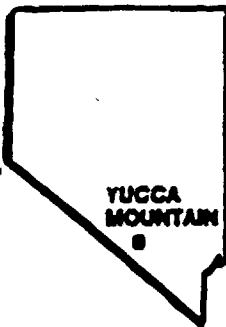


YUCCA  
MOUNTAIN

# YUCCA MOUNTAIN PROJECT

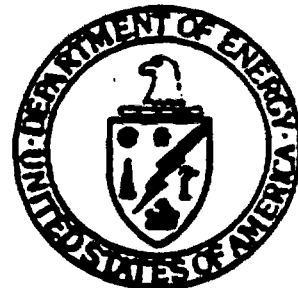
## WHY G-TUNNEL?

**UNDERGROUND ACCESS TO YUCCA MOUNTAIN  
IS NOT AVAILABLE**

**G-TUNNEL IS AVAILABLE AND HAS BEDDED  
NONWELDED AND WELDED TUFFS SIMILAR  
TO THOSE AT YUCCA MOUNTAIN.**

**THE OVERBURDEN AT THE G-TUNNEL  
UNDERGROUND FACILITY (GTUF) IS SIMILAR  
TO THE REPOSITORY HORIZON AT YUCCA  
MOUNTAIN.**

- **THE GTUF IS ABOVE THE WATER TABLE.**



UNITED STATES DEPARTMENT OF ENERGY  
NEVADA OPERATIONS OFFICE/YUCCA MOUNTAIN PROJECT OFFICE

## NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS

### G-TUNNEL UNDERGROUND FACILITY

#### BACKGROUND

The G-Tunnel Underground Facility (GTUF), part of the G-Tunnel Complex, was developed under the Nevada Nuclear Waste Storage Investigations (NNWSI) Project. The G-Tunnel Complex was established for nuclear weapons testing events, which occurred between 1962 and 1971. Since 1971, it has been used as an underground research facility by Sandia National Laboratories (SNL). Programs have included (1) containment and gate development studies for weapons work, (2) hydraulic and explosive fracturing studies for enhanced gas and oil recovery, and (3) recent testing in support of NNWSI.

NNWSI has been involved in evaluating the potential for nuclear waste repository developments at Yucca Mountain. SNL, a participant in NNWSI, initiated the development of the GTUF in 1979 primarily for underground geomechanics studies. Important phenomena being studied were

- Thermal (heat flow characteristics)
- Mechanical (stress-strain responses, excavation effects, strength relationships)
- Thermomechanical (volumetric expansion)
- Hydrothermal (heat induced water migration)

The facility now includes drifts and alcoves in welded and nonwelded tuffs on three major floor levels. Major SNL experimental efforts have been

- In Situ Stress Measurements (in welded tuff)
- Small Diameter Heater Experiments (in welded and nonwelded tuffs)
- Heated Block Experiment (featuring thermal and mechanical loadings)
- Welded Tuff Mining Evaluations (excavation of demonstration drifts)
- Pressurized Slot Testing (featuring chain saw developments)

#### PROTOTYPE TESTING

In 1987, the GTUF became a focus for NNWSI Prototype Testing efforts in preparation for Exploratory Shaft Testing at Yucca Mountain. NNWSI researchers can perform in situ measurements in a welded tuff having thermal and mechanical properties and stress states that are similar to the welded tuff at Yucca Mountain. Similarities in welded and nonwelded tuff stratigraphies also exist. Planned activities include

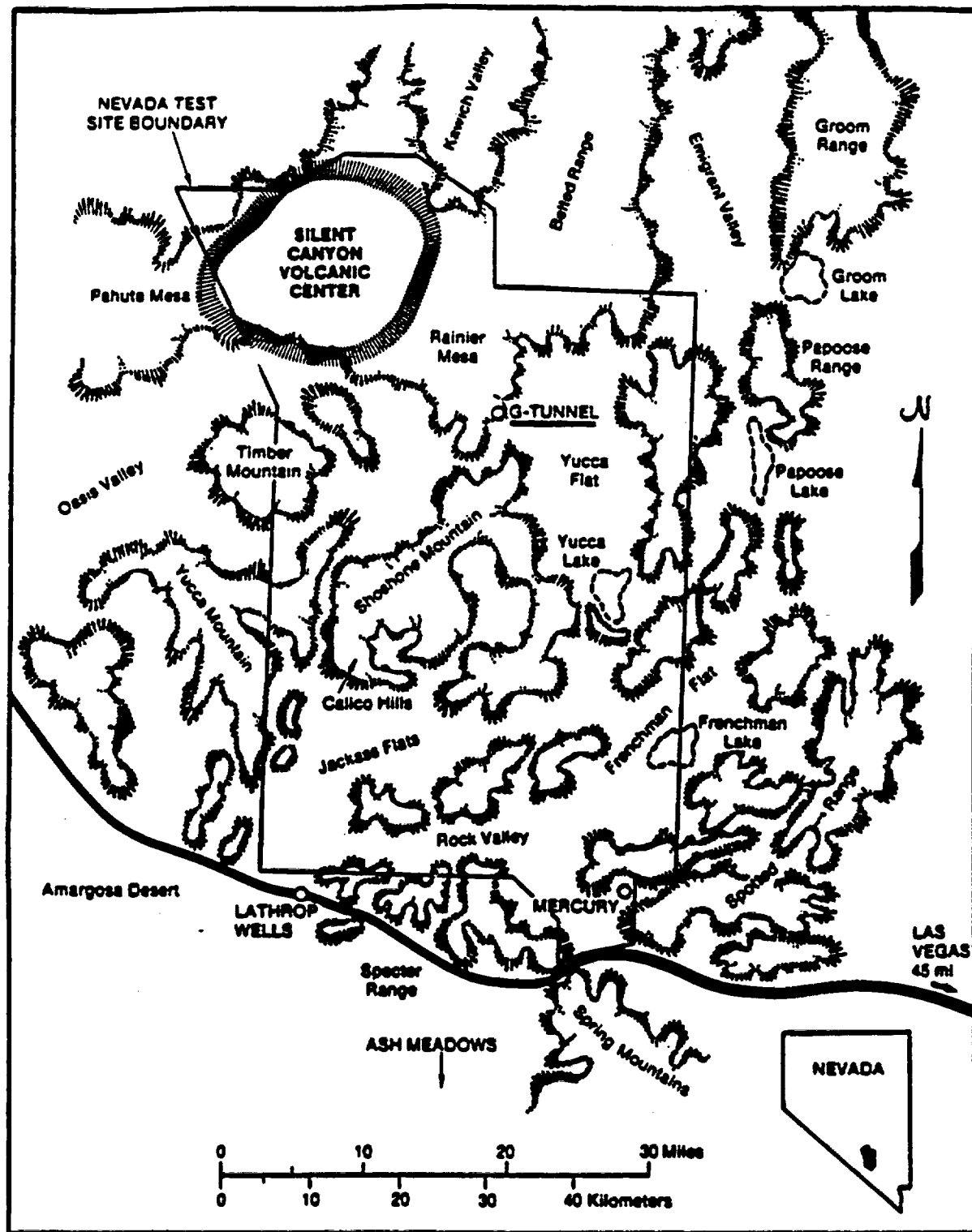
- Geological Mapping Investigations (USGS)
- Development of Drilling Methods (LANL)
- Hydrologic Investigations and Flow Evaluations (USGS, LANL)
- Engineering Barrier Simulations (LLNL)
- Thermal Stress Measurements (SNL)
- Instrumentation Evaluations (USGS, LLNL, SNL)

**NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS  
G-TUNNEL UNDERGROUND FACILITY (GTUF)  
PROTOTYPE TESTING**

**LA/RO  
3/16/89**

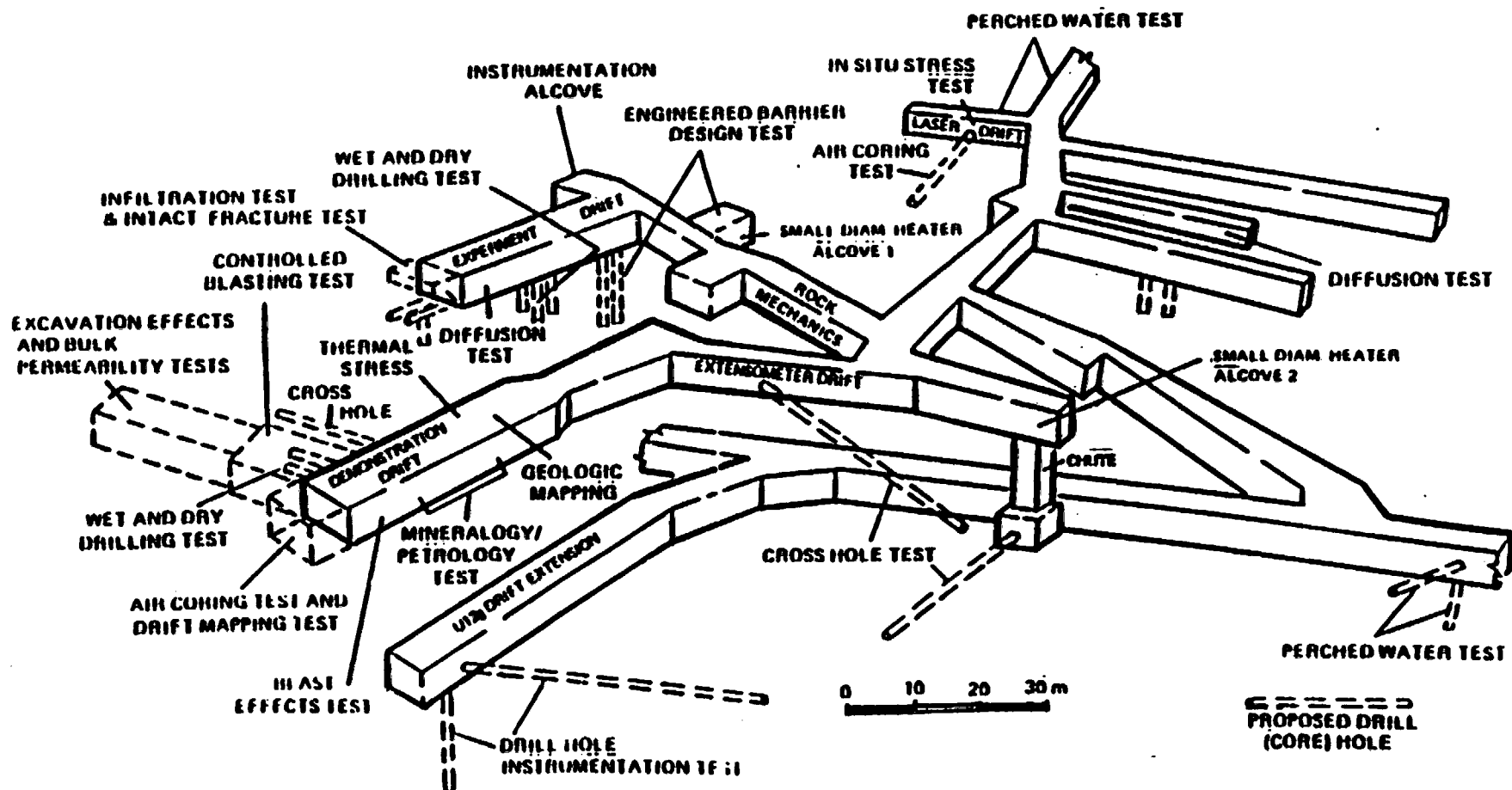
<u>PRIOR WORK</u>	<u>OBJECTIVES</u>	<u>ORG.</u>	<u>STATUS</u>
Geotechnical Field Measurements	In-Situ Stress, mechanical hydrologic phenomena	SNL	Report published
Small Diameter Heater	Thermal, hydrothermal phenomena	SNL	Report published
Heated Block	Thermomechanical properties phenomena	SNL	Report published
Pressurized Slot	Mechanical properties phenomena	SNL	Completed, report in preparation
Mining Evaluation	Mechanical properties phenomena	SNL	Completed, report in preparation
Air coring	Specialized drilling operations	LANL	Completed, report in preparation
Tracer	Hydrologic properties	USGS	Field work completed
Mineralogy/ Petrology	Methodology development, concept validation	LANL	Field work completed
<u>WORK</u>	<u>OBJECTIVES</u>	<u>ORG.</u>	<u>STATUS</u>
Drift Wall Mapping Photogrammetry G-tunnel	Methodology development, concept validation	USGS	95 % completed
Drift Wall Mapping Photogrammetry Fran Ridge	Methodology development, concept validation	USGS	Planning completed Air quality permit
Drill Hole Instru- mentation	Design/function validation	USGS	Data collection, report in preparation
Cross Hole Testing	Hydrologic properties, transport mechanisms	USGS	Drilling completed
Intact Fracture	Flow mechanisms	USGS	Drilling in progress
Infiltrometer Test	Fluid flow properties	USGS	No NTS activities planned

<u>WORK</u>	<u>OBJECTIVES</u>	<u>ORG.</u>	<u>STATUS</u>
Bulk Permeability	Hydrologic properties phenomena	USGS	No NTS activities planned
Thermal Stress Test	Thermomechanical properties phenomena	USGS	Planning
Waste Package Environment Vert. Test	Hydrothermal properties phenomena	LLNL	85 % completed
Waste Package Environment Horz. Test	Hydrothermal properties phenomena	LLNL	Planning
Diffusion Test	Geochemical processes phenomena	LANL	75 % completed
Wet & Dry Drilling	Specialized drilling operations, Hydrologic properties/phenomena	USGS	Data collection, report in preparation
Dry Rubble Coring	Hydrologic properties phenomena	USGS	Approved plans
Optimal Rubble Test	Hydrologic properties phenomena	USGS	Approved plans
Perched Water Test	Hydrologic properties phenomena	USGS	Approved plans
In-Situ Stress	Methodology development, concept validation	USGS	Approved plans
Blast Effects	Design/function validation	USBR SNL	Planning
Excavation Effects	Design/function validation	USGS	Approved plans
Controlled Blasting	Design/function validation	USBR	Planning



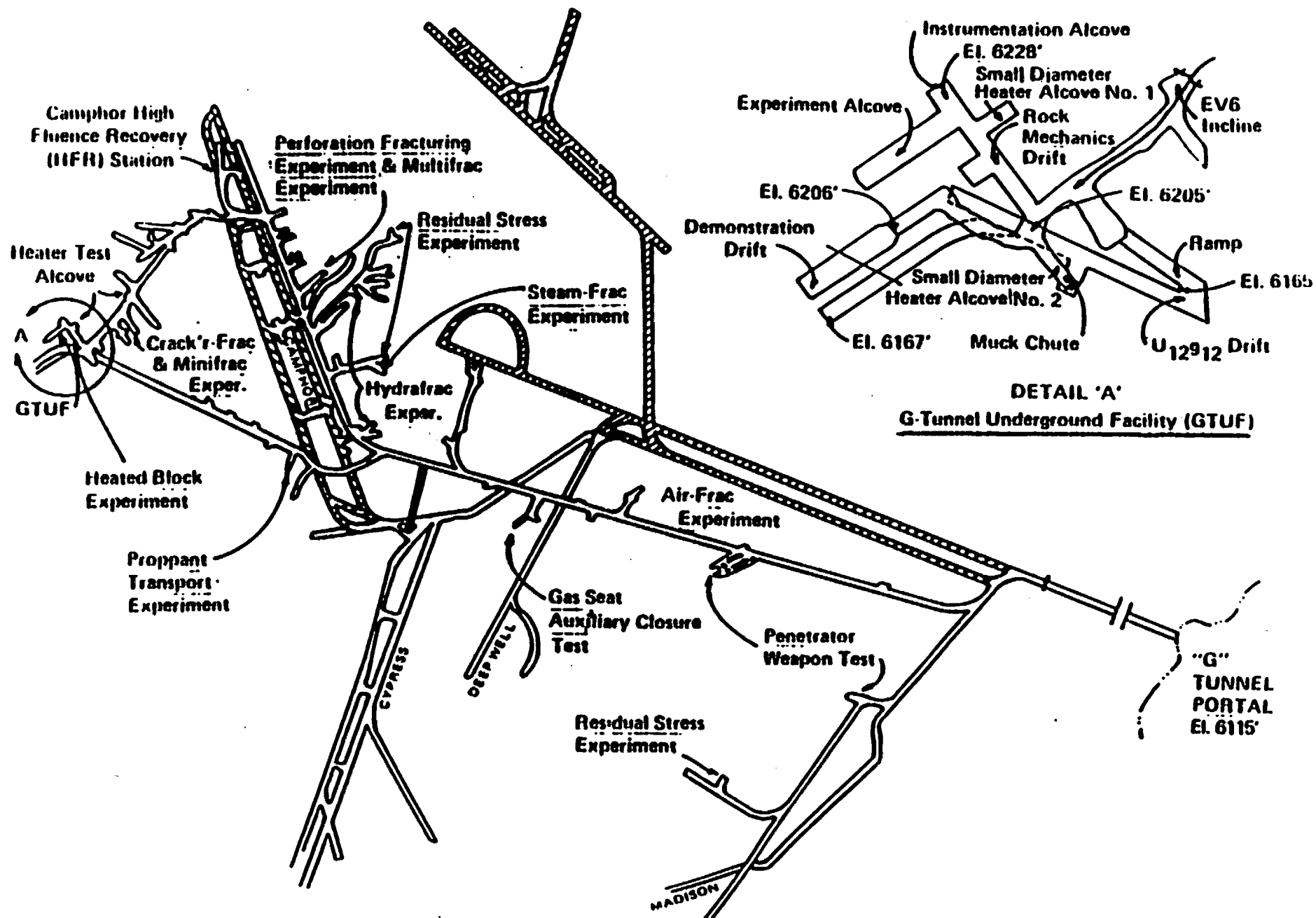
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# PLAN VIEW OF GTUF NORTHWEST SECTION OF G-TUNNEL





# G TUNNEL COMPLEX



**DETAIL 'A'**  
**G-Tunnel Underground Facility (GTUF)**