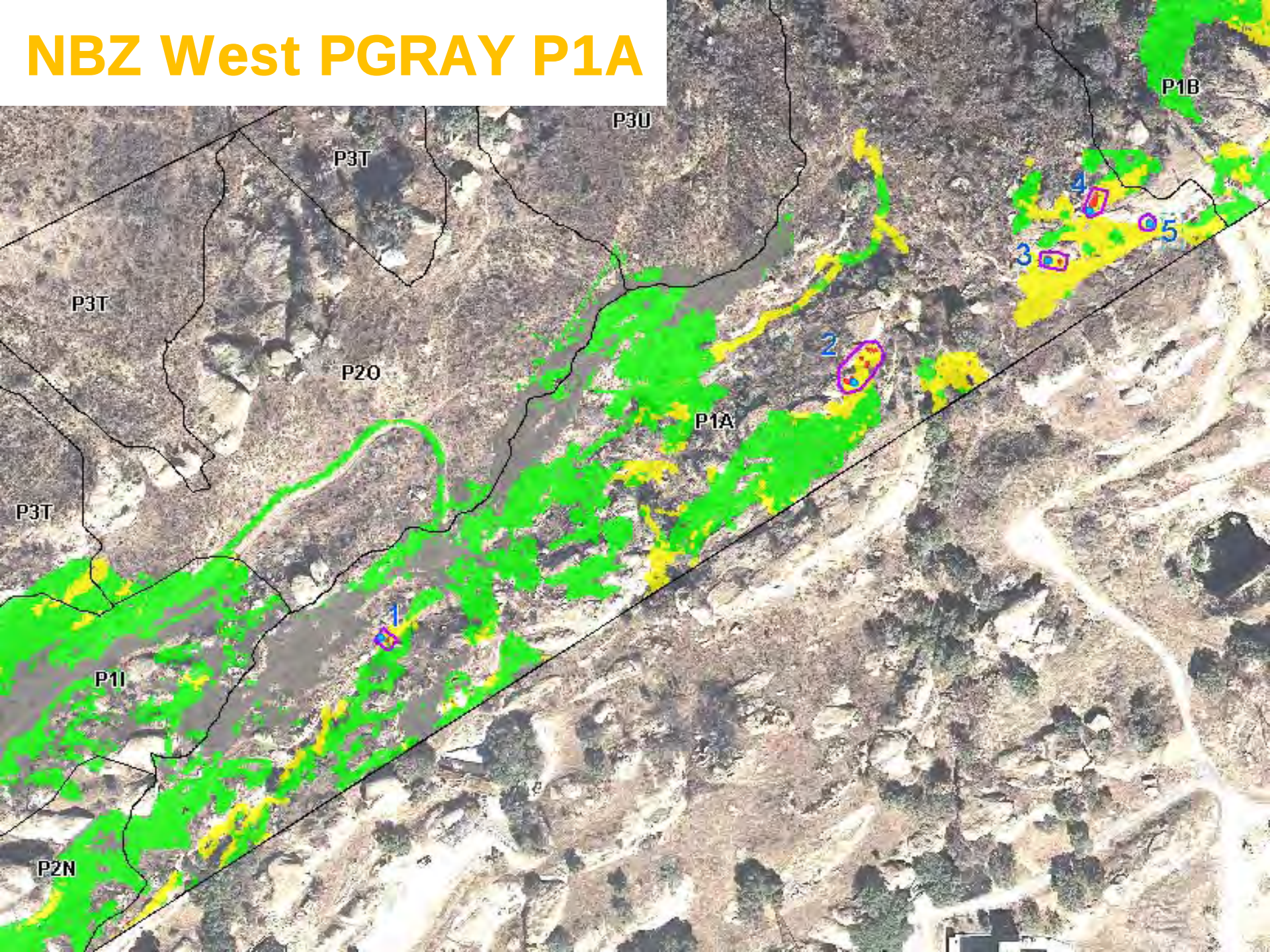
# Northern Buffer Zone
# West PGRAY Map



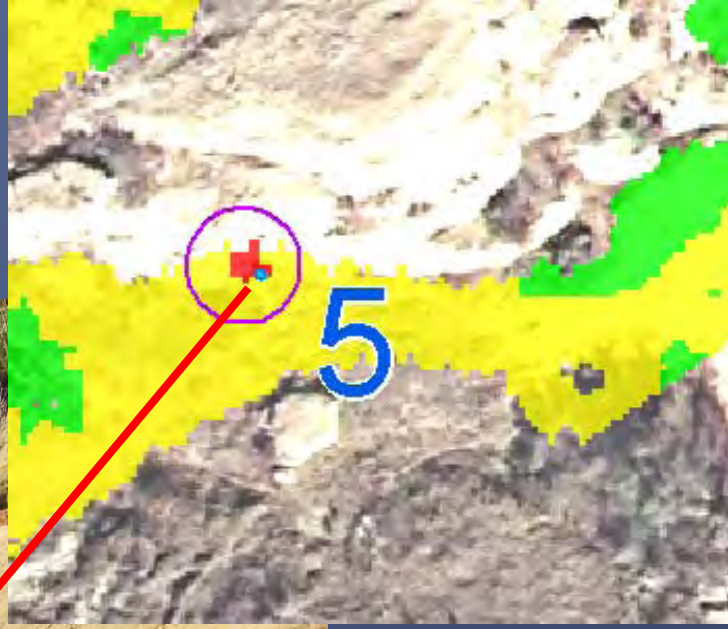
# Northern Buffer Zone East PGRAY Map



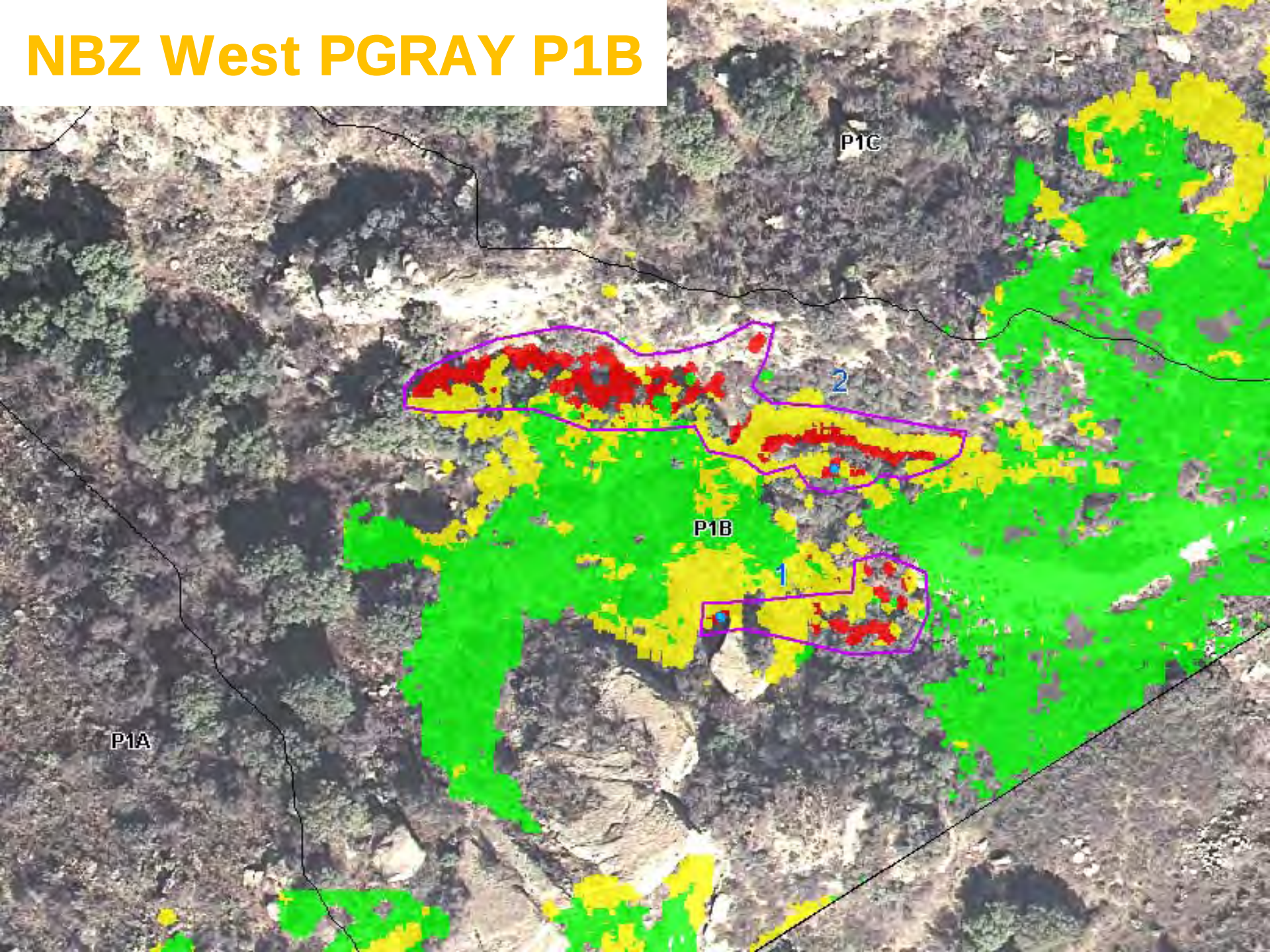
# NBZ West PGRAY P1A



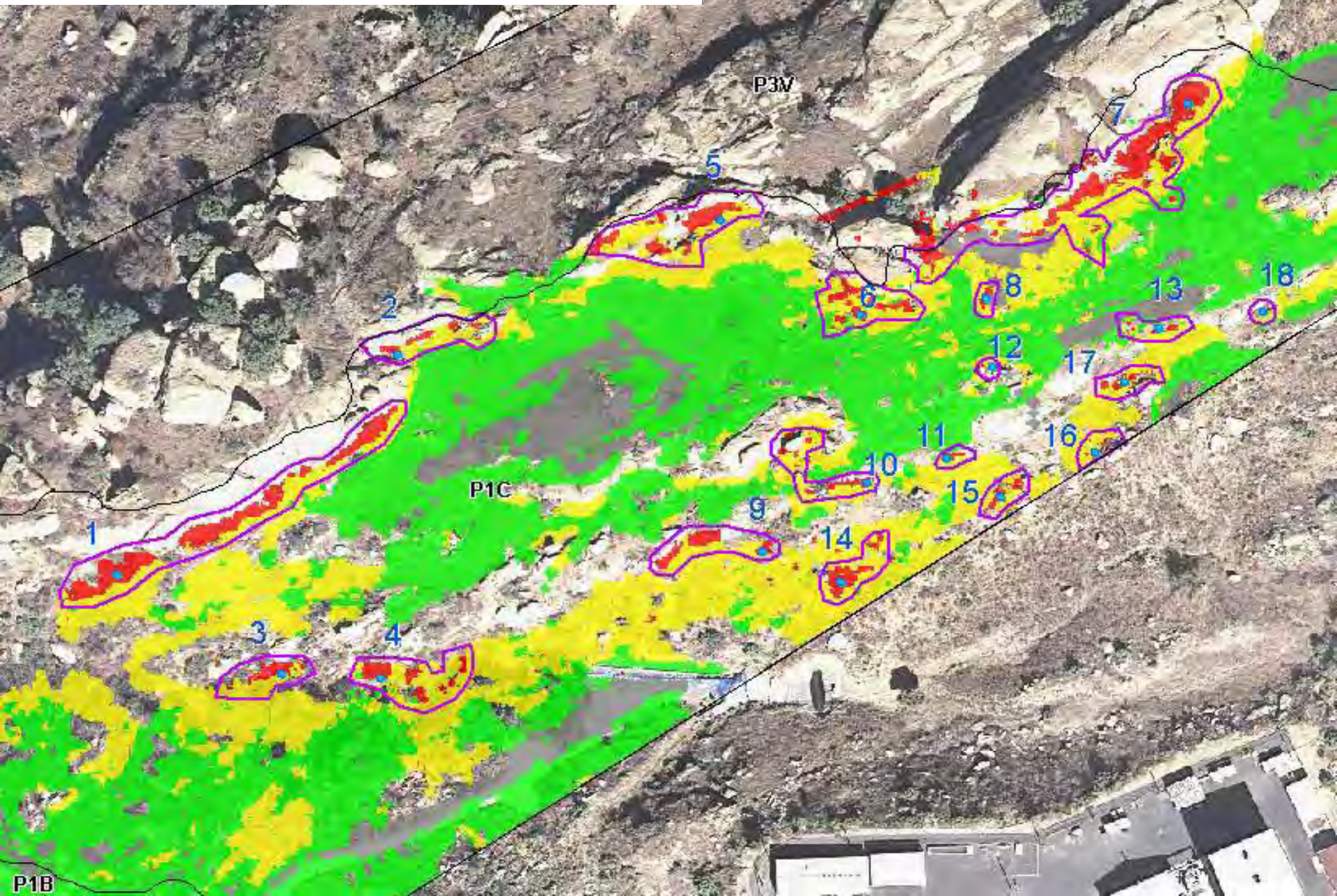
# Terrain Example Photo of NBZ West PGRAY P1A-5



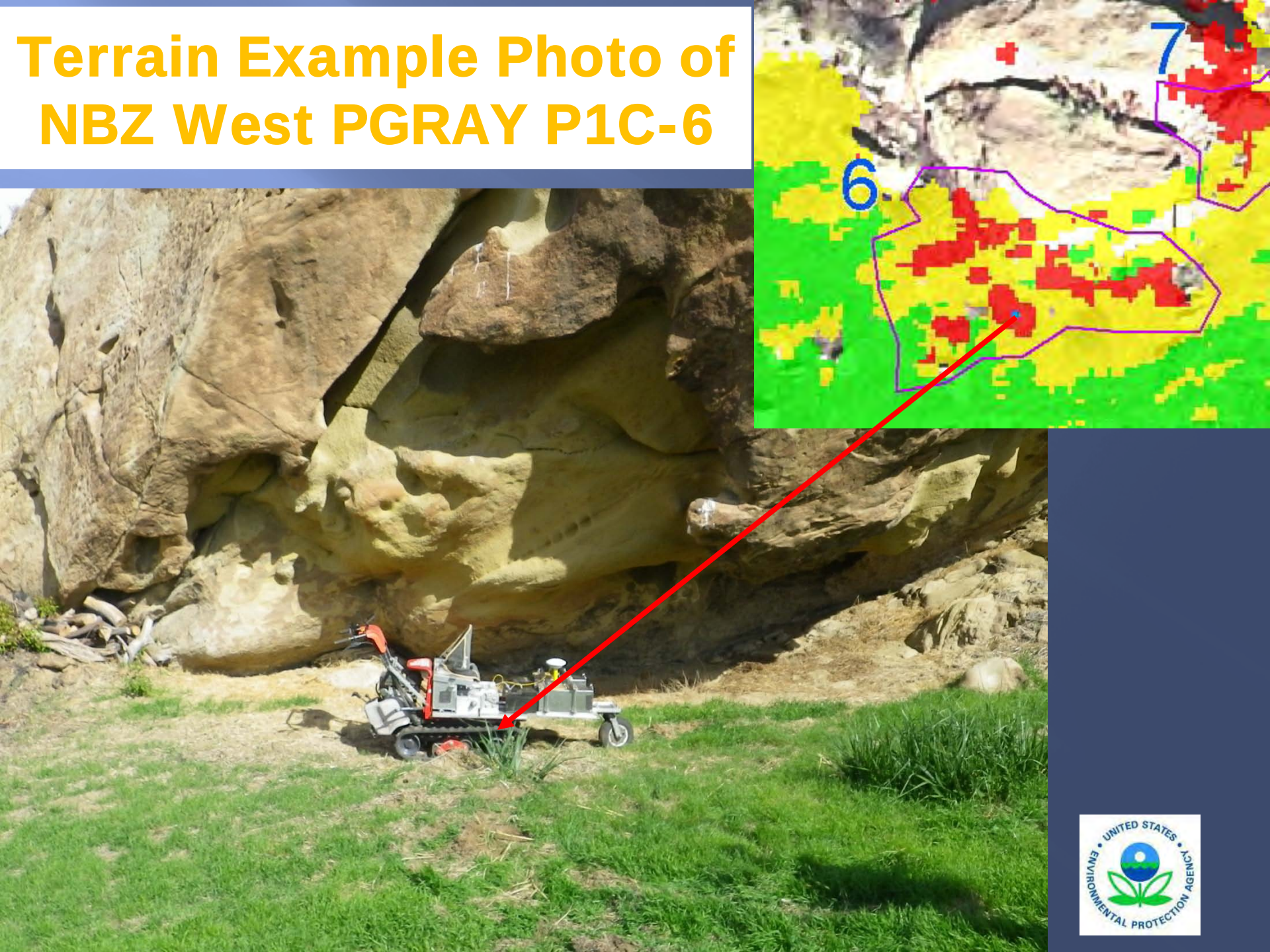
# NBZ West PGRAY P1B



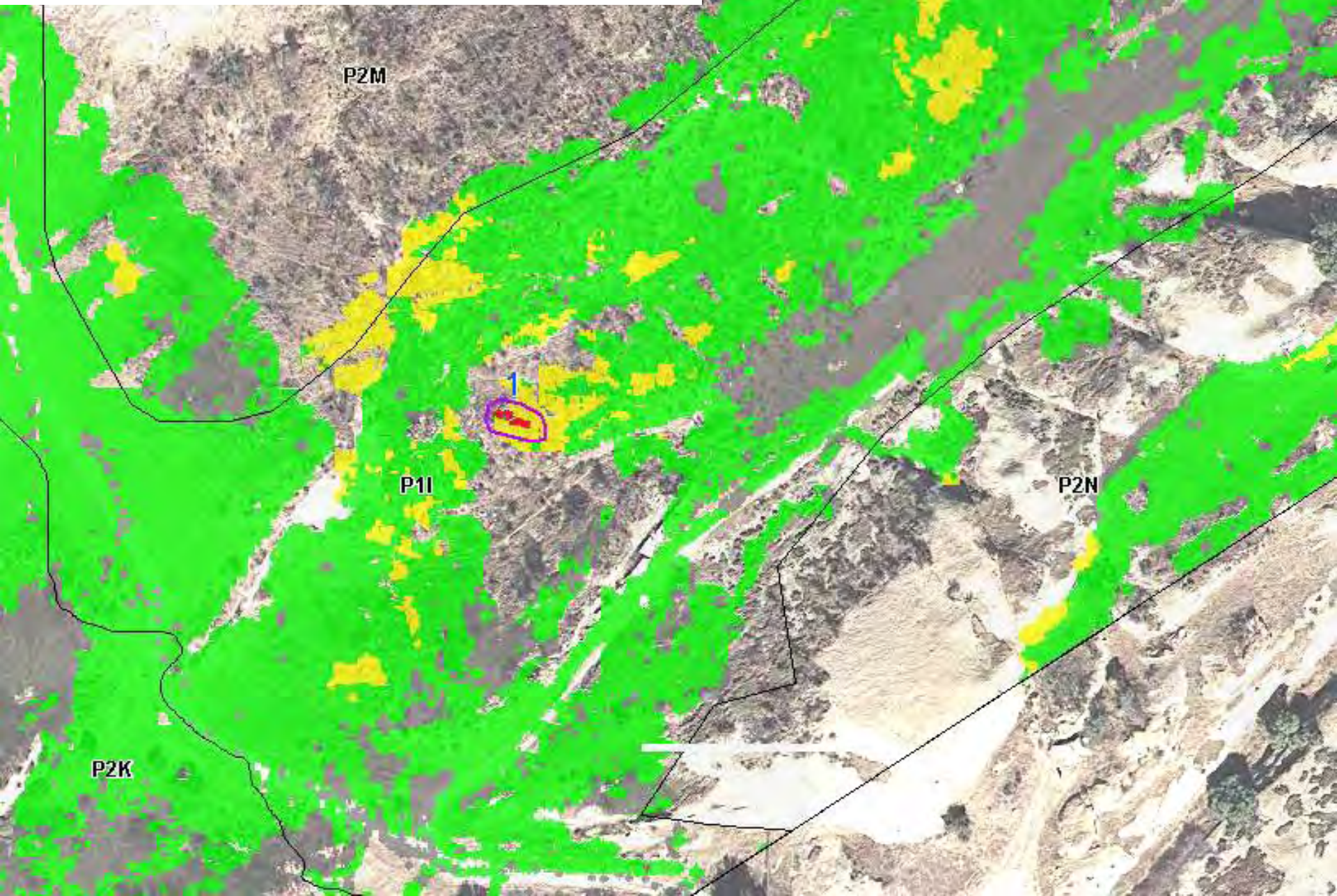
# NBZ West PGRAY P1C



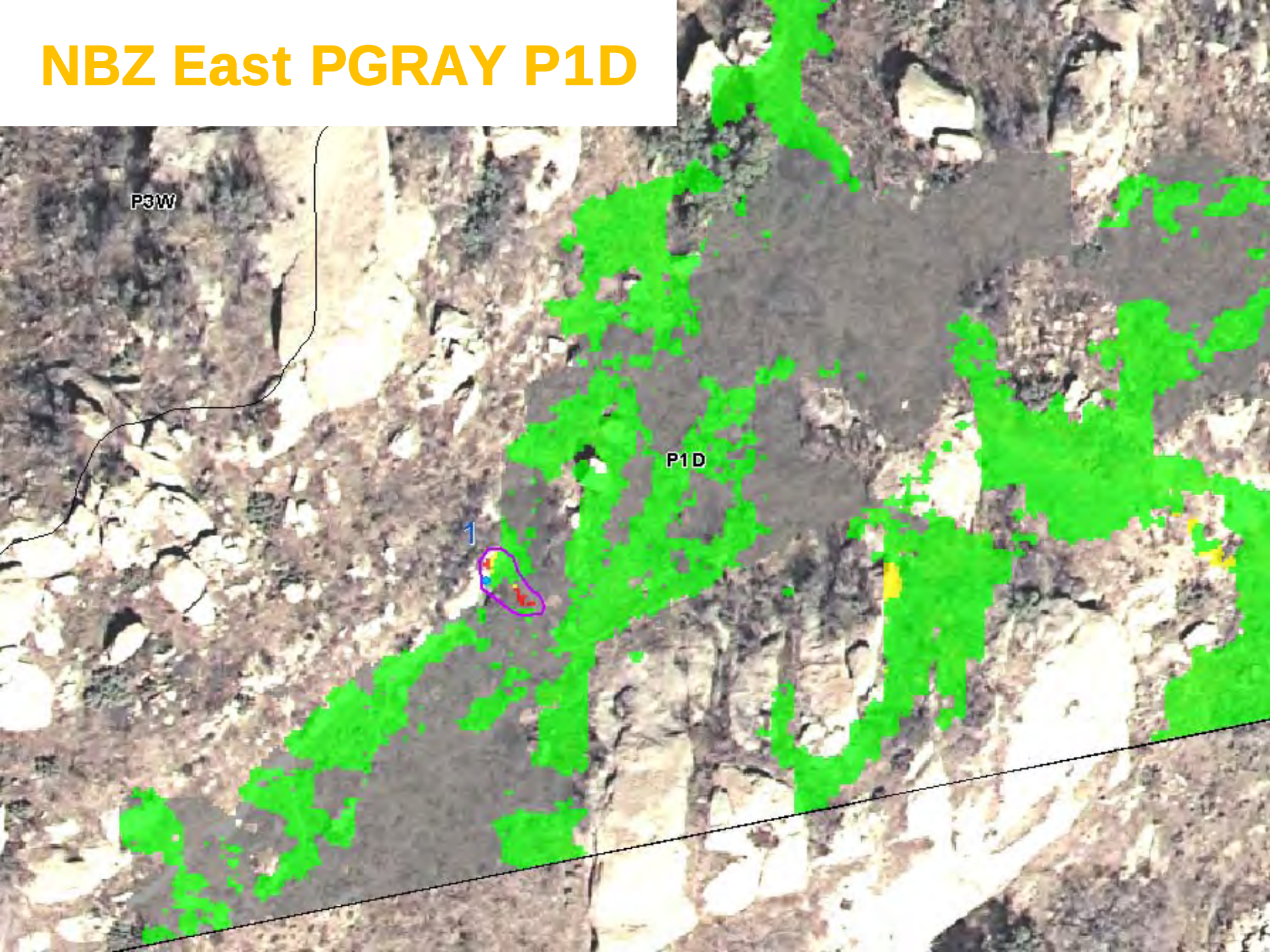
# Terrain Example Photo of NBZ West PGRAY P1C-6



# NBZ West PGRAY P1I



# NBZ East PGRAY P1D



# Evaluation of NBZ W and NBZ E Potential GRAYs

| Locations | Evaluation |
| --- | --- |
| All locations | Not a GRAY; NORM |
| NORM is Naturally Occurring Radioactive Materials (Uranium, Thorium, and Potassium-40) | |

# Questions?

# Thank you!

PRELIMINARY

# Figure 9.11
## *Gamma Anomalies*
## *Northern Buffer Zone East*
## Former Santa Susana Field Laboratory

U.S. EPA Region 9

**Legend**

- PGRAY Location
- PGRAY Boundary
- Priority Area Boundary

**Total Count (CPS)**

14000 17000 20000 23000

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(9-11)_Gamma_Radiation_Anomalies.mxd
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PRELIMINARY

# Figure 9.12
## *Gamma Anomalies*
## *Northern Buffer Zone West*
## Former Santa Susana Field Laboratory

U.S. EPA Region 9

**Legend**

- PGRAY Location
- PGRAY Boundary
- Priority Area Boundary

P3V P3U P1C P1B P3U P3T P3T P2O P1A P3T P3S P2M P2L P1I P3S P2N P2K P3S

Total Count (CPS)
13000 15000 17000 19000

N

0 250 500 1000
Scale In Feet

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(9-12)_Gamma_Radiation_Anomalies.mxd
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# Geophysical Investigation

- **RED** **EM31**: differences in soil conductivity, lateral changes in soil properties, density) sub-surface metal/utilities, containers & disturbed area (burial trenches)

- **BLUE** **Magnetometer**: ferrous (iron based) material Geologic features buried steel containers, unmapped utilities, UST's & demolition debris containing rebar & scrap metal

- **GREEN** **Ground Penetrating Radar (GPR)**: lateral & vertical (substrate) changes in electrical soil properties & subsurface materials, buried containers, UST's & utilities, burial trench & disturbed area/ higher resolution than other methodologies.

# Geophysical Investigation

- **Point Source:** A single or small clustered discrete target
- **Linear:** Follow a line, unmapped utilities & other linear features, such as drainage, pathways & building footings
- **Broad:** Larger target or a cluster of many targets. Burial trench, disturbed area, UST.
- **Area:** Dashed lines boundary of a generally larger area of a common characteristic, such as landfills

North of Building 203 Complex

Northern Storage PCB Areas 1&2

Ad Hoc Area

Wells Area

0 85 170 340
Scale In Feet

0 100 200 400
Scale In Feet

## Legend

### Centerline Roads
- Primary Roads
- Secondary Roads
- Tertiary Roads

### Buildings
- Demolished
- Existing

### Geophysical Anomalies
- Terrain Conductivity
- Magnetometer
- Ground Penetrating Radar
- Cut and Fill Boundaries
- Magnetometer Anomaly Linear
- Terrian Conductivity Anomaly Linear
- Ground Penetrating Radar
- Interpreted Drain Remnant
- Point Source Magnetometer Anomaly
- Point Source Terrain Conductivity Anomaly

### Surface Water
- Intermittent Stream
- Permanent Stream
- Surface Water
- Lined Channel

### Surface Water Flow
- Surface Water Flow (From Boeing Database, 2008)
- Drains
- Wells

### Surface Features
- Channel
- Drain
- Drain
- Drainage Divide
- Gutter
- Tank
- Tank
- Vault
- Well

### Utilities
- Gas
- Storm Drain
- Sanitary Sewer
- Water
- Water (Removed)
- Water (Removed)
- Pipes (Unknown Type)
- Pipes (Unknown Type)

N

HGL—Geophysical Investigation Report,
SSFL—Ventura County, California

# *Northern Buffer Zone Anomalies*
# Santa Susana Field Laboratory

**U.S. EPA Region 9**

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*2/21/2012 pbillock*
*Source:HGL 2010, CIRGIS 2007*
*Coordinate System: NAD83 CA State Plane V*

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# NBZ NE Proposed Soil Samples
# Santa Susana Field Laboratory

**U.S. EPA Region 9**

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## Legend

### Proposed NBZ SampleLocations

**SampleType**

- Surface (Random)
- Drainage
- Drainage Subsurface
- Subsurface
- Surface Subsurface
- Sediment Sample Locations
- PGRAY Locations
- Magnetometer Anomalies
- ScreenLayer
- Magnetometer
- Terrain Conductivity
- Subareas

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NBZ_SampleLocationsE_31x44.mxd
2/27/2012 pblilock

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# NBZ NW Proposed Soil Samples
# Santa Susana Field Laboratory

**U.S. EPA Region 9**

PRELIMINARY

## Legend

### Proposed NBZ SampleLocations

**SampleType**

- Surface (Random)
- Drainage
- Drainage Subsurface
- Subsurface
- Surface Subsurface
- Sediment Sample Locations
- PGRAY Locations
- Magnetometer Anomalies
- ScreenLayer
- Magnetometer
- Terrain Conductivity
- Subareas

BZ-NW

Subarea 7
Subarea 5A
Subarea 5B
Subarea 5C
Subarea 5D-North
Subarea 5D-South
Subarea 8-North
Subarea 8-South

EPASED01 EPASED02 EPASED03 EPASED04 EPASED05 EPASED06 EPASED07 EPASED08 EPASED09 EPASED10 EPASED11 EPASED12 EPASED13 EPASED14 EPASED34 EPASED35 EPASED36 EPASED37 EPASED38 EPASED39

PGRAYP1C-1 PGRAYP1C-2 PGRAYP1C-3 PGRAYP1C-4 PGRAYP1C-5 PGRAYP1C-6 PGRAYP1C-7 PGRAYP1C-8 PGRAYP1C-9 PGRAYP1C-10 PGRAYP1C-11 PGRAYP1C-12 PGRAYP1C-13 PGRAYP1C-14 PGRAYP1C-15 PGRAYP1C-16 PGRAYP1C-17 PGRAYP1C-18
PGRAYP1A-1 PGRAYP1A-2 PGRAYP1A-3 PGRAYP1A-4 PGRAYP1A-5

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33

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NBZ_SampleLocationsW_31x44.mxd
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# Subarea 5B Summary of Results Exceeding RTLs

| Sample Type | total | surface | subsurface | drainage |
|---|---|---|---|---|
| Samples Collected | 466 | 188 | 249 | 29 |
| Samples Exceeded | 12 | 8 | 0 | 4 |
| NORM Exceedances | 0 | 0 | 0 | 0 |
| Radionuclides Found | Cs-137 (10), Sr-90 (1), Eu-152 (1) | | | |
| Exceedance Ratios (= Activity / RTL) | 10 – 1 = All 12 Exceedances | | | |

# Subarea 5B
## *Round 2 Step-out Plan Overview*
## Former Santa Susana Field Laboratory

**U.S. EPA Region 9**

PRELIMINARY

Location ID:332
Sample ID: 20567
Sample Depth:0-0.5 ft
Nuclide: Europium
Activity: 0.070
RTL :0.056

Location ID:316
Sample ID: 20695
Sample Depth:0-0.5 ft
Nuclide: Strontium
Activity: 0.563
RTL :0.485

Location ID:212
Sample ID: 20456
Sample Depth:0-0.5 ft
Nuclide: Cesium-137
Activity: 0.252
RTL :0.207

Location ID:214
Sample ID: 20458
Sample Depth:0-0.5 ft
Nuclide: Cesium-137
Activity: 0.552
RTL :0.207

Location ID:218
Sample ID: 20463
Sample Depth:0-0.5 ft
Nuclide: Cesium-137
Activity: 0.294
RTL :0.207

Location ID:219
Sample ID: 20464
Sample Depth:0-0.5 ft
Nuclide: Cesium-137
Activity: 0.444
RTL :0.207

Location ID:223
Sample ID: 20471
Sample Depth:0-0.5 ft
Nuclide: Cesium-137
Activity: 0.813
RTL :0.207

Location ID:211
Sample ID: 20455
Sample Depth:0-0.5 ft
Nuclide: Cesium-137
Activity: 0.213
RTL :0.207

Location ID:221
Sample ID: 20467
Sample Depth:0-0.5 ft
Nuclide: Cesium-137
Activity: 0.626
RTL :0.207

Location ID:225
Sample ID: 20475
Sample Depth:0-0.5 ft
Nuclide: Cesium-137
Activity: 0.313
RTL :0.207

Location ID:224
Sample ID: 20473
Sample Depth:0-0.5 ft
Nuclide: Cesium-137
Activity: 0.911
RTL :0.207

Location ID:222
Sample ID: 20469
Sample Depth:0-0.5 ft
Nuclide: Cesium-137
Activity: 0.623
RTL :0.207

## Legend

### Step-out Locations
**SampleType**
- S
- S/SS
- SS
- Samples above R.T.L.s

### Soil Sample Locations
**SampleType**
- Drainage
- Subsurface
- Surface Subsurface
- ScreenLayer
- Chemical Likely Remediation Zones
- D & D Likely Remediation Zones

Location ID: 237
Sample ID: 60367
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 0.325 pCi/g
RTL: 0.207 pCi/g

1 - 10 x RTL value

### Geophysical Anomalies
- Terrain Conductivity
- Magnetometer
- Cut and Fill Boundaries
- Magnetometer Anomaly Linear
- Terrian Conductivity Anomaly Linear
- Point Source Magnetometer Anomaly
- Point Source Terrain Conductivity Anomaly

### Gamma Total Count (cps)
12700 — 14100 — 15500 — 16900

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2/27/2012 pbillock

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# Subarea 6 Summary of Results Exceeding RTLs

| Sample Type | total | surface | subsurface | drainage |
|---|---|---|---|---|
| Samples Collected | 437 | 167 | 246 | 24 |
| Samples Exceeded | 75 | 50 | 24 | 1 |
| NORM Exceedances | 4 | 4 | 0 | 0 |
| Radionuclides Found | Cs-137 (60), C-14 (9), Sr-90 (9), H-3 (8), Eu-152 (2), Cs-134 (1), Co-60 (1), Np-239 (1), Pu-239/240 (1) | | | |
| Exceedance Ratios (= Activity / RTL) | 1000 – 100 = 7 exceedances<br>100 – 10 = 26 exceedances<br>10 – 1 = 60 exceedances | | | |

# Subarea 6
# Samples above RTLs and Step-out Locations

**U.S. EPA Region 9**

## Legend

### Step-out Locations

**SampleType**

- Drainage Subsurface
- Surface
- Surface Subsurface
- Subsurface
- Samples above R.T.L.s

### Soil Sample Locations

**SampleType**

- Drainage
- Subsurface
- Surface Subsurface
- ScreenLayer
- Chemical Likely Remediation Zones
- D & D Likely Remediation Zones

Location ID: 237
Sample ID: 60367
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 0.325 pCi/g
RTL: 0.207 pCi/g — 1 - 10 x RTL value

Location ID: 314
Sample ID: 60494
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 4.61 pCi/g
RTL: 0.207 pCi/g — 10.001 - 100 x RTL value

Location ID: 306
Sample ID: 60478
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 198 pCi/g
RTL: 0.207 pCi/g — 100.001 - 1000 x RTL value

**Geophysical Anomalies**

- Terrain Conductivity
- Magnetometer
- Cut and Fill Boundaries
- Magnetometer Anomaly Linear
- Terrian Conductivity Anomaly Linear
- Point Source Magnetometer Anomaly
- Point Source Terrain Conductivity Anomaly

**Gamma Total Count (cps)**

13000 | 14800 | 16600 | 18400

PRELIMINARY

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# Subarea 6
# Samples above RTLs and Step-out Locations

**U.S. EPA Region 9**

PRELIMINARY

Location ID: 134
Sample ID: 60190
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 0.934 pCi/g
RTL: 0.207 pCi/g

Location ID: 134
Sample ID: 60190
Sample Depth: 0.00 - 0.50
Nuclide :Sr-90
Activity: 1.07 pCi/g
RTL: 0.485 pCi/g

Location ID: 134
Sample ID: 60190
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 0.935 pCi/g
RTL: 0.207 pCi/g

Location ID: 142
Sample ID: 60199
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 0.596 pCi/g
RTL: 0.207 pCi/g

Location ID: 142
Sample ID: 60199
Sample Depth: 0.00 - 0.50
Nuclide :Sr-90
Activity: 0.56 pCi/g
RTL: 0.485 pCi/g

Location ID: 142
Sample ID: 60199
Sample Depth: 0.00 - 0.50
Nuclide :C-14
Activity: 35.5 pCi/g
RTL: 2.96 pCi/g

Location ID: 142
Sample ID: 60200
Sample Depth: 1.00 - 2.00
Nuclide :Cs-137
Activity: 0.548 pCi/g
RTL: 0.207 pCi/g

Location ID: 142
Sample ID: 60200
Sample Depth: 1.00 - 2.00
Nuclide :Sr-90
Activity: 0.934 pCi/g
RTL: 0.485 pCi/g

Location ID: 133
Sample ID: 60188
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 0.422 pCi/g
RTL: 0.207 pCi/g

Location ID: 128
Sample ID: 60179
Sample Depth: 1.00 - 5.00
Nuclide :H-3
Activity: 1170 pCi/g
RTL: 11.9 pCi/g

Location ID: 131
Sample ID: 60184
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 0.535 pCi/g
RTL: 0.207 pCi/g

Location ID: 131
Sample ID: 60184
Sample Depth: 0.00 - 0.50
Nuclide :Sr-90
Activity: 0.523 pCi/g
RTL: 0.485 pCi/g

Location ID: 130
Sample ID: 60182
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 0.355 pCi/g
RTL: 0.207 pCi/g

Location ID: 130
Sample ID: 60182
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 0.347 pCi/g
RTL: 0.207 pCi/g

Location ID: 130
Sample ID: 60183
Sample Depth: 1.00 - 5.00
Nuclide :H-3
Activity: 1270 pCi/g
RTL: 11.9 pCi/g

Location ID: 132
Sample ID: 60186
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 0.257 pCi/g
RTL: 0.207 pCi/g

Location ID: 293
Sample ID: 60452
Sample Depth: 0.00 - 0.50
Nuclide :H-3
Activity: 1190 pCi/g
RTL: 11.9 pCi/g

Location ID: 293
Sample ID: 60452
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 46.4 pCi/g
RTL: 0.207 pCi/g

Location ID: 293
Sample ID: 60453
Sample Depth: 1.00 - 2.50
Nuclide :Cs-137
Activity: 1.19 pCi/g
RTL: 0.207 pCi/g

Location ID: 144
Sample ID: 60203
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 0.321 pCi/g
RTL: 0.207 pCi/g

Location ID: 145
Sample ID: 60205
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 0.378 pCi/g
RTL: 0.207 pCi/g

Location ID: 294
Sample ID: 60454
Sample Depth: 0.00 - 0.25
Nuclide :Cs-137
Activity: 11.3 pCi/g
RTL: 0.207 pCi/g

Location ID: 294
Sample ID: 60454
Sample Depth: 0.00 - 0.25
Nuclide :Sr-90
Activity: 2.39 pCi/g
RTL: 0.485 pCi/g

Location ID: 146
Sample ID: 60207
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 2.33 pCi/g
RTL: 0.207 pCi/g

Location ID: 148
Sample ID: 60211
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 1.01 pCi/g
RTL: 0.207 pCi/g

Location ID: 149
Sample ID: 60213
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 4.36 pCi/g
RTL: 0.207 pCi/g

Location ID: 278
Sample ID: 60422
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 0.405 pCi/g
RTL: 0.207 pCi/g

Location ID: 298
Sample ID: 60462
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 3.02 pCi/g
RTL: 0.207 pCi/g

Location ID: 296
Sample ID: 60458
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 1.35 pCi/g
RTL: 0.207 pCi/g

Location ID: 96
Sample ID: 60137
Sample Depth: 1.00 - 2.00
Nuclide :H-3
Activity: 1200 pCi/g
RTL: 11.9 pCi/g

Location ID: 86
Sample ID: 60127
Sample Depth: 1.00 - 5.00
Nuclide :C-14
Activity: 35.8 pCi/g
RTL: 2.96 pCi/g

Location ID: 297
Sample ID: 60460
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 2.51 pCi/g
RTL: 0.207 pCi/g

Location ID: 150
Sample ID: 60216
Sample Depth: 1.00 - 2.25
Nuclide :C-14
Activity: 36 pCi/g
RTL: 2.96 pCi/g

Location ID: ---
Sample ID: 60215
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 1.03 pCi/g
RTL: 0.207 pCi/g

Location ID: 103
Sample ID: 60146
Sample Depth: 1.00 - 5.00
Nuclide :H-3
Activity: 1160 pCi/g
RTL: 11.9 pCi/g

Location ID: 69
Sample ID: 60110
Sample Depth: 1.00 - 5.00
Nuclide :C-14
Activity: 33.8 pCi/g
RTL: 2.96 pCi/g

Location ID: 81
Sample ID: 60122
Sample Depth: 1.00 - 5.00
Nuclide :H-3
Activity: 1180 pCi/g
RTL: 11.9 pCi/g

Location ID: 81
Sample ID: 60122
Sample Depth: 1.00 - 5.00
Nuclide :C-14
Activity: 35.9 pCi/g
RTL: 2.96 pCi/g

Location ID: 292
Sample ID: 60450
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 0.894 pCi/g
RTL: 0.207 pCi/g

Location ID: 290
Sample ID: 60446
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 24.3 pCi/g
RTL: 0.207 pCi/g

Location ID: 290
Sample ID: 60446
Sample Depth: 0.00 - 0.50
Nuclide :Sr-90
Activity: 21.3 pCi/g
RTL: 0.485 pCi/g

Location ID: 290
Sample ID: 60446
Sample Depth: 0.00 - 0.50
Nuclide :Co-60
Activity: 0.048 pCi/g
RTL: 0.028 pCi/g

Location ID: 290
Sample ID: 60446
Sample Depth: 0.00 - 0.50
Nuclide :Pu-239/240
Activity: 0.0515 pCi/g
RTL: 0.0404 pCi/g

Location ID: 98
Sample ID: 60139
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 1.19 pCi/g
RTL: 0.207 pCi/g

Location ID: 288
Sample ID: 60442
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 1.41 pCi/g
RTL: 0.207 pCi/g

Location ID: 287
Sample ID: 60440
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 0.882 pCi/g
RTL: 0.207 pCi/g

Location ID: 291
Sample ID: 60449
Sample Depth: 1.00 - 2.70
Nuclide :Cs-137
Activity: 1.47 pCi/g
RTL: 0.207 pCi/g

Location ID: 291
Sample ID: 60448
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 2.18 pCi/g
RTL: 0.207 pCi/g

Location ID: 147
Sample ID: 60209
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 0.391 pCi/g
RTL: 0.207 pCi/g

Location ID: 237
Sample ID: 60367
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 0.325 pCi/g
RTL: 0.207 pCi/g

Location ID: 314
Sample ID: 60494
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 4.61 pCi/g
RTL: 0.207 pCi/g

Location ID: 306
Sample ID: 60478
Sample Depth: 0.00 - 0.50
Nuclide :Cs-137
Activity: 198 pCi/g
RTL: 0.207 pCi/g

## Legend

### Step-out Locations

**SampleType**

- Drainage Subsurface
- Surface
- Surface Subsurface
- Subsurface
- Samples above R.T.L.s

### Soil Sample Locations

**SampleType**

- Drainage
- Subsurface
- Surface Subsurface
- Chemical Likely Remediation Zones
- ScreenLayer
- D & D Likely Remediation Zones

1 - 10 x RTL value

10.001 - 100 x RTL value

100.001 - 1000 x RTL value

**Geophysical Anomalies**

- Terrain Conductivity
- Magnetometer
- Cut and Fill Boundaries
- Magnetometer Anomaly Linear
- Terrian Conductivity Anomaly Linear
- Point Source Magnetometer Anomaly
- Point Source Terrain Conductivity Anomaly

**Gamma Total Count (cps)**

12700 — 14100 — 15500 — 16900

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2/27/2012 phillock

HGL HydroGeoLogic, Inc

# Major Milestones

| | |
|---|---|
| • Historical Site Assessment Report | May 2012 |
| • Gamma Scanning Report | May 2012 |
| • Groundwater Report | May 2012 |
| • Completion of Soil Sampling | July 2012 |
| • Demobilization | Sept 2012 |
| • Final Soils Report | Dec 2012 |

# Round 1 Soil Sampling

| Subarea | Planned | Collected | Duplicates | Total | Not Collected |
|---|---|---|---|---|---|
| 3 | 15 | 12 | 1 | 13 | 2 |
| 5A | 379 | 338 | 16 | 354 | 41 |
| 5B | 493 | 466 | 22 | 488 | 27 |
| 5C | 216 | 200 | 10 | 210 | 16 |
| 5D | 486 | 466 | 25 | 491 | 19 |
| 6 | 518 | 437 | 23 | 460 | 81 |
| 7 | 302 | 254 | 13 | 267 | 48 |
| 8 | 304 | 284 | 17 | 301 | 20 |
| TOTAL | 2713 | 2457 | 127 | 2584 | 254 |