
Decommissioning of the Hanford Burial Cribs Controlled Area (BCCA) using the Aerial Measuring Systems Helicopter Emergency Response Acquisition Systems

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U.S. Department of Energy National Nuclear Security Administration

Remote Sensing Laboratory (RSL)



RSL – Andrews
Andrews Air Force Base
Washington, D.C

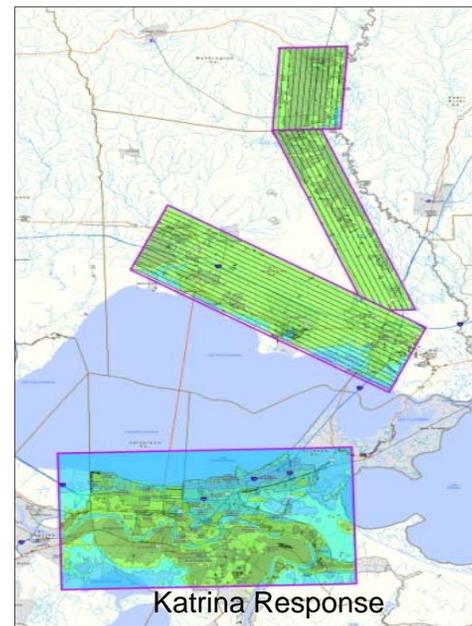


RSL – Nellis
Nellis Air Force Base
Las Vegas, NV

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AMS Program

- Established in 1960
- Originally supported the Nuclear Test Program
- Expanded Mission
 - Emergency Response
 - Baseline Surveys
 - Periodic area monitoring



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Capabilities

Mission Equipment - Aircraft

Beechcraft King Air B-200

- Twin-engine turbo prop
- IFR (all weather) rated
- 260 knots (300 mph) (transition speed)
- Range 1,130 nm (1,300 sm)
- Max endurance 5 hrs (without refueling)

Four-person crew

- Pilot and co-pilot
- Scientist/Health physicist
- Technician/Technologist



Bell-412

- Twin-Pac turboshaft engine
- IFR (all weather) rated
- 120 knots (140 mph) (transition speed)
- Range 360 nm (410 sm)
- Max Endurance 3 hrs (without refueling)

Three-person crew

- Pilot and co-pilot
- Technician/Technologist



Ground Support

- Scientist/Health physicist
- Data Analyst
- Aircraft mechanic

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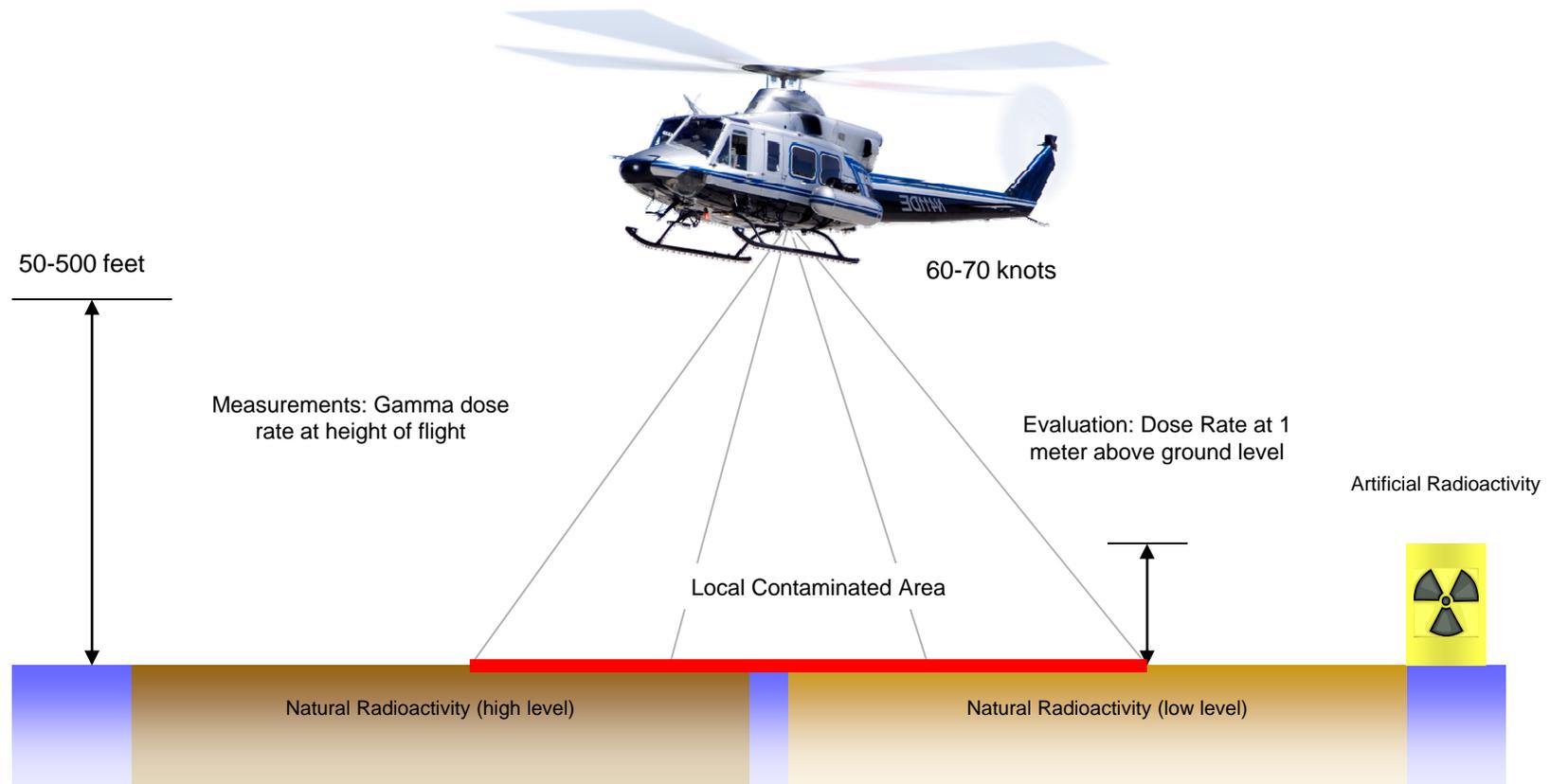
Hanford BCCA Remediation Survey

- OVERVIEW OF HANFORD AERIAL RADIOLOGICAL SURVEYS

Dates	Company	Aircraft	Altitude	Line Spacing	Detectors
July 1959	USGS	Fixed-wing	500'	1 mile	6 4"x2" NaI
1973-1974	EG&G	Fixed-wing & Helicopter	500' 150'	1300-5280' 150'	21 4"x4" NaI 40 5"x2" NaI
May-June 1978	EG&G	Helicopter	200'	250'	20 5"x2" NaI
July-August 1988	EG&G	Helicopter	200'	400'	8 2"x4"x16" NaI
February-March 1996	Bechtel Nevada	Helicopter	200'	400'	8 2"x4"x16" NaI

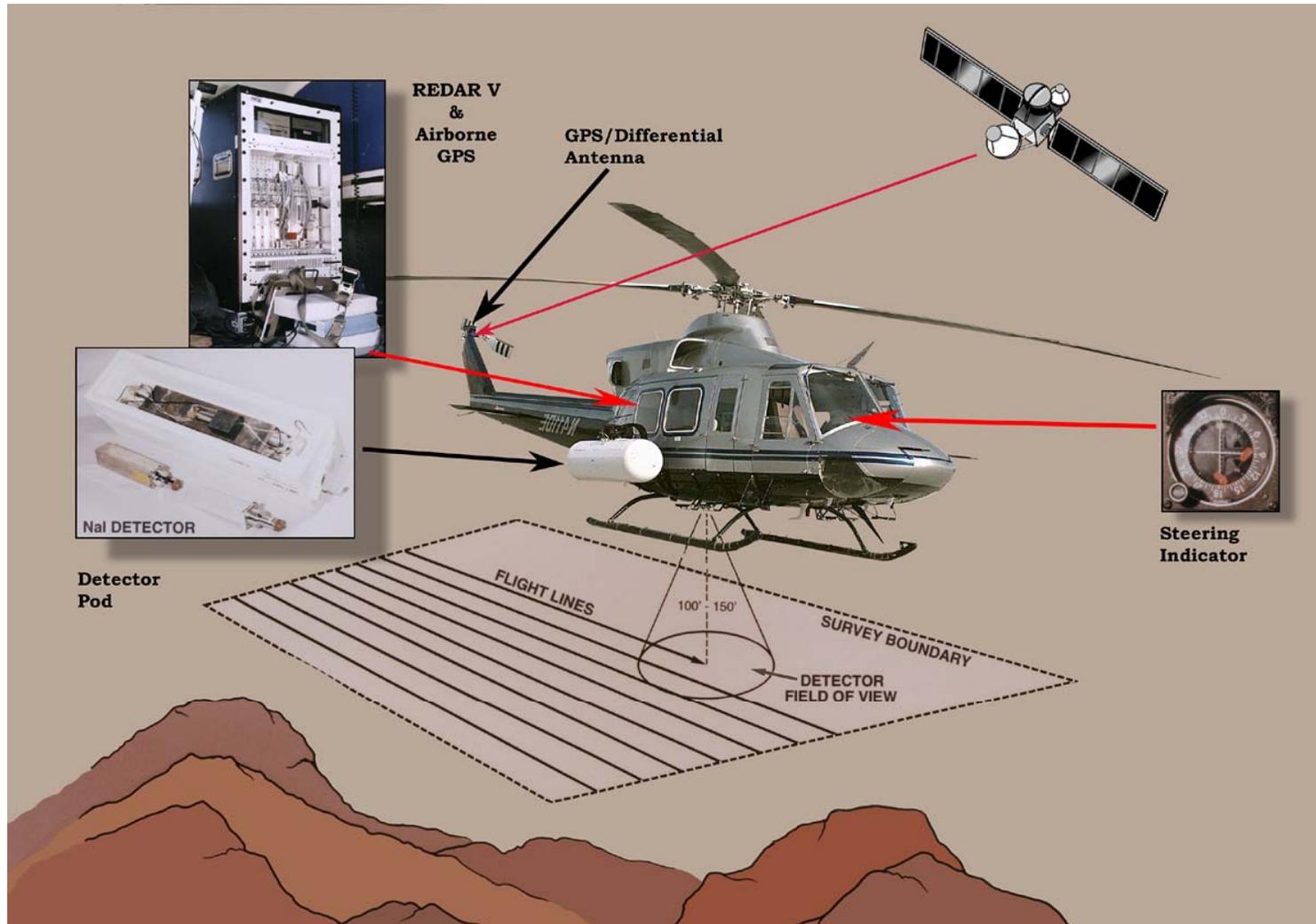
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Aerial Detection Mechanics



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Typical Survey Layout

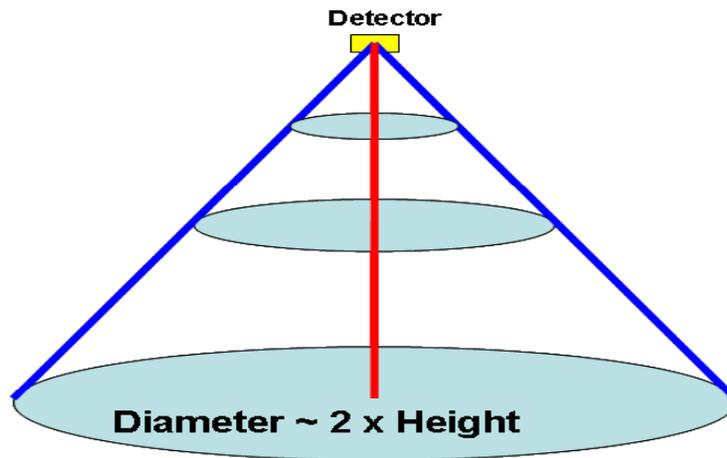


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Altitude Trade-Offs

Low detector

- High Resolution
- Discrete sampling
- Slow coverage
- Atmospheric attenuation is small



High detector

- Low resolution
- Area averaging
- Rapid coverage
- Significant sensitivity loss
- Atmospheric attenuation is large

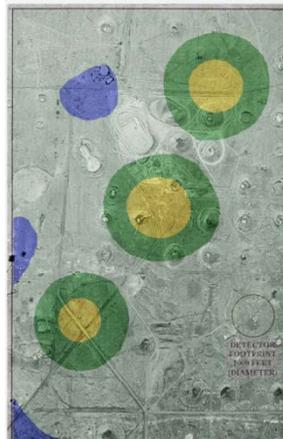
1750 ft



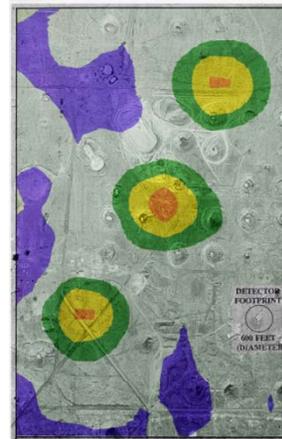
1000 ft



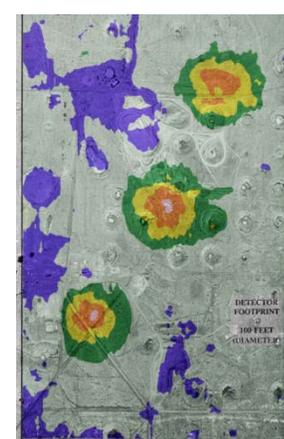
500 ft



200 ft



50 ft



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Helicopter Data Products

Detector Gross Counts



Man-made Algorithm or Specific Isotope Counts



Exposure Rate at 1 meter



Specific Isotope Surface Activity



Specific Isotope Volumetric Activity

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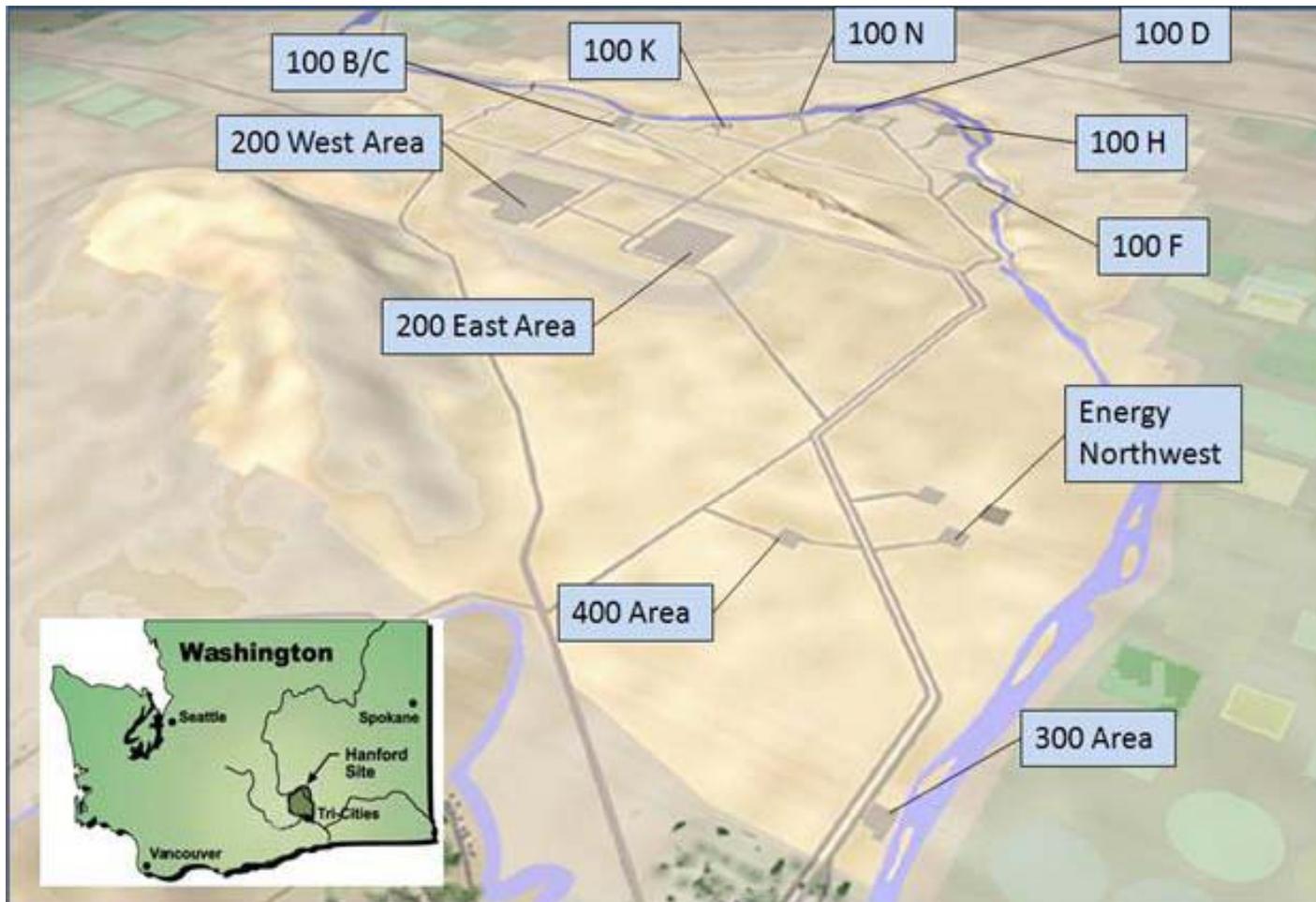


Comparison of Emergency Response Surveys to Environmental Surveys

Parameter	Emergency Response	Environmental
Contaminated Surfaces	Three Dimensional	Two Dimensional
Source Term	Dynamic	Stable
Infrastructure	Yes	No
Clean-up Level	No	Yes

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Hanford, Washington



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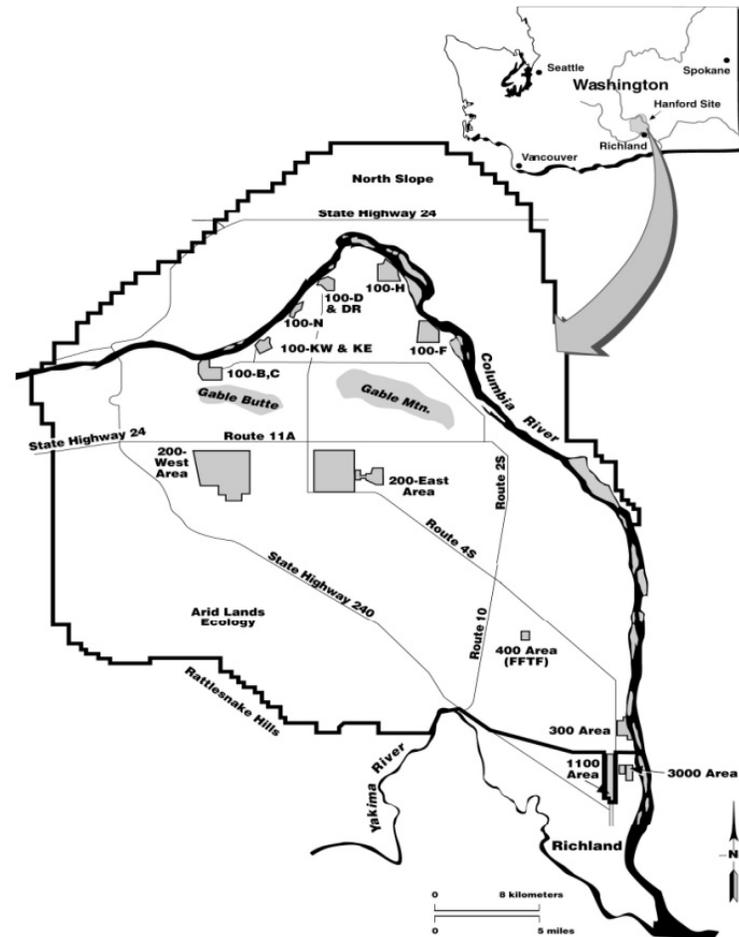


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Background

- Largest Superfund Site in America
- Unique radiation hazards
- Unprecedented volumes of contaminated water and soil
- Vast number of contaminated structures including nuclear reactors, chemical plants for the extraction of nuclear materials and evaporation ponds

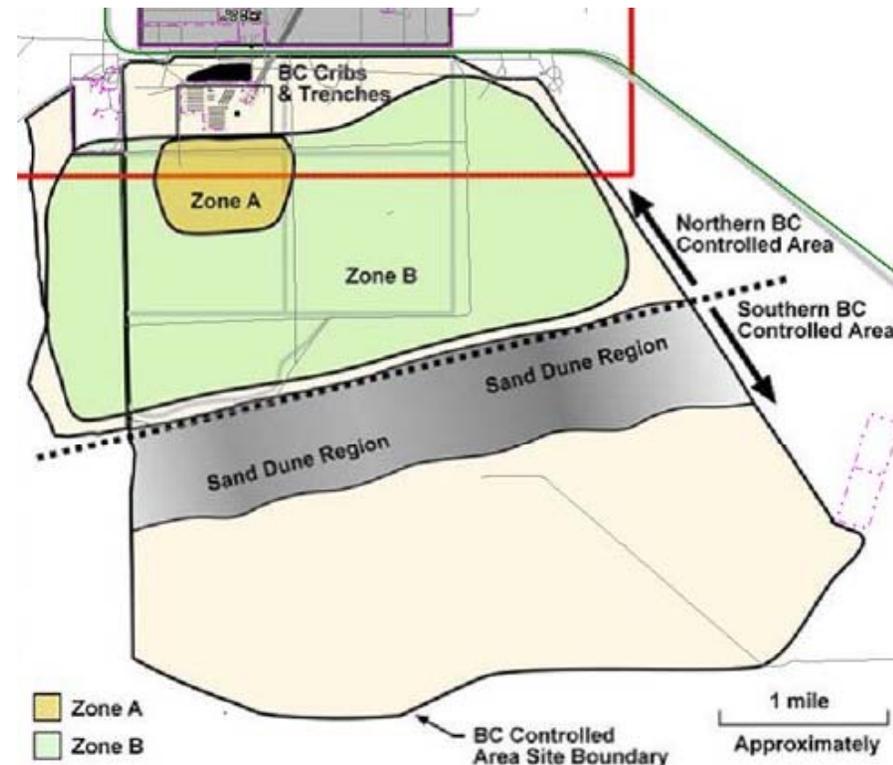
Hanford Site Setting



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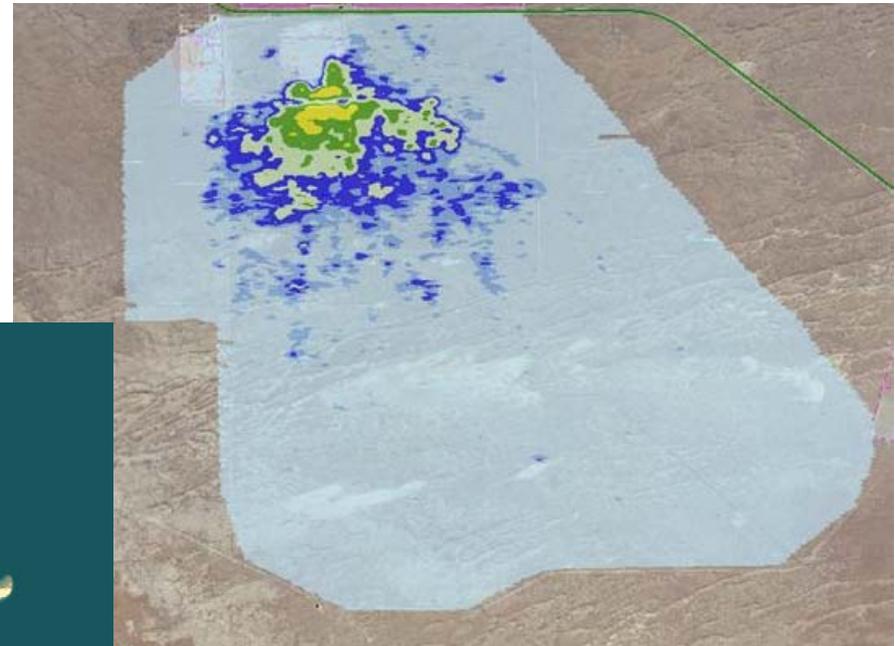
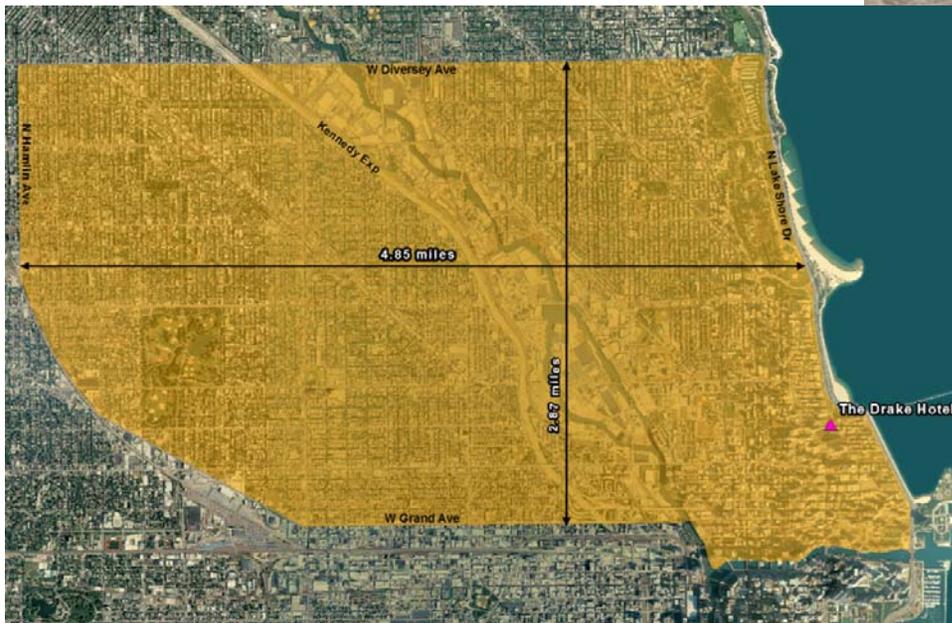
Burial Cribs Control Area (BCCA)

- Divided into regions based upon history and sampling activities
- Liquid waste from processing facilities pumped into trenches
- Material dispersion
 - Wind
 - Animals (lesser extent)
- Trenches covered in 1969
- Primary contaminants of concern
 - Cs-137
 - Sr-90
- Soil sampling performed to develop ratios of Cs/Sr



Size of the Problem

- BCCA approximately 13.4 square miles
- Approximates area/size over Chicago



Considerations and Options

Cleanup Considerations:

- Worker Safety
- Risk to the Environment
- Minimal Environmental Impact
- Cost and Time



Options:

- GPRS Handheld Surveys
 - 50+ Pound Units
 - Walking Survey – lat long
 - Biological Hazards (i.e., snakes, spiders)
 - 6-8 Months Estimate to Complete
- Tractor Surveys
 - Large Old Growth Sagebrush
 - Protected Species Habitat



Aerial Measuring Systems Helicopter Emergency Response Acquisition Systems



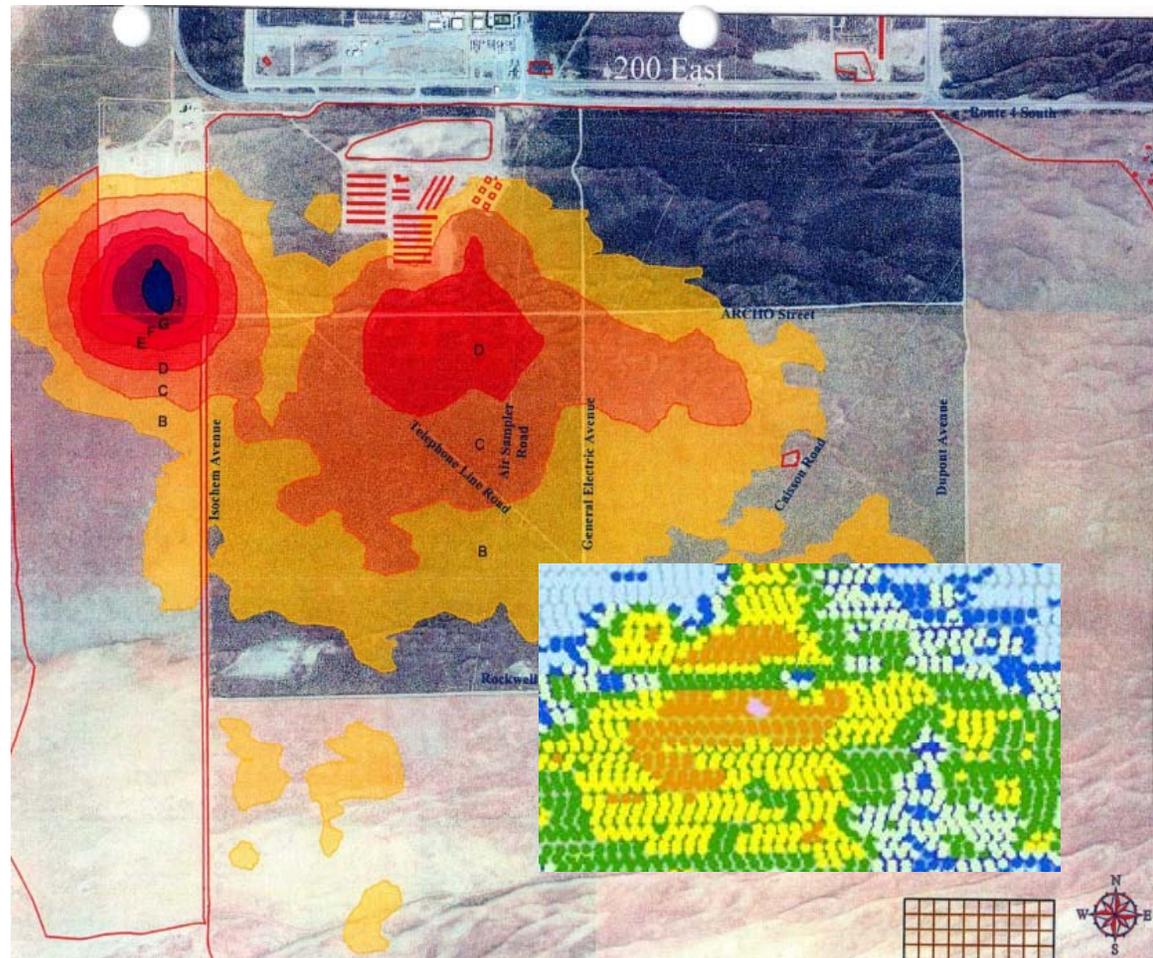
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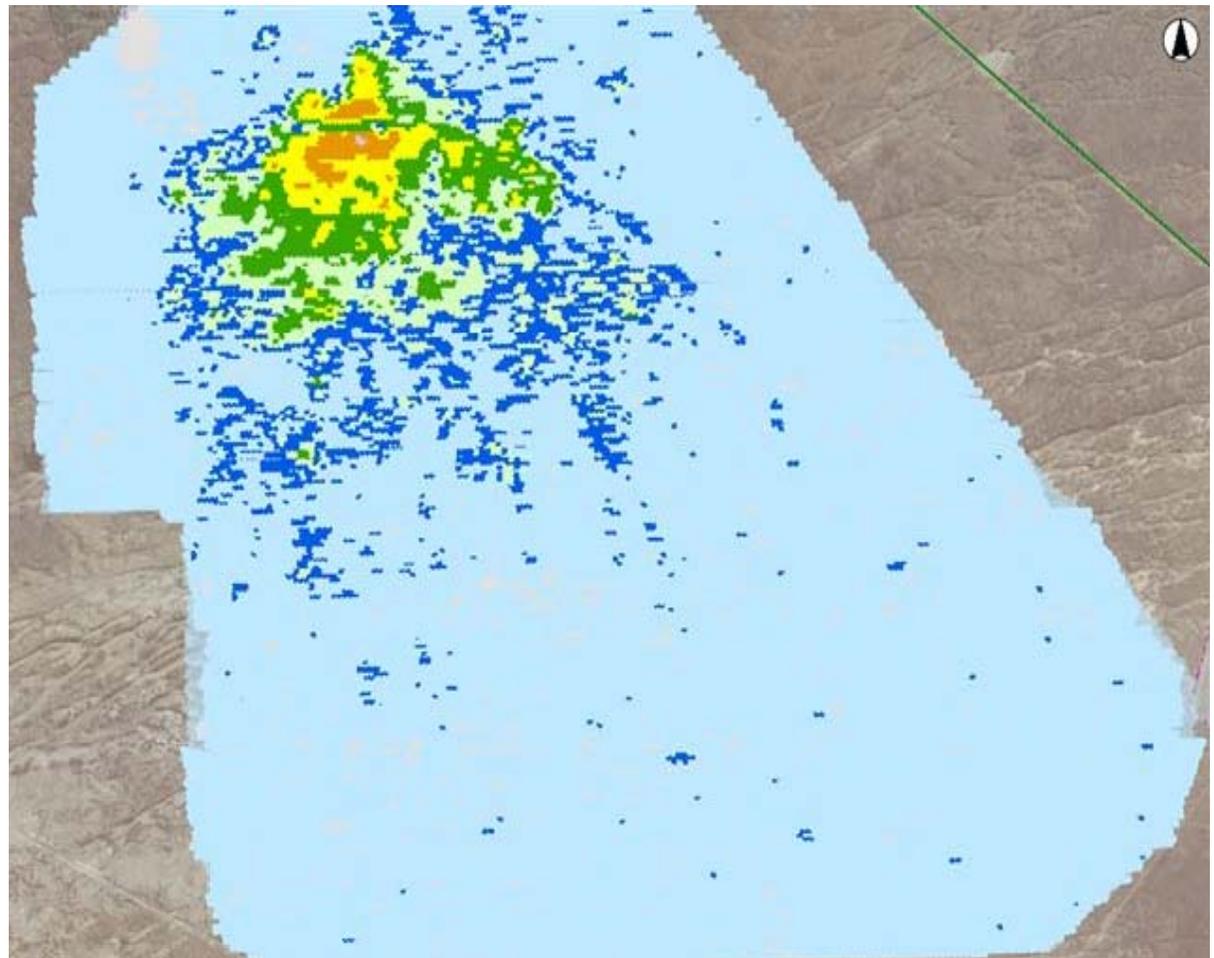
Difference in Resolution

- 200 ft elevation, 400 ft spacing
- 50 ft elevation, 75 ft spacing (inset)



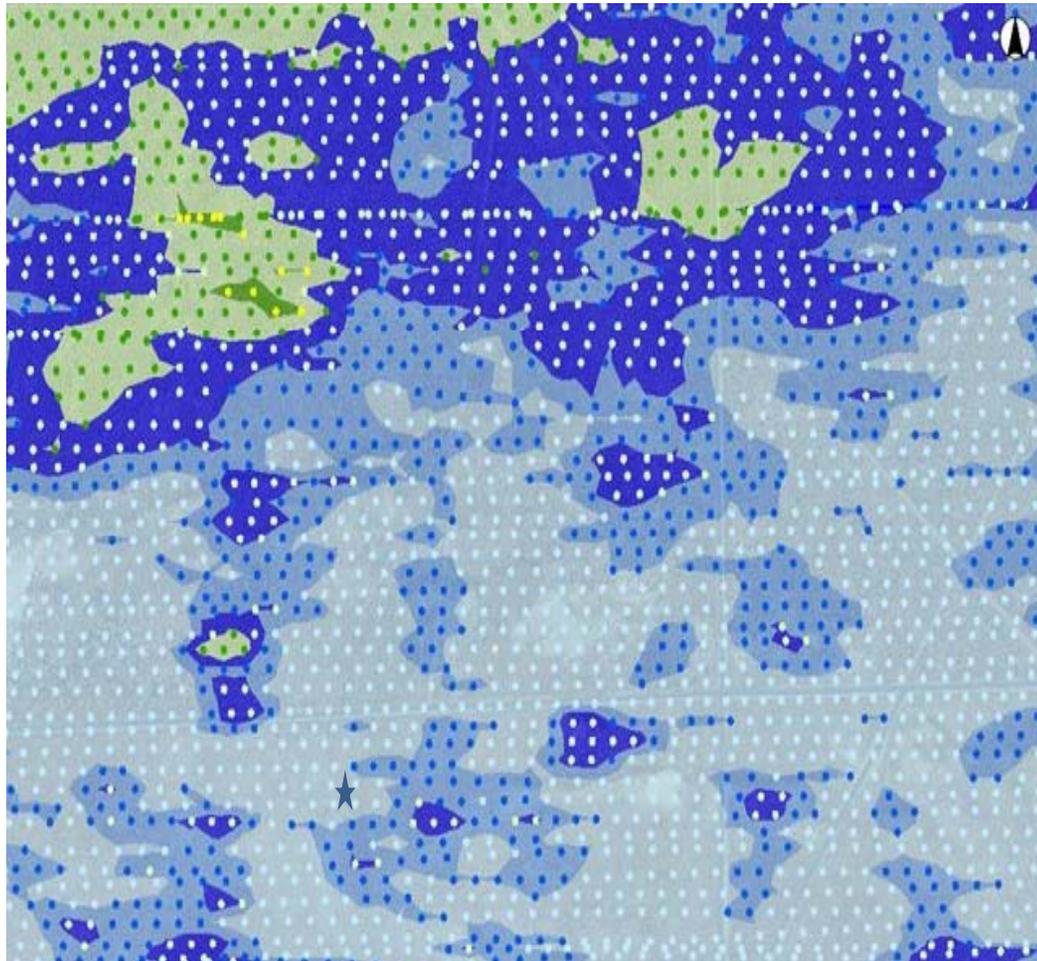
50 Foot Survey

- 50 ft Survey
- Parallel Line Spacing of 75 Feet
- Large, Complex Deposition Patterns



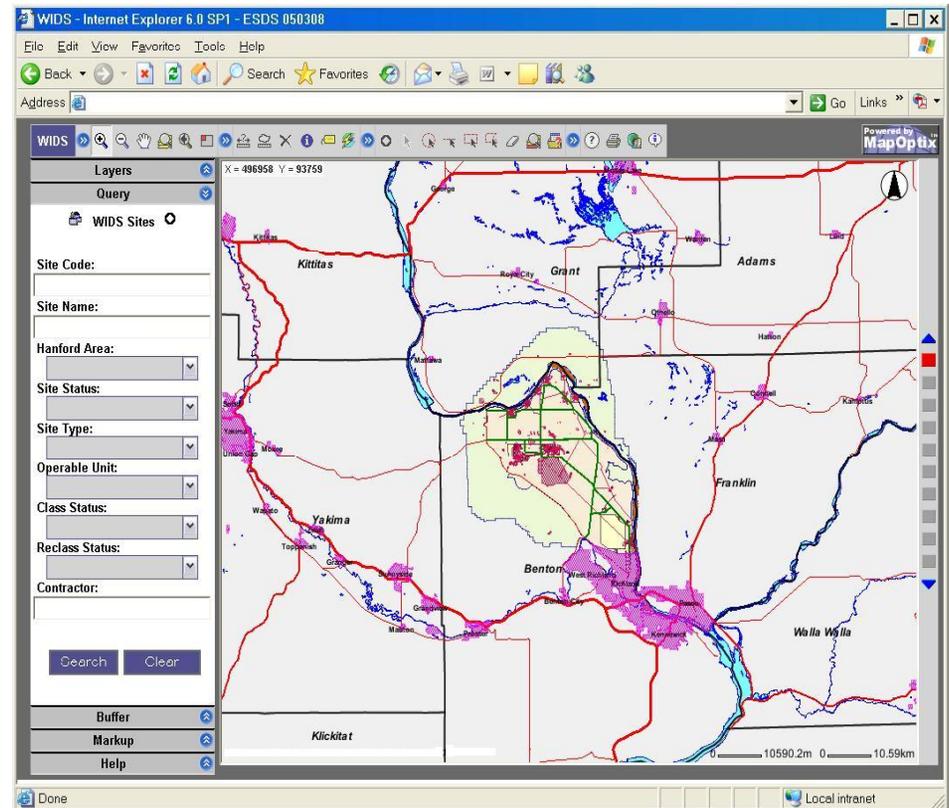
50 Foot Survey

- 50 ft Survey
- Parallel Line Spacing of 75 Feet
- Large, Complex Deposition Patterns
- GPS used for Cleanup/Verification



Web-Based Mapping (QMAP)

- Web-based geospatial data portal
- Available to over 500 Hanford users
- Integrates CAD, GIS and other visual data into a common interface
- Accommodates basic and advanced GIS skills
- Simple web-based administration
- Map layers reusable in mapping applications
- Easy integration of application system data (reports, charts, etc)
- Assists users in accessing environmental and project data from any web browser.



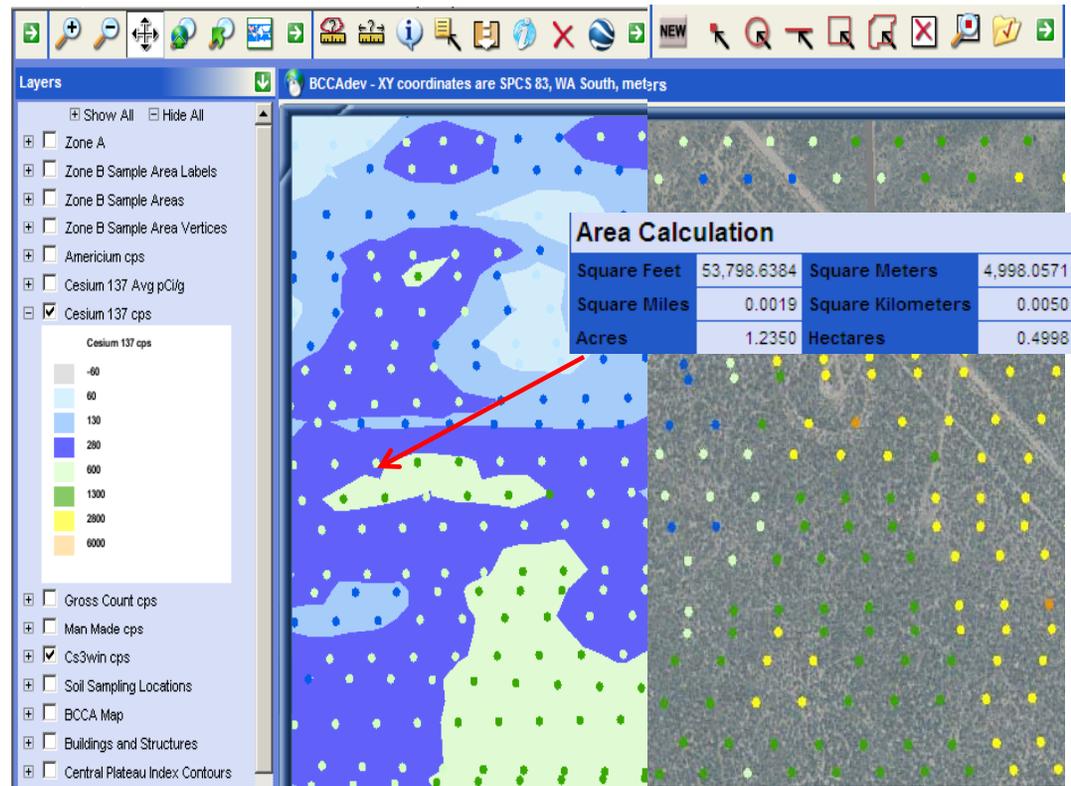
Technologies and Tools

Combines Technologies:

- ESRI ArcGIS Server
- ESRI ArcIMS
- GeoNorth MapOptix
- Custom Code

Built-in tools:

- Markup
- Distance
- Area
- Layers
- Imagery
- Overlays
- Application Links



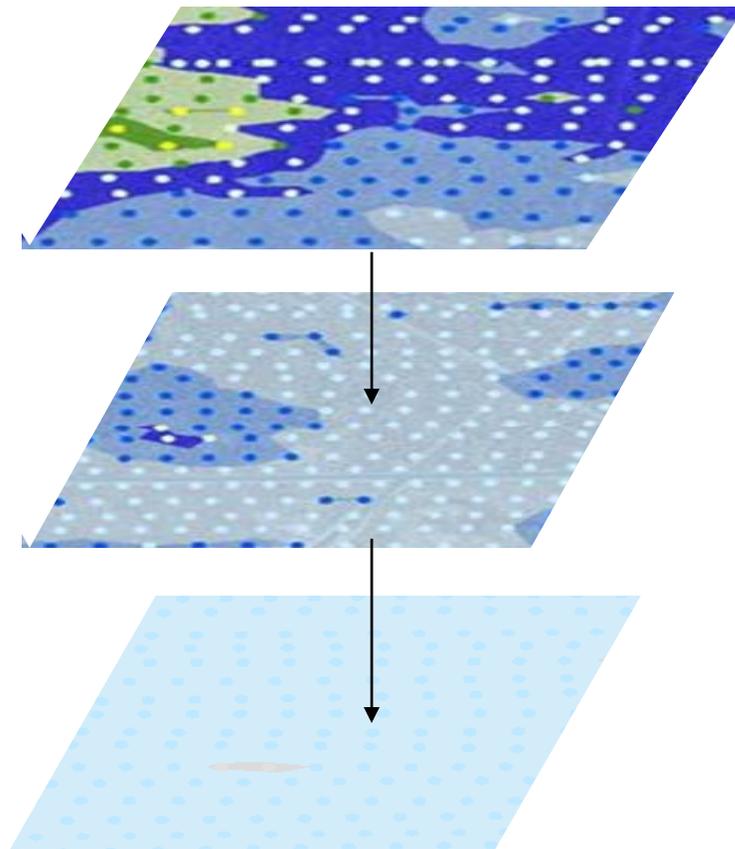
Tracking Progress

Tracking Cleanup Over Time:

- Helicopter Flyover (Initial)
- Verification Surveys (Ongoing)

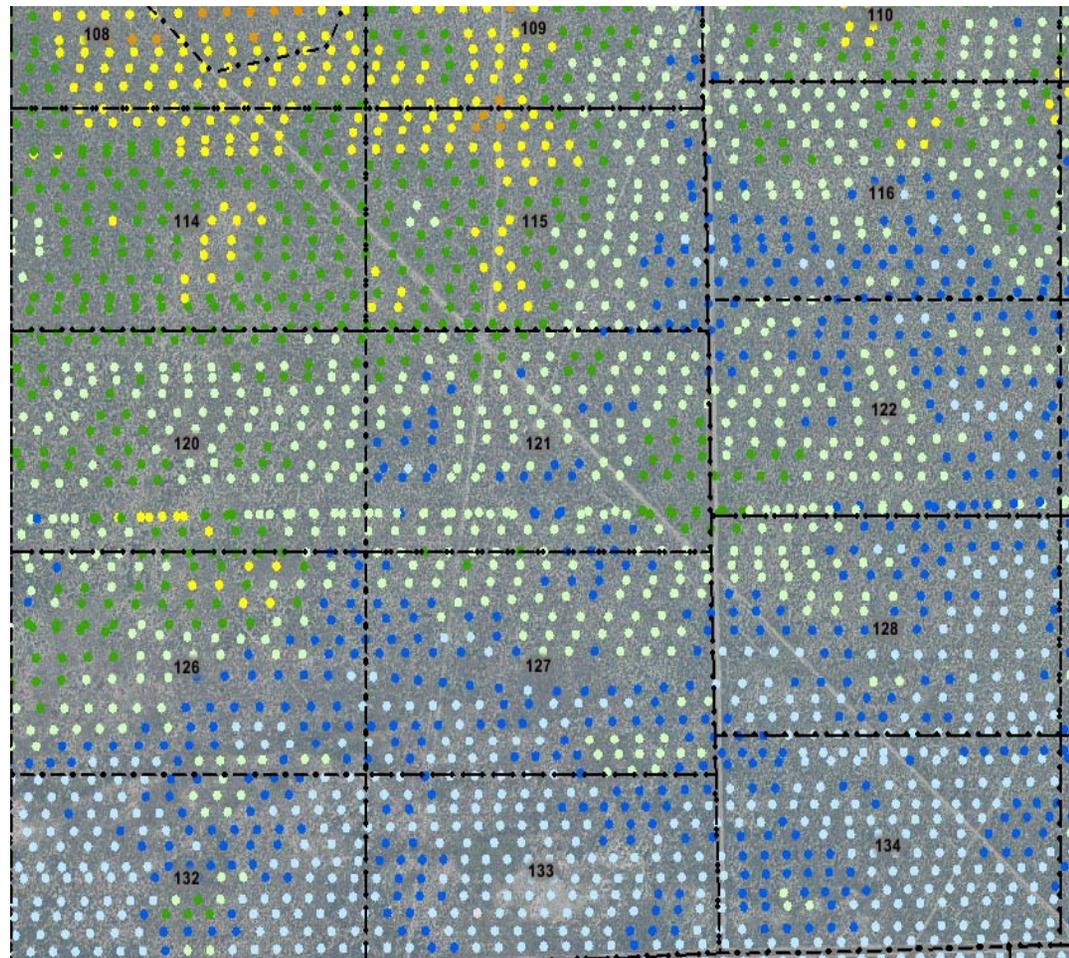
Layering Cleanup Over Time:

- Initial Survey
- After Initial Remedial Actions
- After Final Remedial Actions



Mapping Tools Support Remediation Planning:

- GPS Location
- Cleanup Areas
- Hazards





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