EXIT

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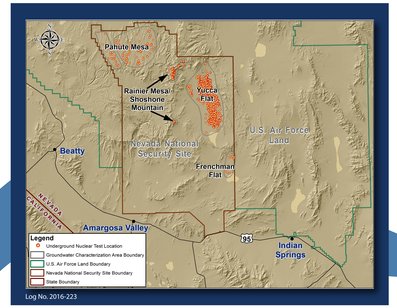
Frenchman Flat A Success Story

START HERE FOR AN OVERVIEW



Log No. 2016-223

Frenchman Flat

- Ten underground nuclear tests
  - Conducted between 1965 and 1971
  - Nine in alluvium and one in a volcanic unit
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Frenchman Flat Timeline

1999–2000
- State approved Phase I investigation plan
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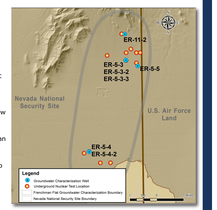

2011–2014
- Initial use-restriction boundaries and regulatory boundary objective identified
- Two wells drilled and tested
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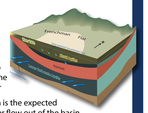
What We Know

- Groundwater flow is extremely slow
- Groundwater flow is to the south-southeast in the alluvial and volcanic aquifers and to the southwestward in the lower carbonate aquifer



- Rock Valley fault system is the expected pathway of groundwater flow out of the basin
- Contaminated groundwater is not forecasted to reach the Rock Valley fault system within 1,000 years

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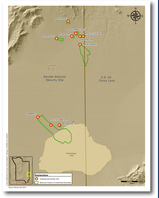
Boundaries

What is a Contaminant Boundary?

Groundwater within this boundary may exceed the safety standards at some time within 1,000 years

- Safety standard for tritium is 20,000 picocuries per liter
- Boundary is developed based on modeling studies of groundwater flow and radionuclide transport



What is a Use-Restriction Boundary?

Boundaries defining the areas that require institutional controls to restrict access to potentially contaminated groundwater

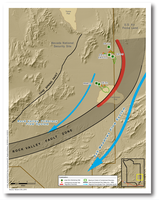
- Based on contaminant boundaries
- Use-restrictions are associated with the deep subsurface
- Drilling, pumping, and other activities require authorization in this area

***Regulatory boundary objective** is to protect water resources down gradient of the Rock Valley fault system from radionuclide contamination*

What is a Regulatory Boundary?

Boundaries that provide protection for the public and the environment from the effects of radionuclide contamination

- 1,000-year contaminant boundaries are well within the regulatory boundary
- If radionuclides reach this boundary, a plan must be submitted to the State to ensure water resources down gradient are protected



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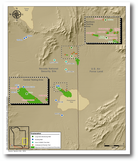
Long-Term Monitoring
The First Five Years

Groundwater Sampling and Analysis
- Sample six wells annually

Water-Level Measurements
- Measure groundwater levels in 16 wells quarterly to verify conditions have not changed



Frenchman Flat Long-Term Monitoring Network

Frenchman Flat Long-Term Water-Level Monitoring Network

Institutional Controls
- Monitor annually to verify that use-restriction boundaries effectively restrict access to contaminated groundwater

Monitoring Network Maintenance
- Annually inspect monitoring networks to verify well functionality and effectiveness

Documenting and Assessing Results
- Report results annually
- Verify consistency of groundwater quality and water levels with model assumptions and boundaries
- Confirm effectiveness of institutional controls
- Evaluate strategy for protecting human health and the environment

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Long-Term Monitoring
After Five Years

Routine Monitoring
- Provides a baseline for future evaluation
- Establishes thresholds/triggers for assessing protection of public health
- Determines the optimal path forward

Periodic Evaluations
- Assess current land use restrictions, processes and procedures to ensure the protection of human health and the environment
- Consider any new land use applications that may affect the long-term monitoring strategy
- Ensure water level data are consistent with the conceptual model and whether sampling results are consistent with model predictions

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Implementing protections for the health and safety of the public and environment

Extensive Investigations and Characterization of Subsurface Environment → Scientific Understanding of Contamination Extent and Movement → Monitoring and Restricted Access

A Look Ahead
Frenchman Flat Sets the Stage for Advancing Other Groundwater Investigation Areas

- New processes and methodologies developed
  - Regulatory process refined to best support strategy of modeling, monitoring, and restricted access
  - Peer review processes (external and internal committees of experts) established to provide confidence that the strategy is protective of the public and environment
  - State-of-the-art methodologies developed and applied by a highly technical team of experts from numerous scientific organizations

- Transitioning Frenchman Flat provides an invaluable experience for understanding the necessary balance of modeling, monitoring, and institutional control that is protective of public health and the environment

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Hard Work Pays off at Nevada National Security Site's Frenchman Flat

Between 1965 and 1971, ten underground nuclear tests were conducted at Frenchman Flat on the Nevada National Security Site (NNSS), each providing valuable data in a few spectacular seconds. In the decades to follow, NNSS scientists worked to understand the effects of those tests on the site's groundwater. Their studies have confirmed that the contamination from nuclear testing in groundwater at Frenchman Flat poses no risk to the public, and in a milestone achievement for the NNSS groundwater characterization program, the area has been approved by the State of Nevada Division of Environmental Protection to transition to long-term monitoring.

Long-term monitoring is the end goal of the strategy outlined in the Federal Facility Agreement and Consent Order (FFACO) for the five groundwater investigation areas at the NNSS. Frenchman Flat is the first to enter into this important final stage. While entering this stage signifies a thorough understanding of the groundwater flow system, routine monitoring at Frenchman Flat will continue, and results will continue to be reported annually in a publicly-released report.

NNSS Scientist Jenny Chapman (foreground) discusses groundwater characterization at Frenchman Flat with a resident of Amargosa Valley, NV at the 2016 NNSS Groundwater Open House

The success at Frenchman Flat follows over twenty years of hard work and continuous study carried out by multiple organizations, including two external peer reviews. During this time, multiple groundwater characterization wells were drilled, three-dimensional computer models were developed and refined, and boundaries for restricted access were established. "The NNSS is one of the most studied locations in the world, and this achievement is a testament to the teamwork between all

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organizations involved," said Bill Wilborn, manager of NNSS groundwater characterization for the Department of Energy.

In preparation to enter the long-term monitoring stage, scientists prepared a report detailing the studies conducted at Frenchman Flat. Their findings include that contaminated groundwater is not expected to leave the Frenchman Flat basin, and that radionuclides in the groundwater will travel less than a mile in 1,000 years. "The groundwater flow system and potential for contaminant movement is well understood, to the point that protection of the public is ensured," said Wilborn.

Transitioning Frenchman Flat to long-term monitoring provided NNSS scientists and staff with an invaluable experience for understanding the necessary balance of modeling, monitoring, and restricted access that is protective of the public and the environment. It also sets the stage for other NNSS groundwater investigation areas. "Although the regulatory strategy is the same, each will have unique challenges due to the varying subsurface environments," said Wilborn. Groundwater studies at the NNSS will continue with the goal of transitioning all areas of the NNSS to the long-term monitoring stage.

Click here to learn more about groundwater characterization at the NNSS.

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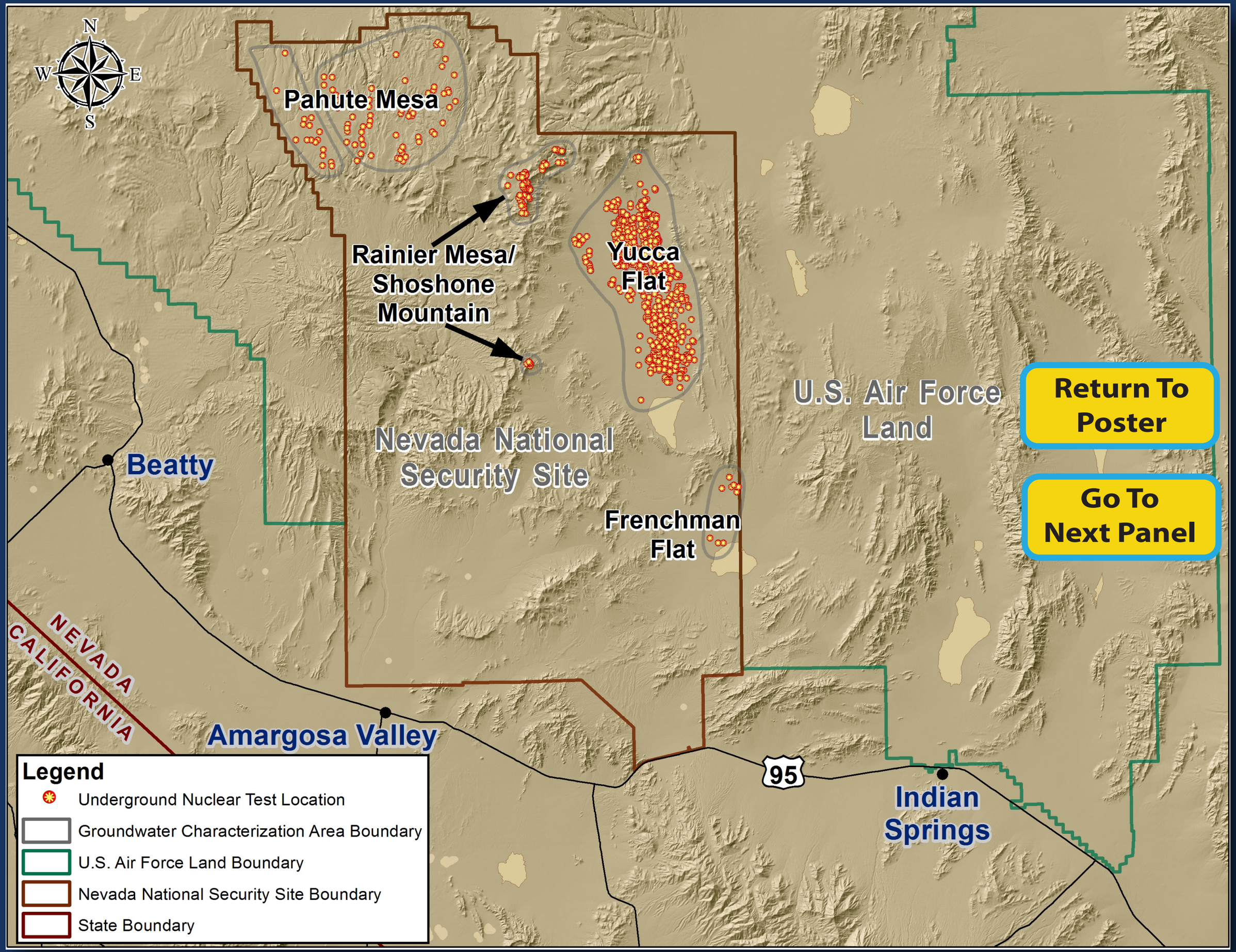

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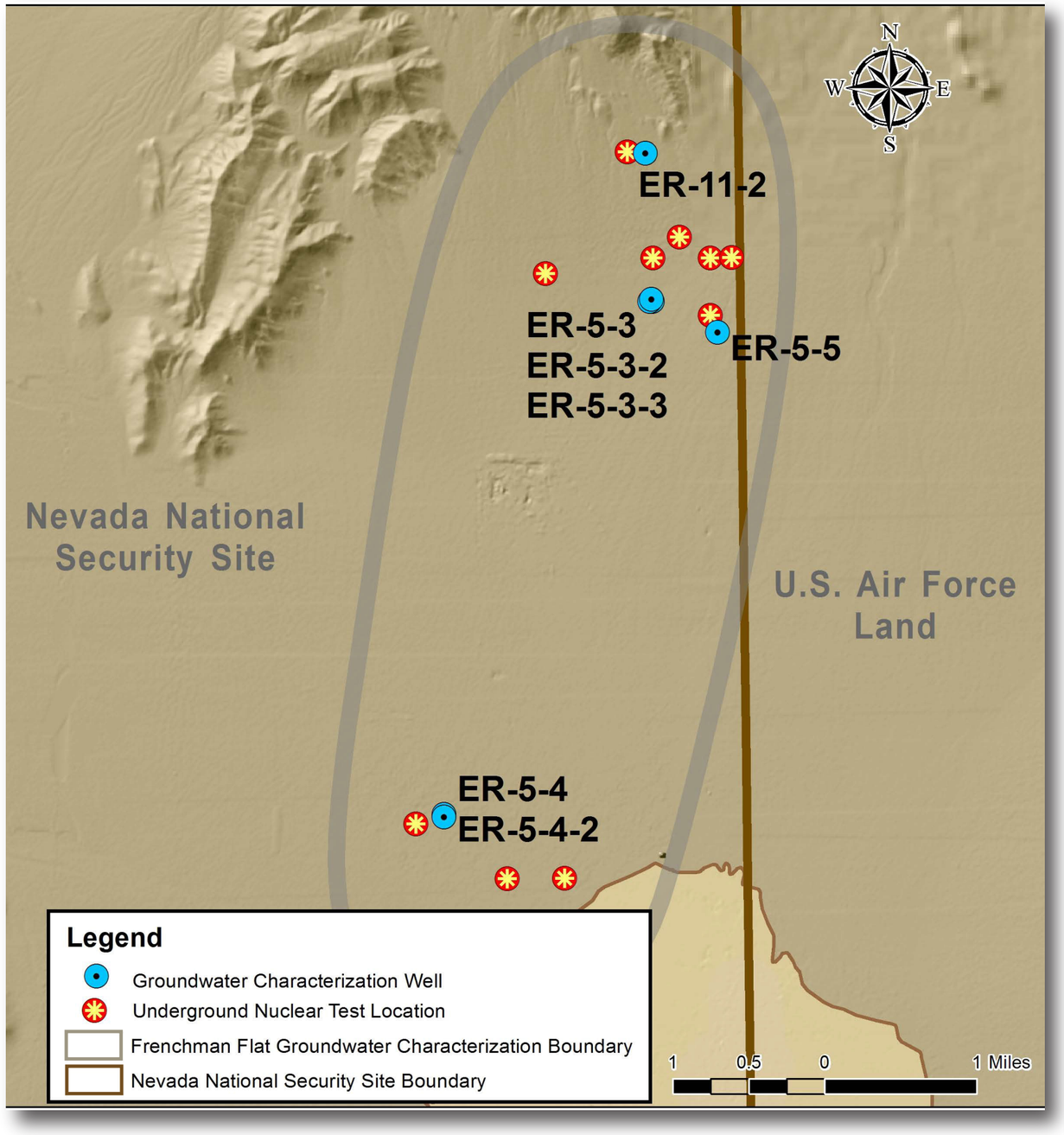

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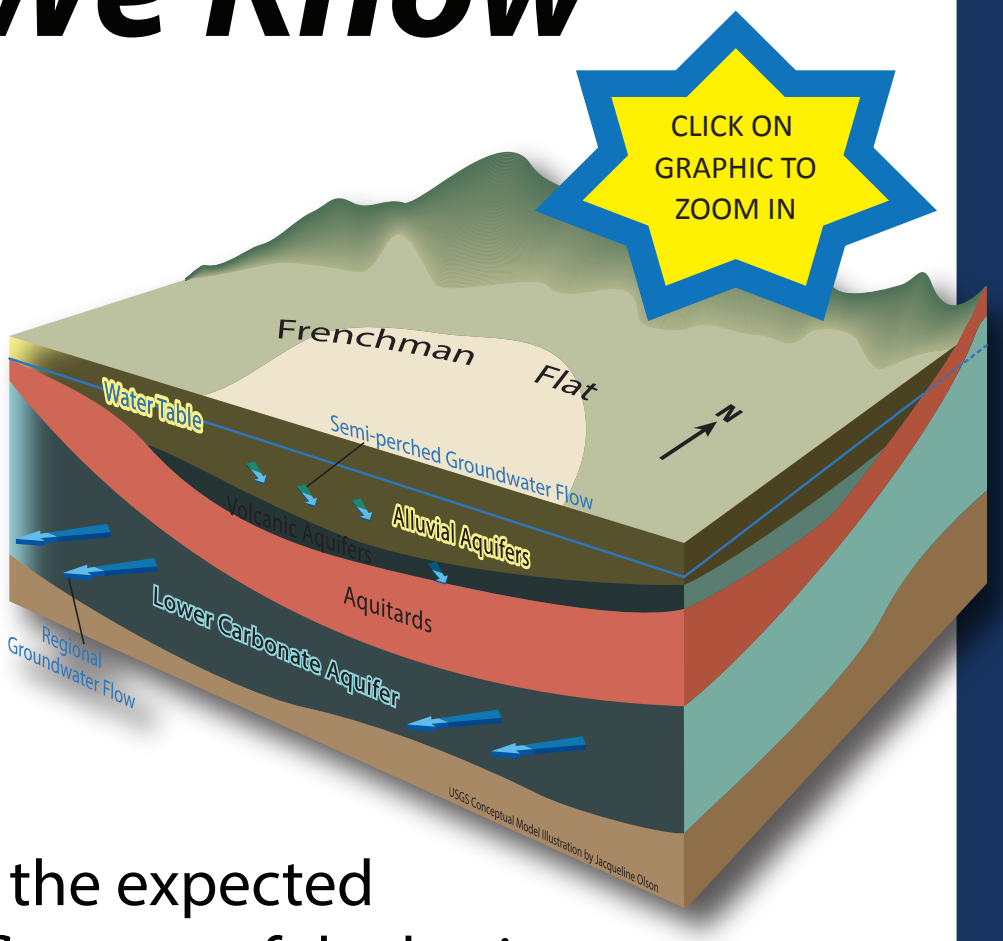

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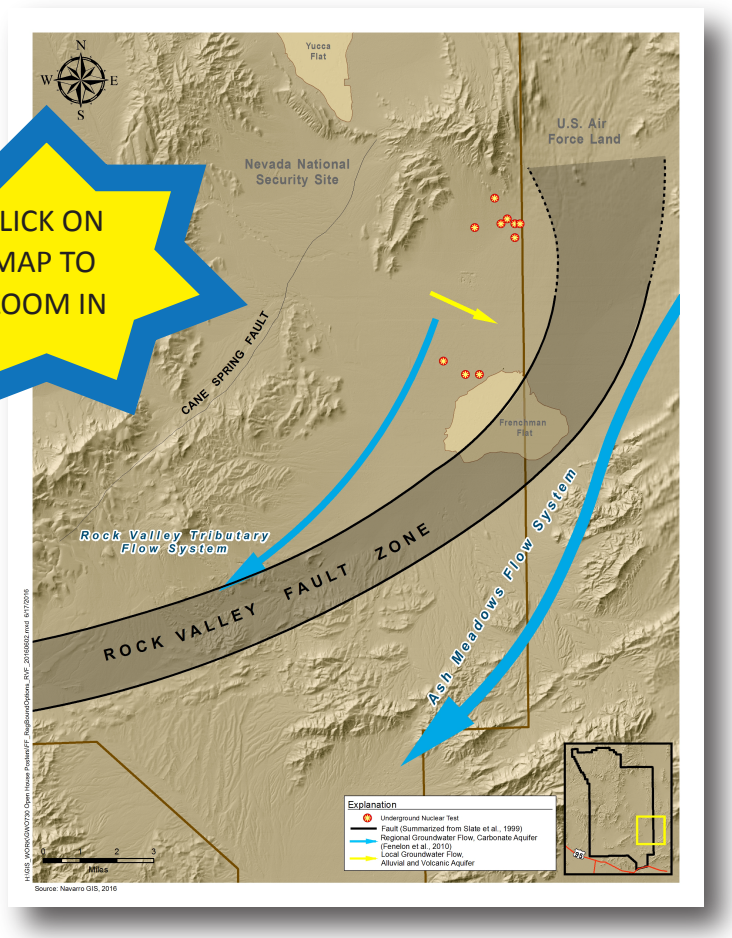

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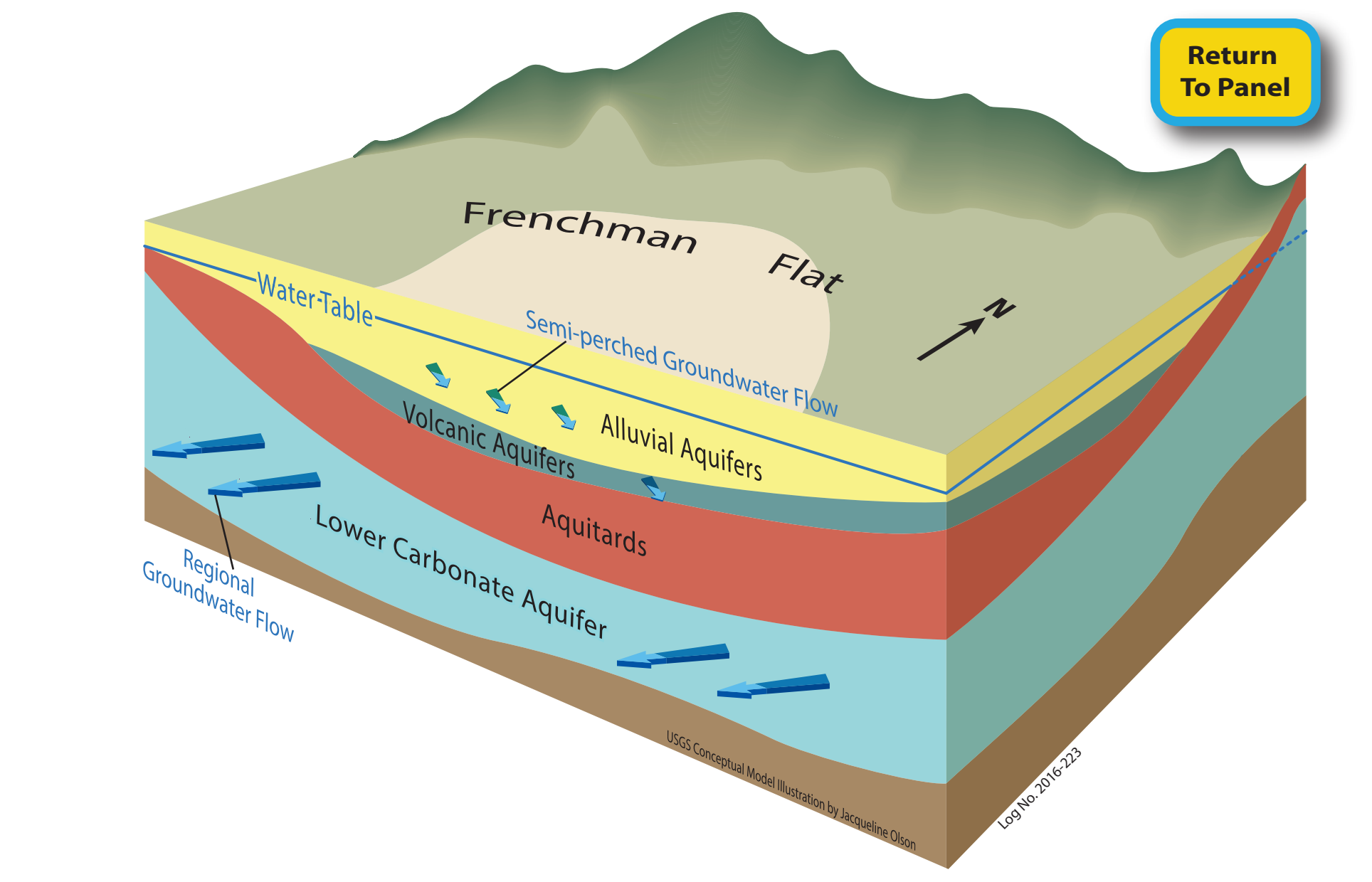
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Frenchman Flat
N
Water-Table
Semi-perched Groundwater Flow
Alluvial Aquifers
Volcanic Aquifers
Aquitards
Lower Carbonate Aquifer
Regional Groundwater Flow
USGS Conceptual Model Illustration by Jacqueline Olson
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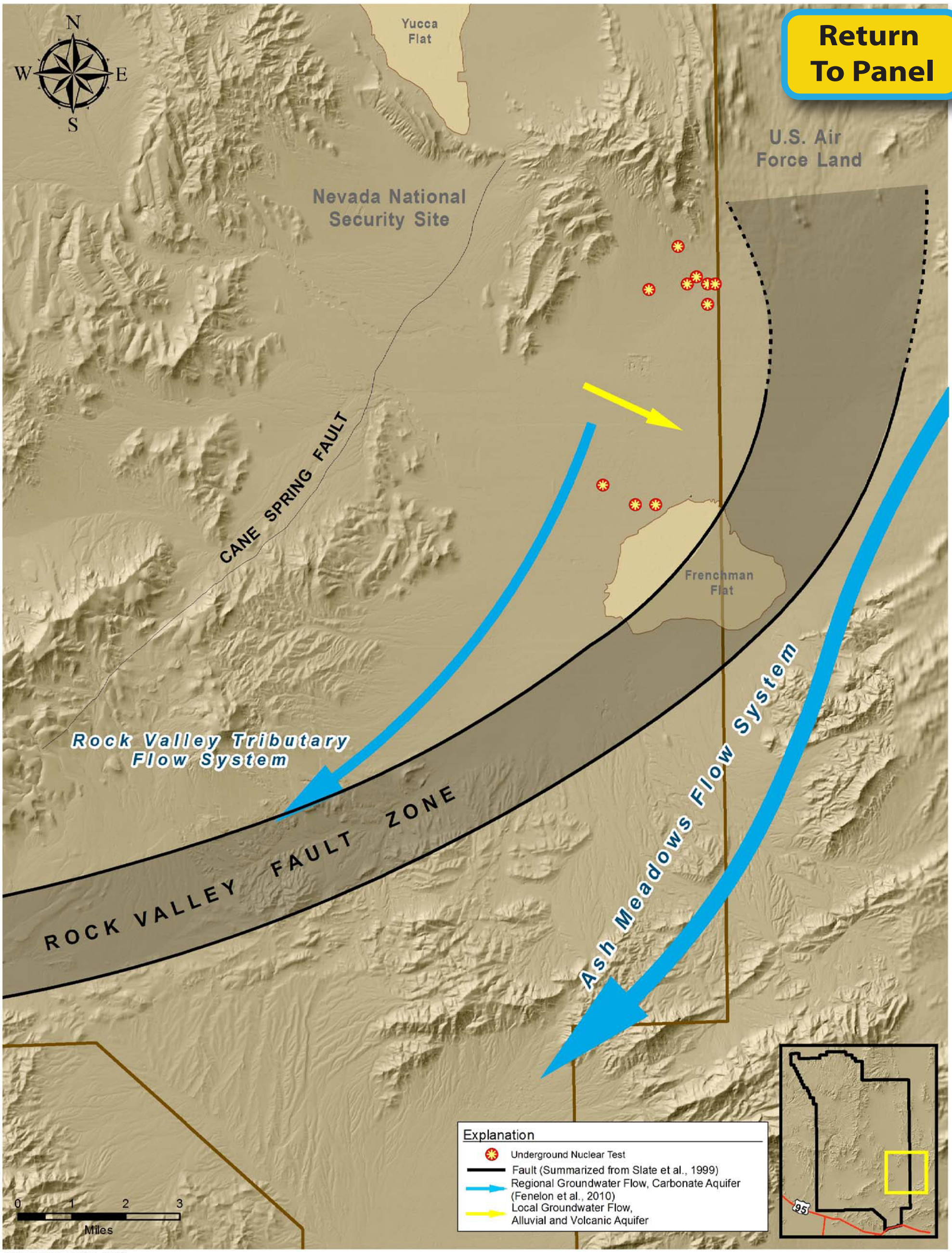

Source: Navarro GIS, 2016

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Rock Valley Fault System

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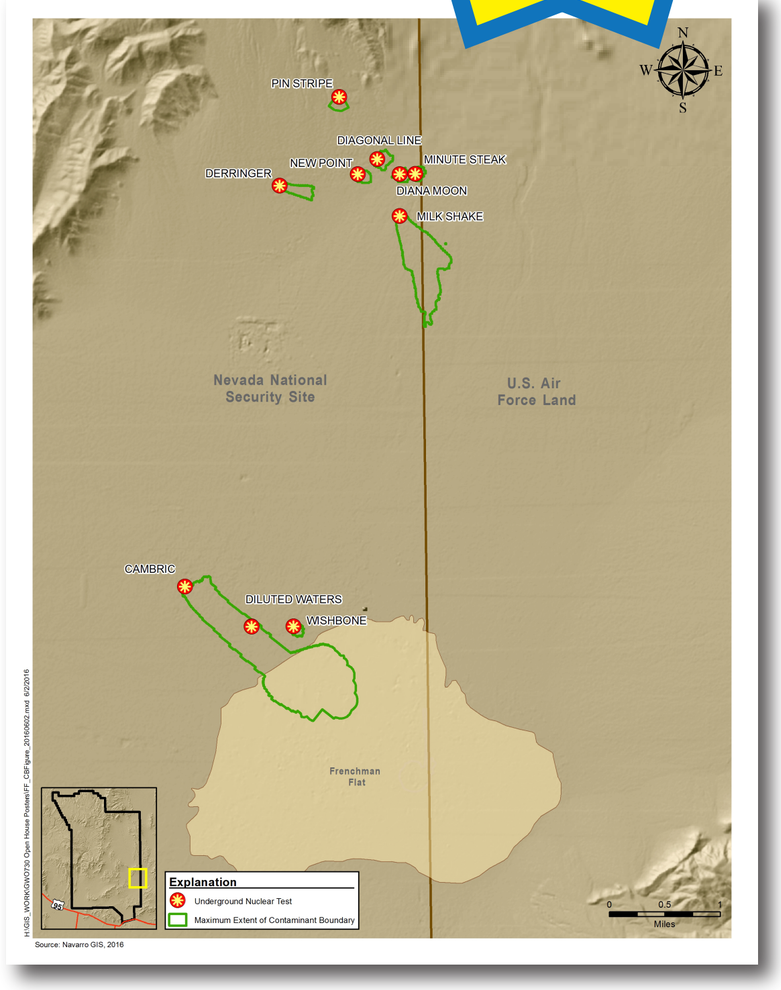

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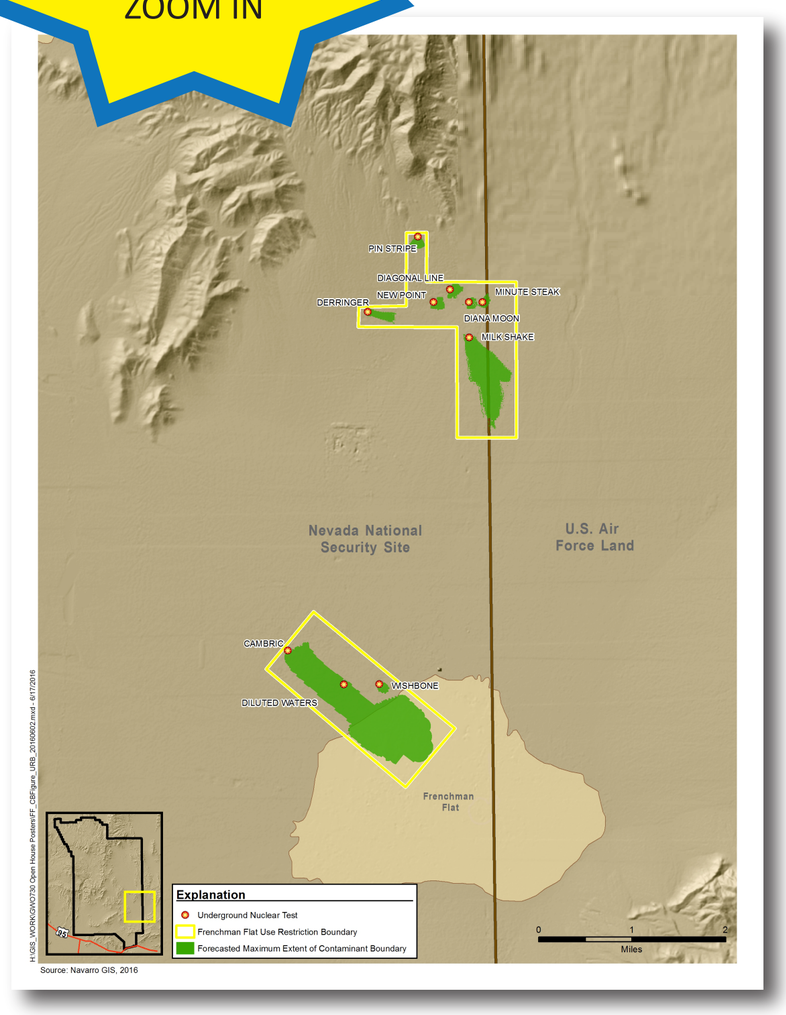

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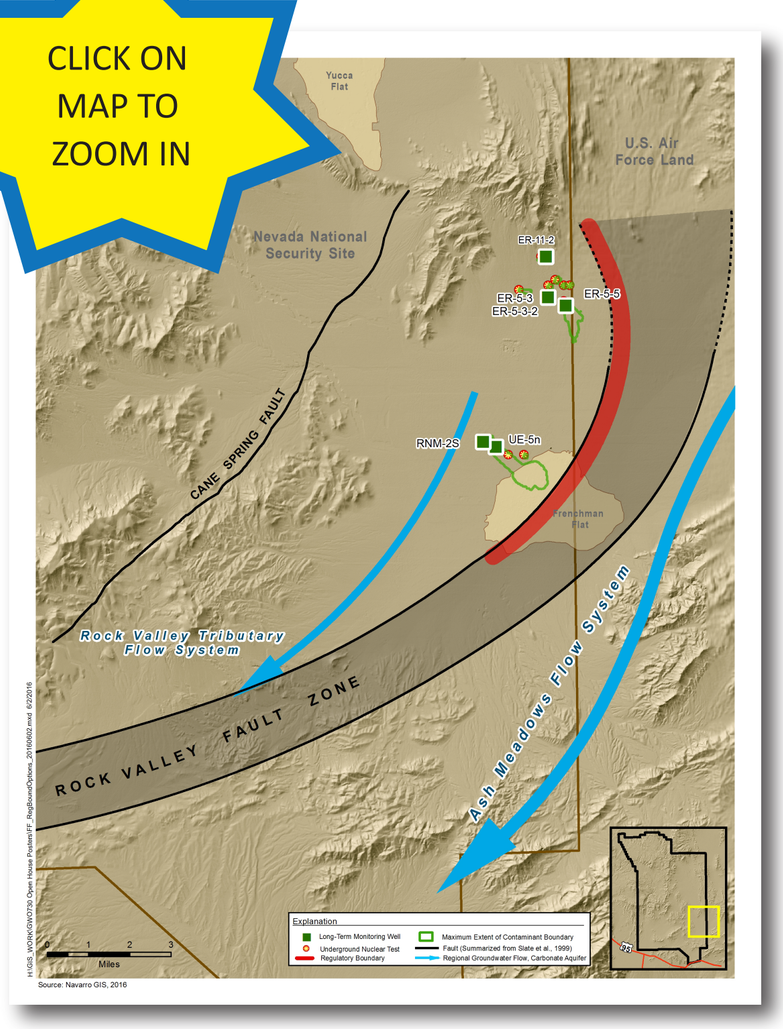

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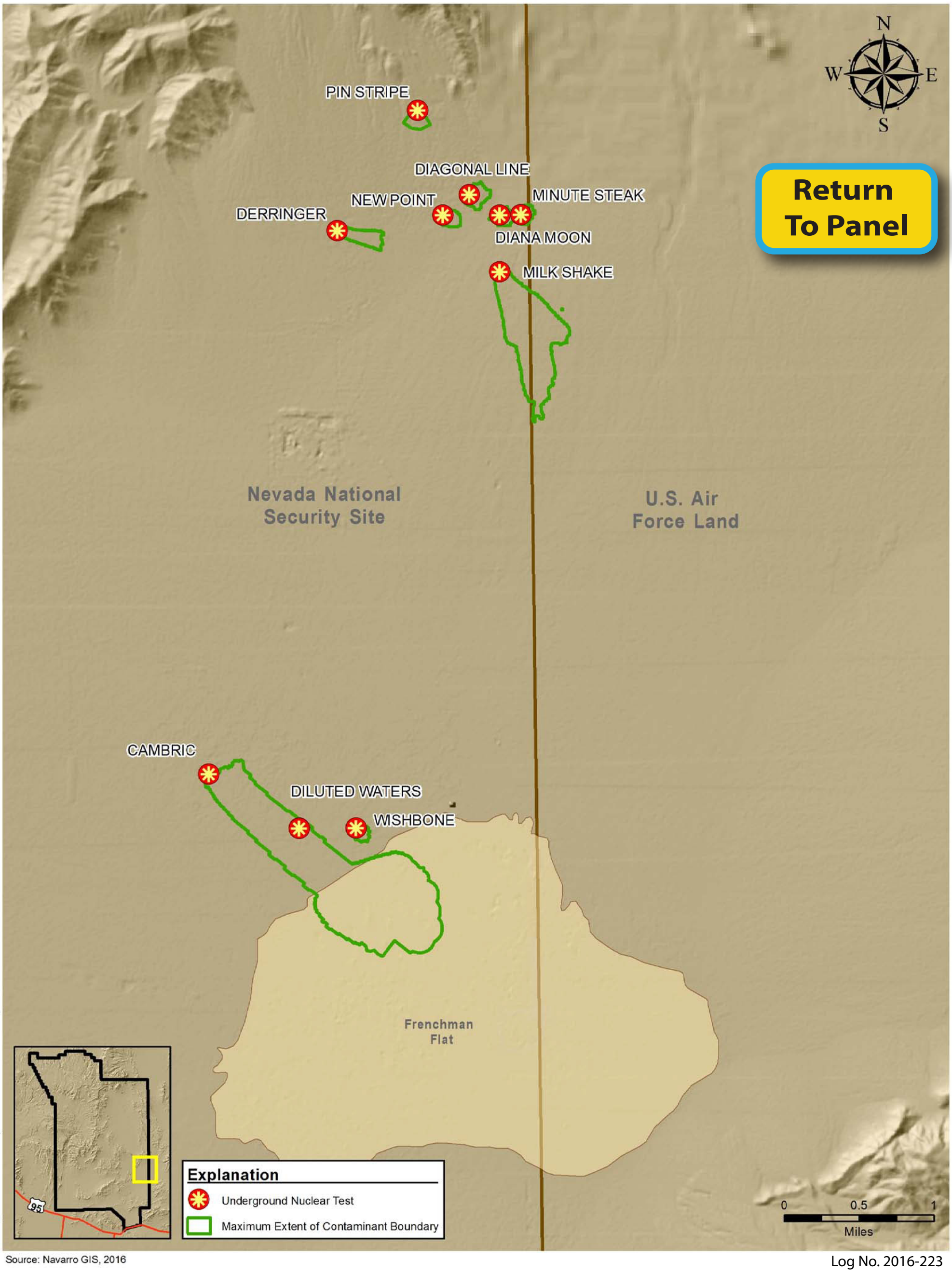

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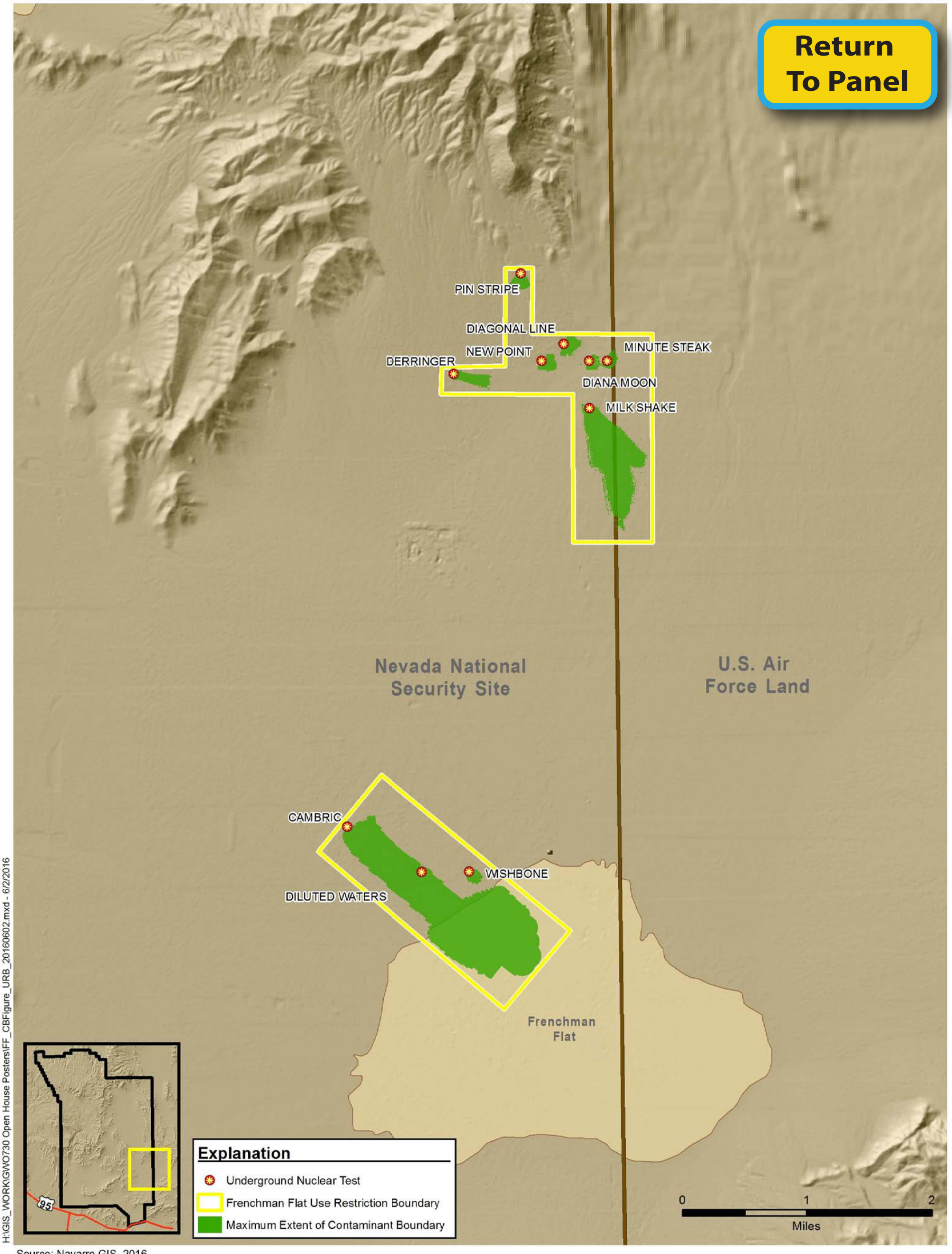

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Use-Restriction Boundary

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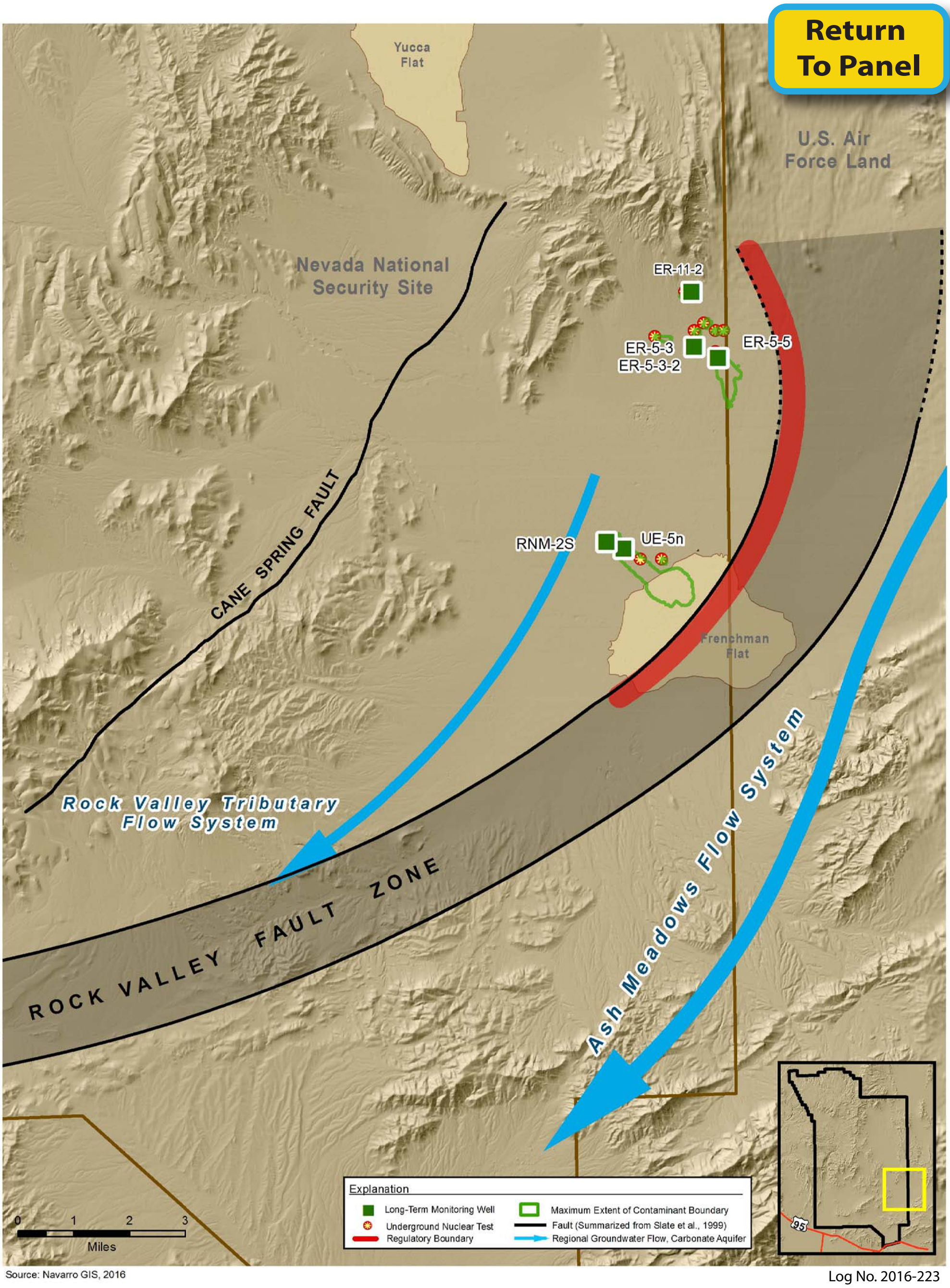

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Regulatory Boundary

Long-Term Monitoring

The First Five Years

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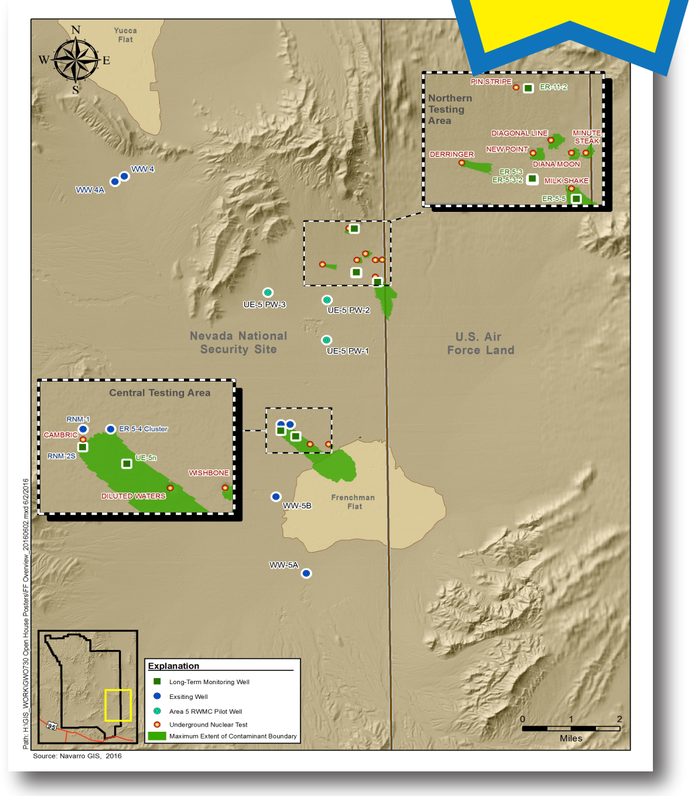

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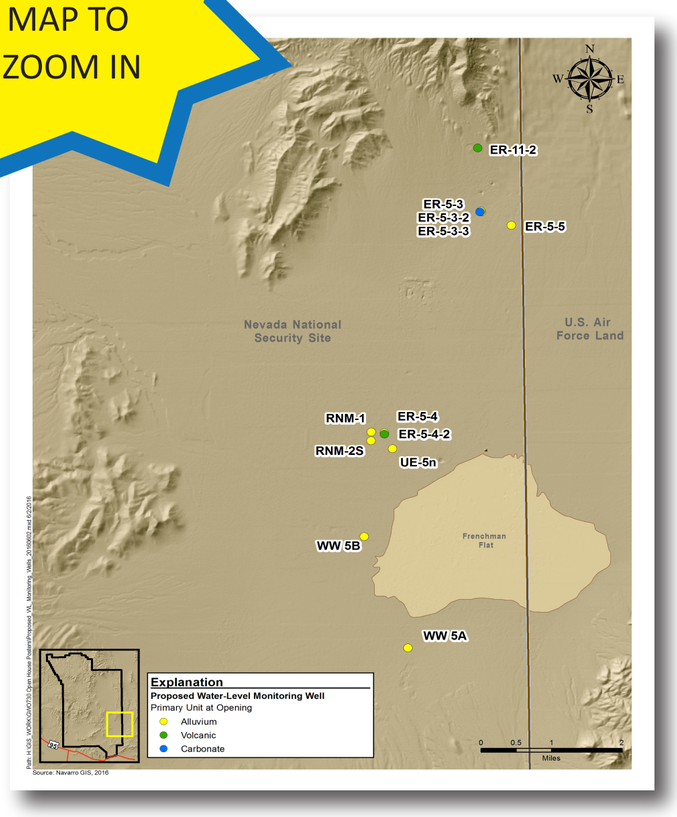

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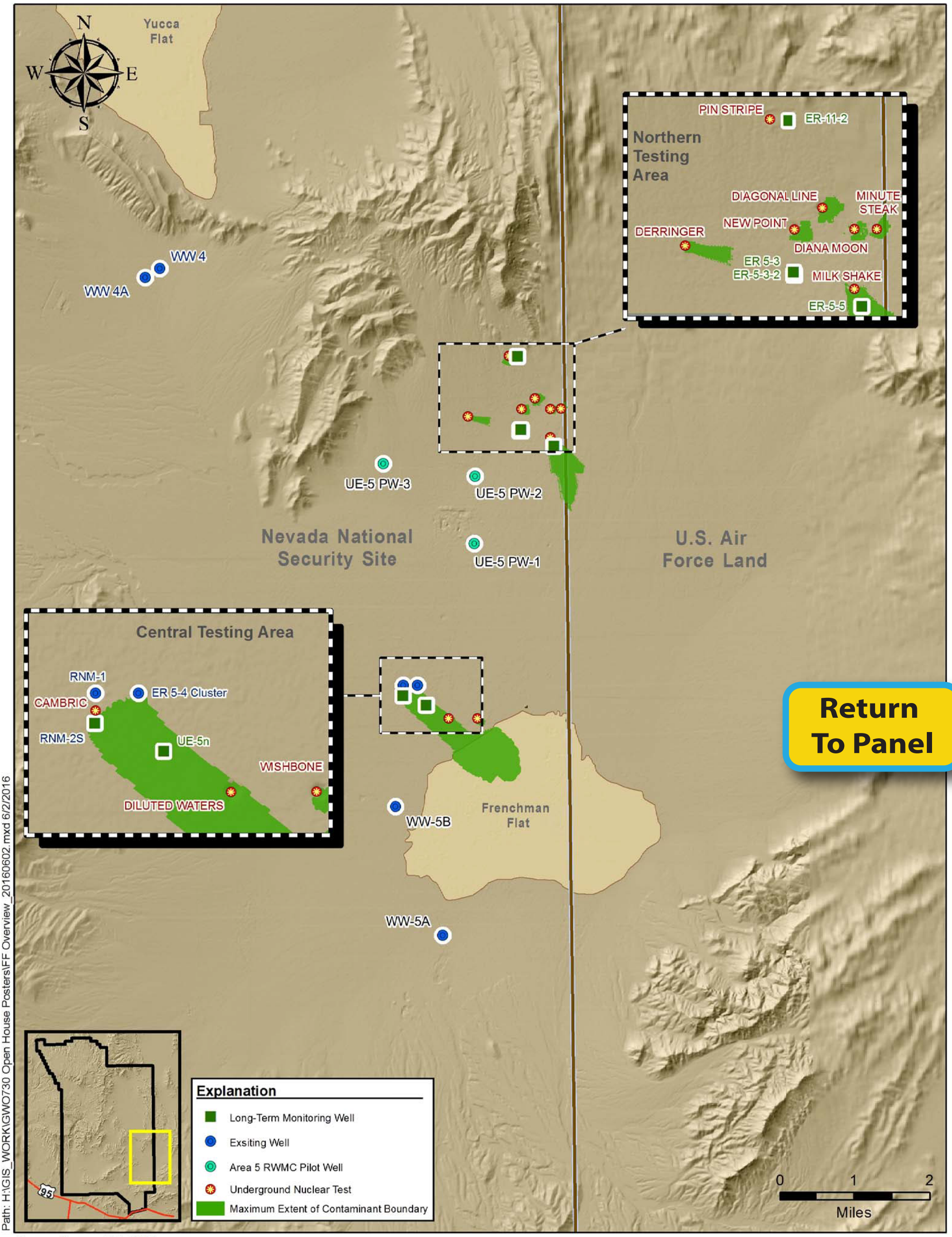

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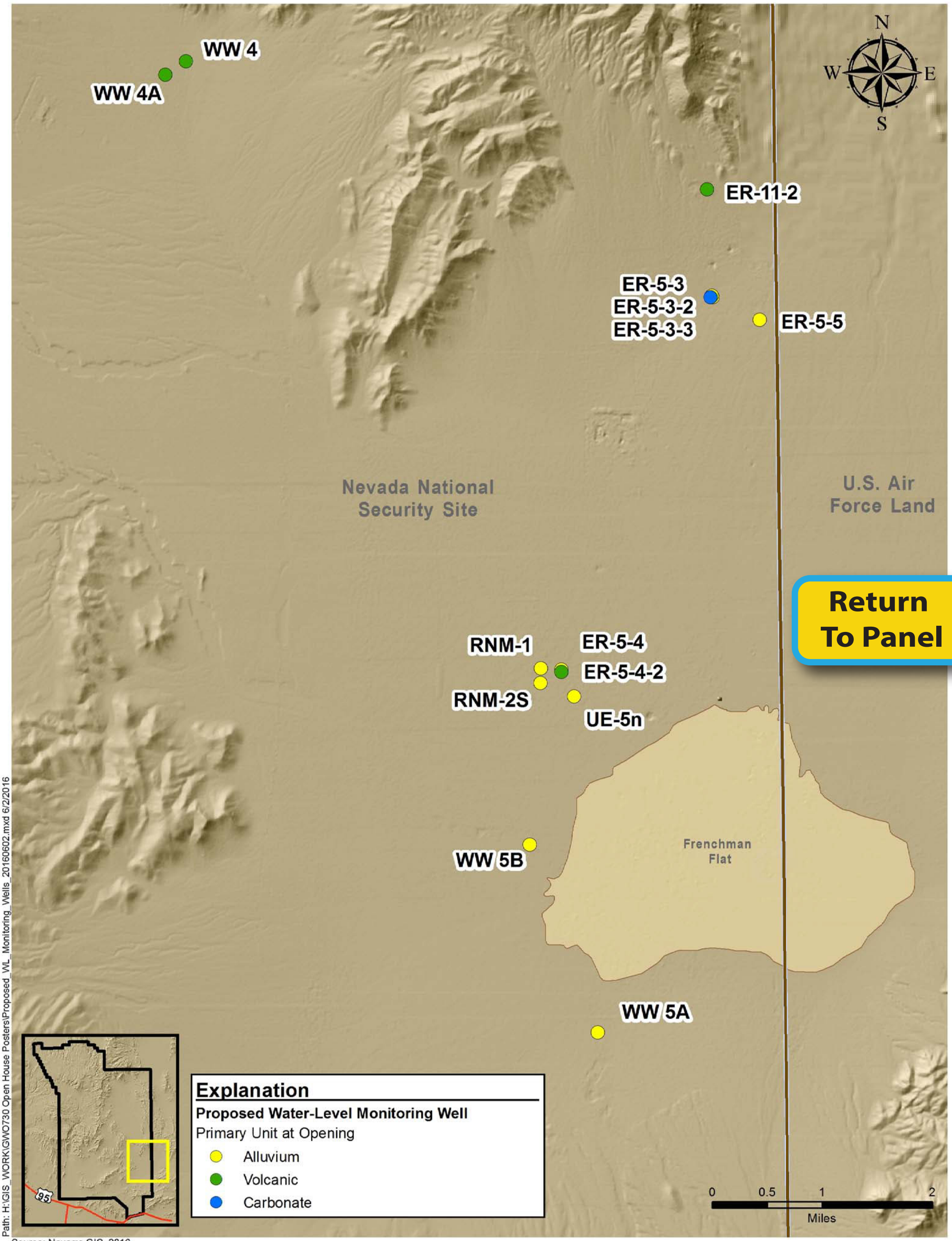

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Long-Term Monitoring
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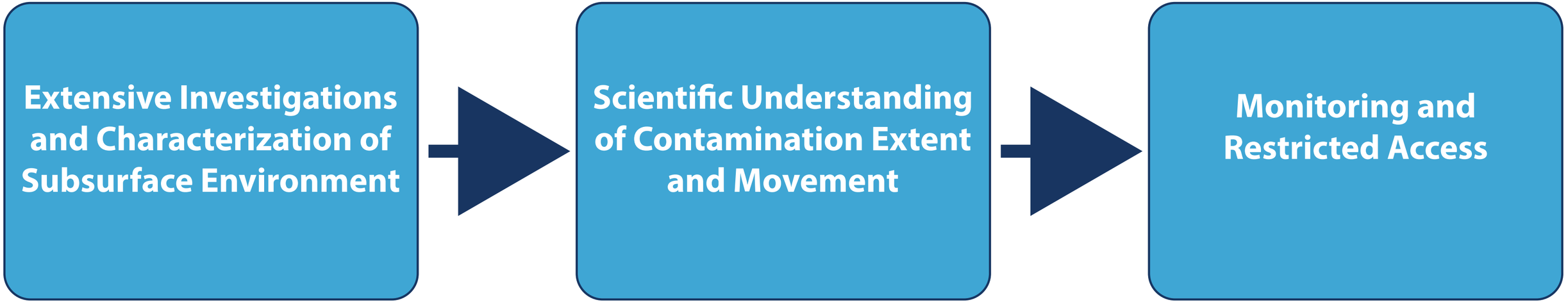
Implementing protections for the health and safety of the public and environment



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