

# History and Contamination Legacy at INL: An Overview

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Presentation to the ERSP Workshop  
July 12, 2006

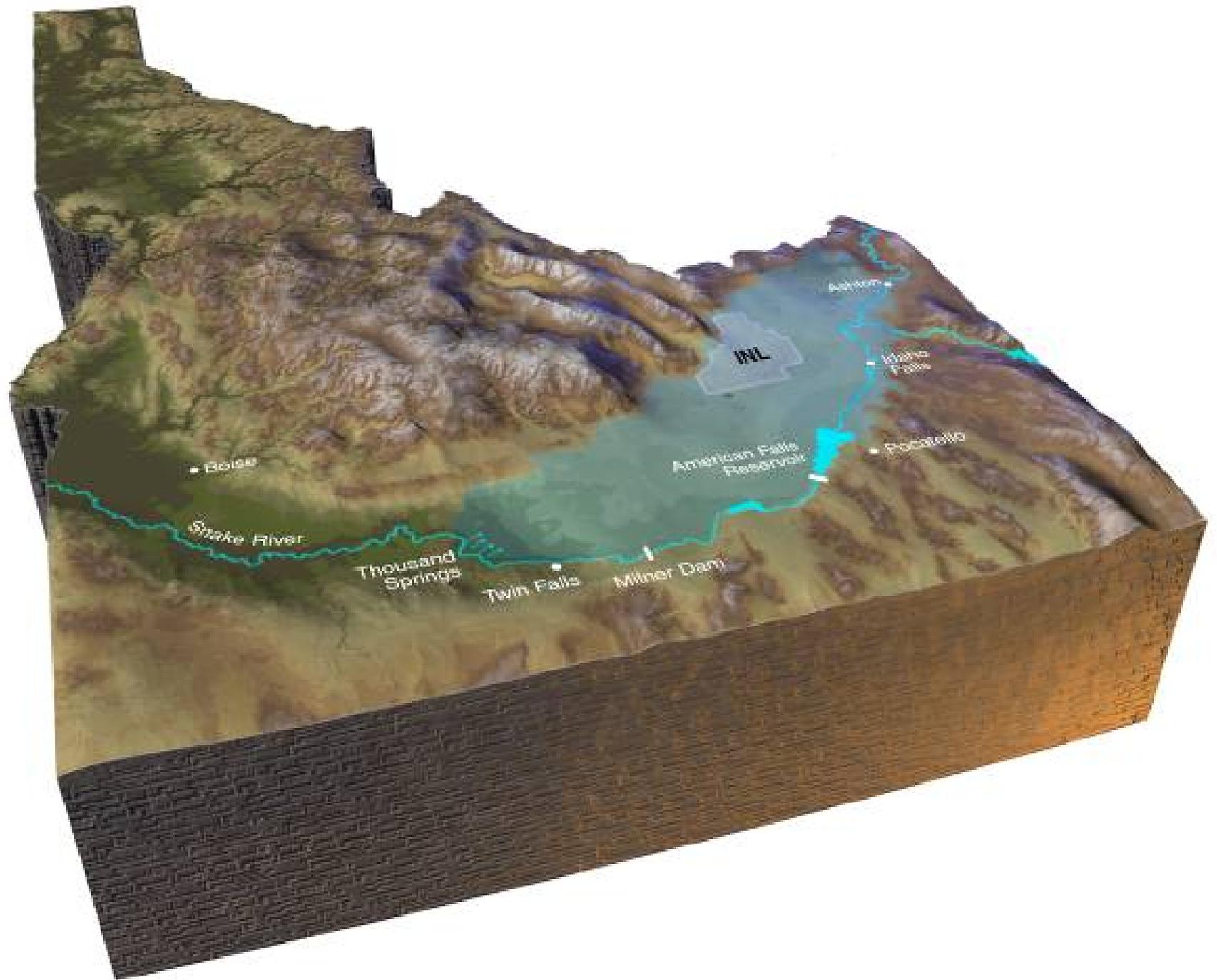


# Topics

- Site History
- CERCLA Process
- Contamination at RWMC and INTEC
- How can ERSP fit in to CERCLA work?

# Where are we?

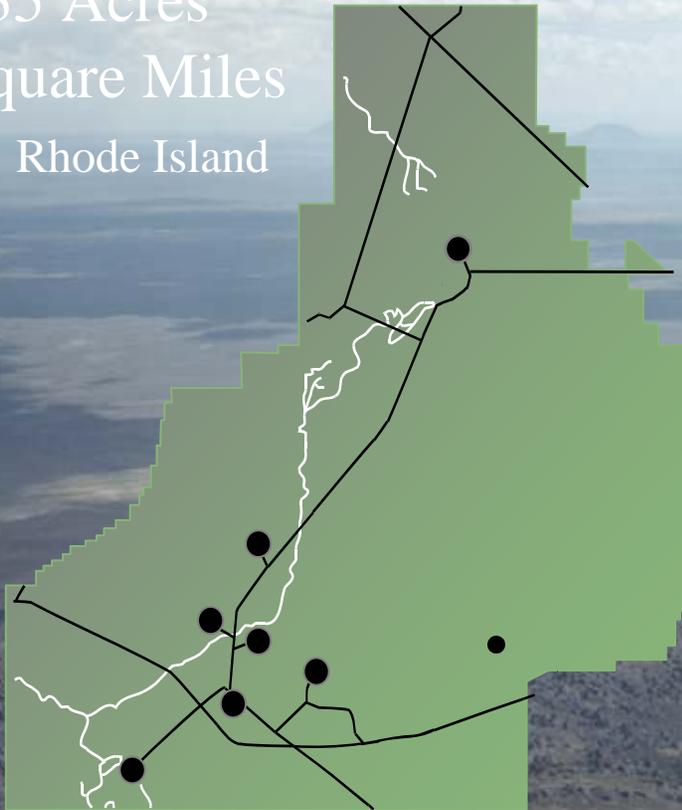




# Idaho National Laboratory

569,135 Acres  
889 Square Miles

- 75% Rhode Island



- Established in 1949
- One of 9 National Labs in the country
- 9 Primary Facilities
- A National Environmental Research Park

INL History

- Gunnery Range in WWII





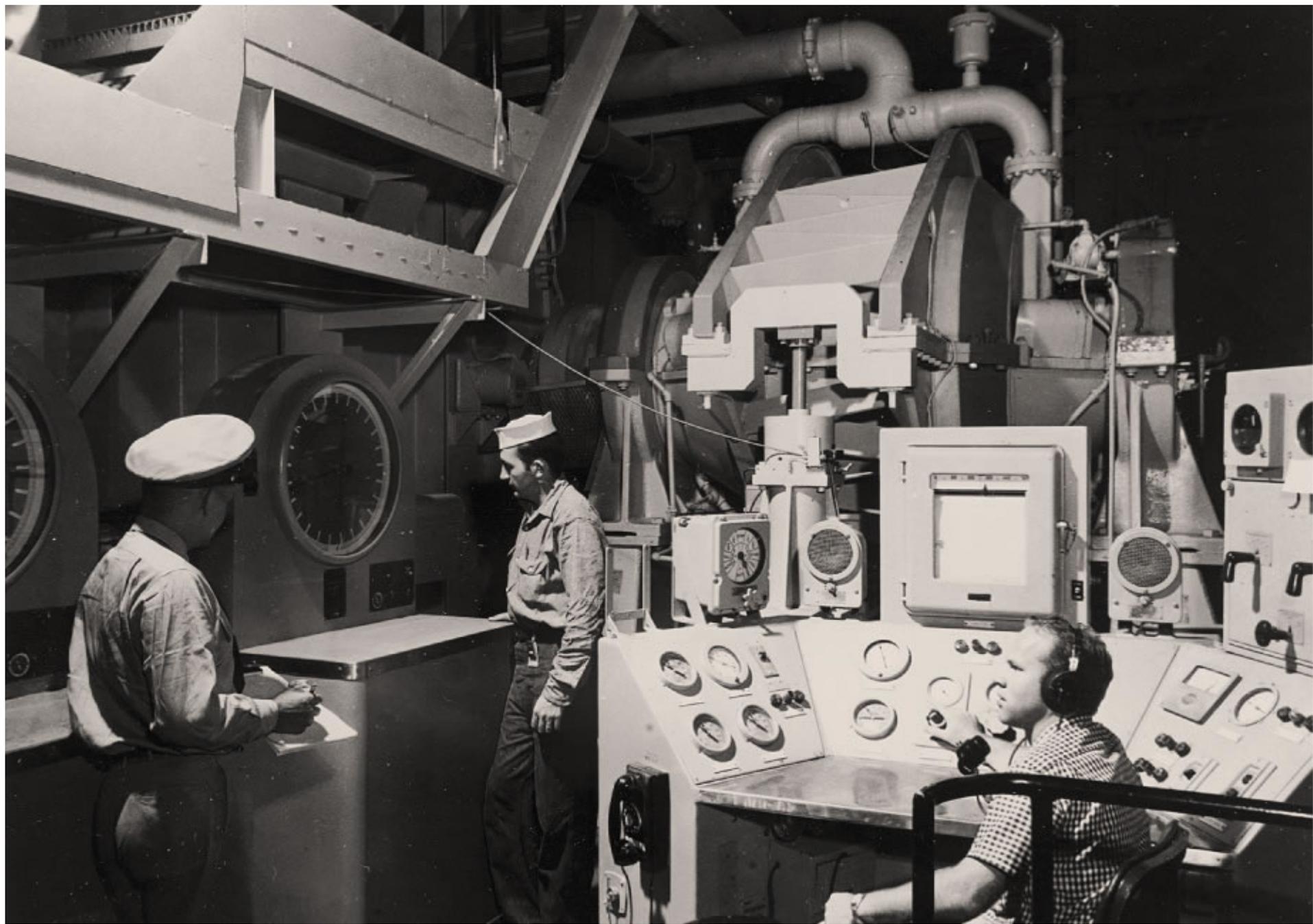
Electricity was first generated here  
from Atomic Energy on Dec. 20, 1951.  
On Dec. 21, 1951—all of the electrical  
power in this building was supplied from  
Atomic Energy ~

Those Present

- |               |                    |
|---------------|--------------------|
| W. Zinn       | H.V. Lichtenberger |
| W. Dick       | L. J. Koenig       |
| EMMETT        | G. K. Whitlam      |
| R. Cameron    | M. L. King         |
| B. C. CERVETT | M. WILKINSON       |
| E. J. Barlow  | G. H. Stoneaker    |
| L. E. Koffin  | K. Johnson         |
| C. R. Gibson  | K. McGinnis        |
| K. E. MOLEN   |                    |
| H. JOLL       |                    |

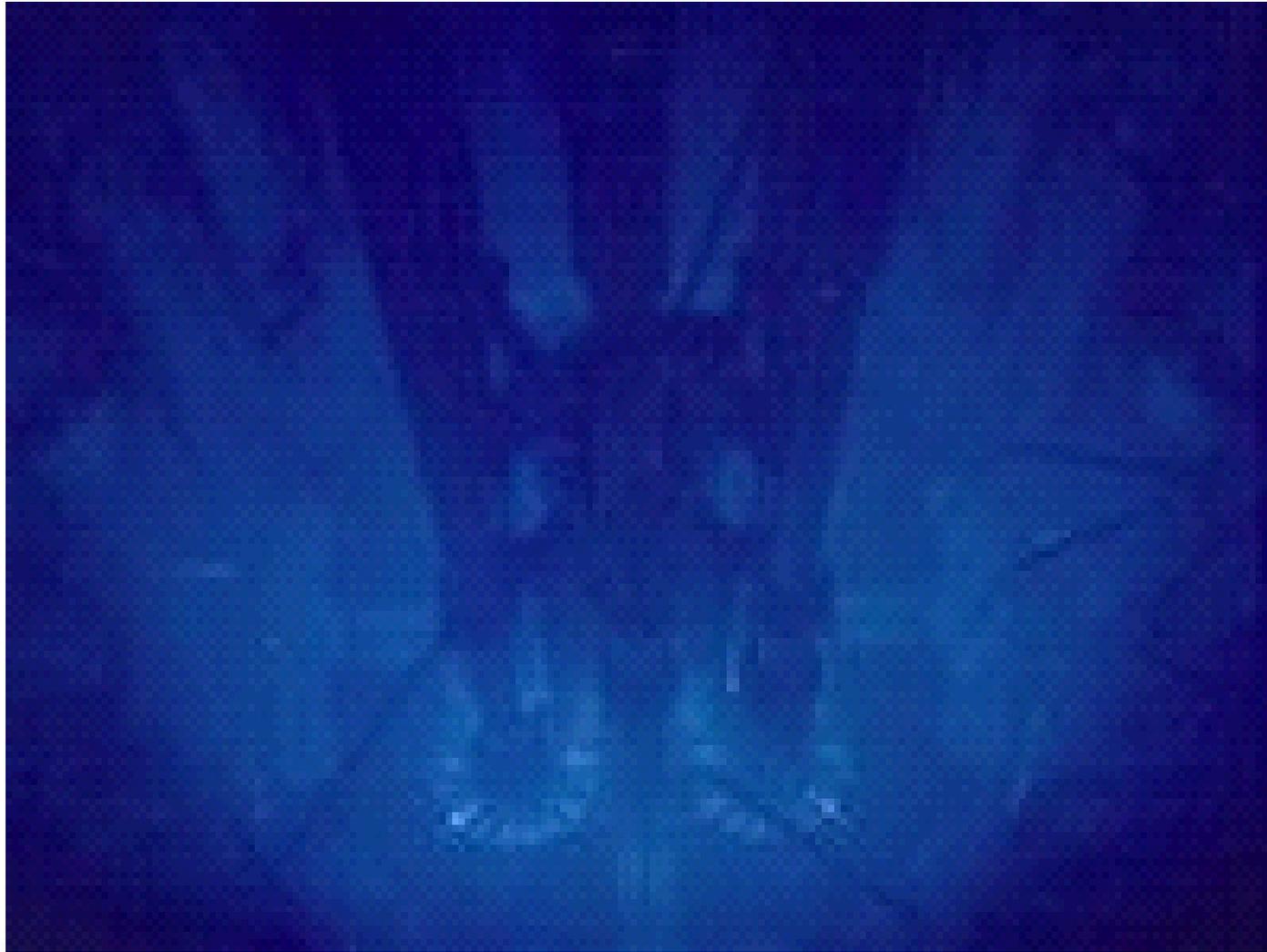
















# The Big Picture: Lab and Cleanup Separated

**IDAHO CLEANUP PROJECT**  
SAFELY PLAN • MOTIVATE • DELIVER

**iNL** Idaho National Laboratory

Idaho  
Cleanup  
Project

Idaho  
National  
Laboratory



*Battelle  
Energy  
Alliance*

## **Cleanup**

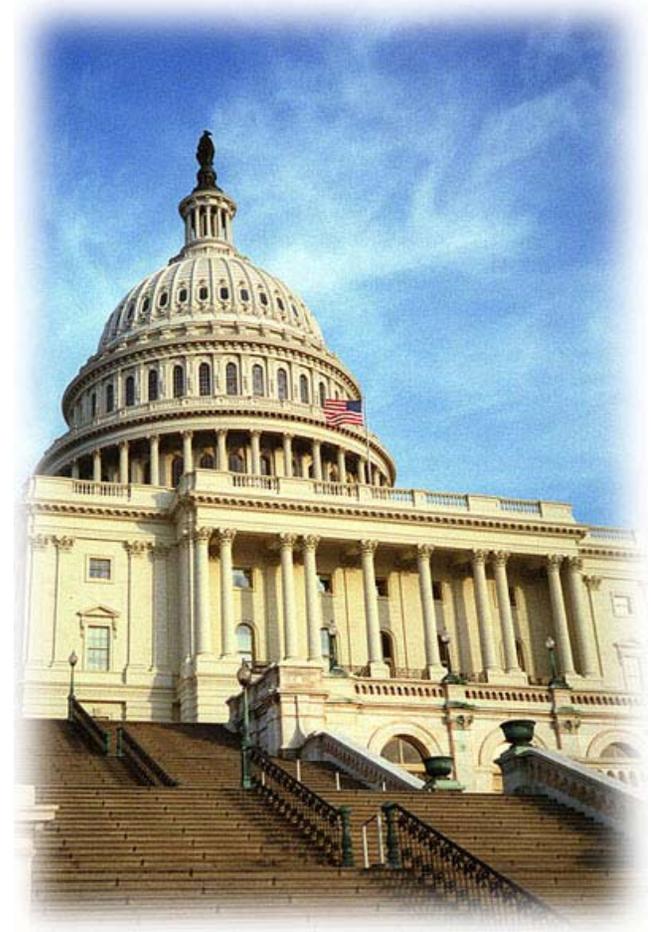
Complete Major Site  
Cleanups by 2012

## **Research**

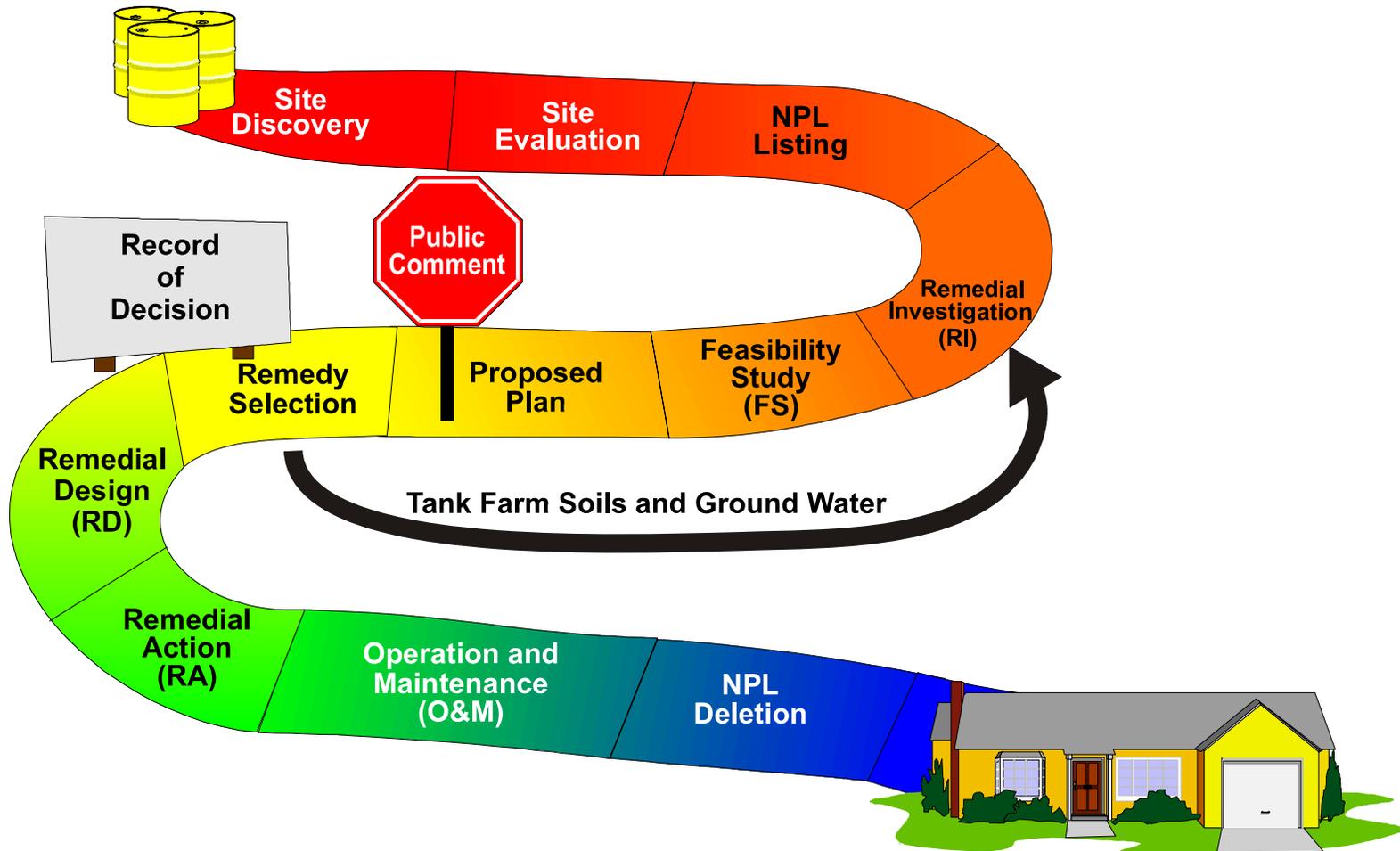
Nuclear technology,  
national security and other  
multi-program research

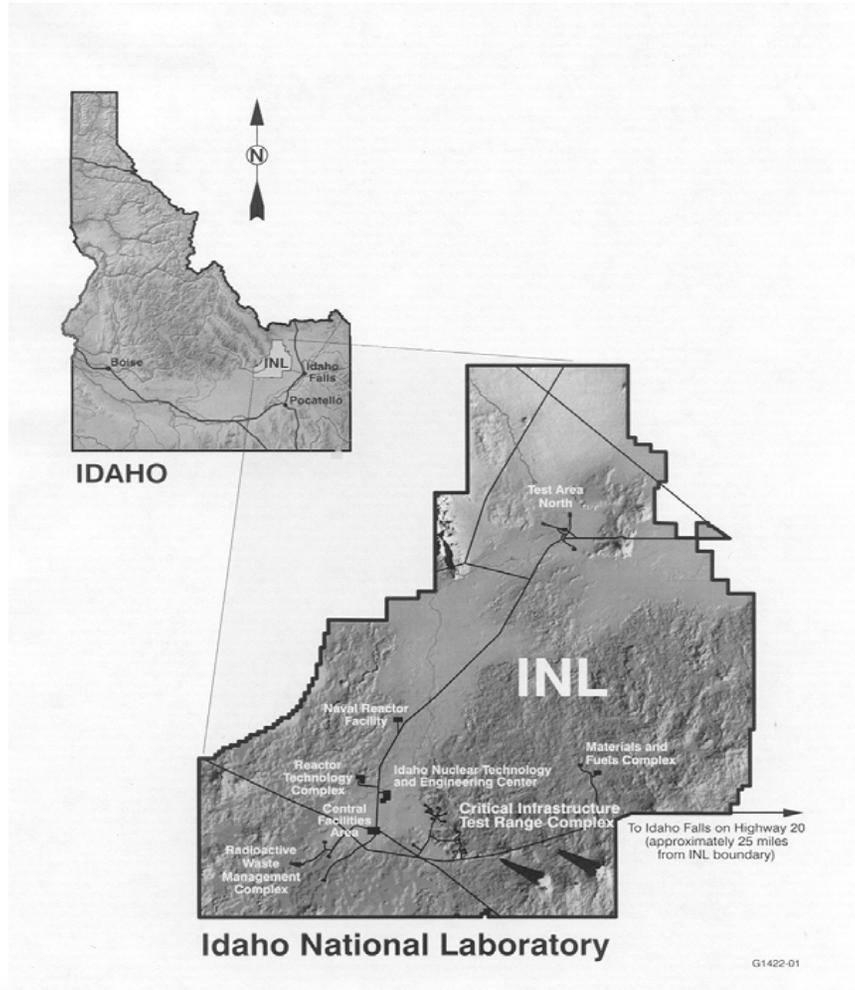
# Environmental Laws: Cleaning Up Past Waste

- Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or “Superfund”
  - Requires cleanup of waste sites
  - DOE is governed by agreement with EPA and State as defined by a Federal Facility Agreement and Consent Order (FFA/CO).
  - FFA/CO outlines the major cleanup projects and sets enforceable deadlines for submitting cleanup plans for review by EPA and the State of Idaho
  - Proposed cleanup plans are published for public comment, and finalized in CERCLA Record of Decision (ROD)



# The CERCLA Process

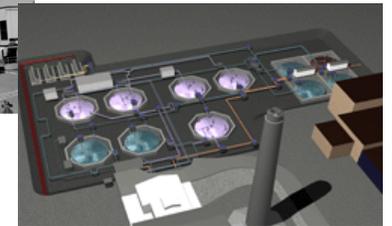






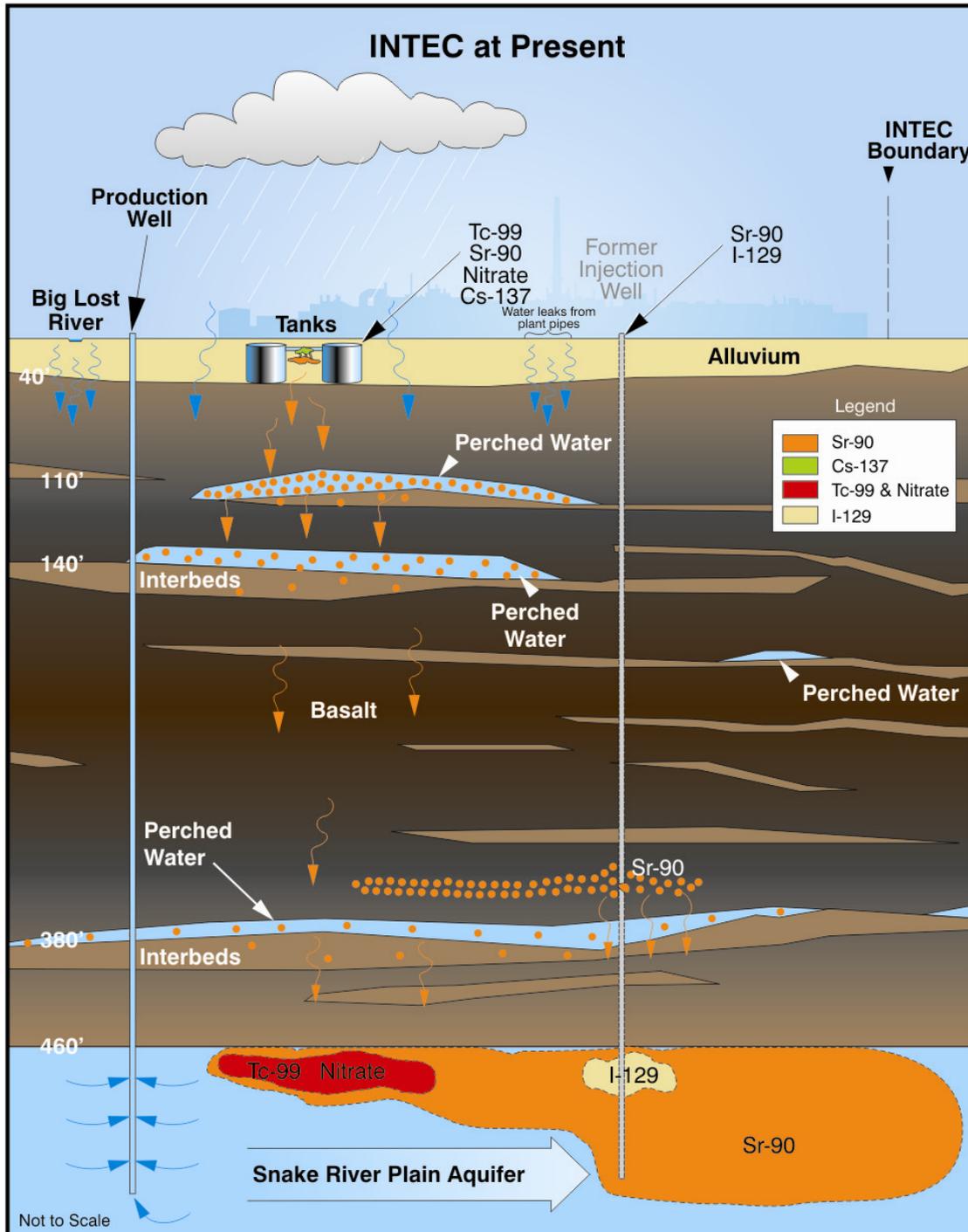
# INTEC Background

- Reprocessing spent nuclear fuel from government reactors (1953 – 1992) generated liquid high-level waste and sodium-bearing liquid waste
- Liquid waste was placed into interim storage in underground tanks at the INTEC Tank Farm.
- Liquid high-level waste was converted to solid calcine (1963 – 1998) stored in stainless steel bins
- Just under 1 million gallons of liquid sodium-bearing waste remains in storage awaiting treatment
- Soils surrounding the tanks and groundwater are contaminated from historic activities



# INTEC Decisions

- OU 3-13 INTEC Comprehensive Record of Decision
  - Signed in 1999 by EPA, DEQ, and DOE
  - Established interim actions to provide protection until final remedy (OU 3-14)
  - Interim Actions
    - Tank Farm Soil
    - Snake River Plain Aquifer
  - Perched Water Final Action (reduce recharge, minimize migration to Snake River Plain Aquifer)
- OU 3-14 Tank Farm Soil and Groundwater RI/FS
  - RI/BRA and FS published in May and June 2006
  - ROD scheduled for spring 2007



## Conceptual Model

### Tank Farm

- Sedimentary interbeds
- Thin (~ft to tens of ft)
  - Retard downward flow
- Basalt
- Depth to basalt 40-60 ft
  - Small, interfingering flows
  - Highly transmissive

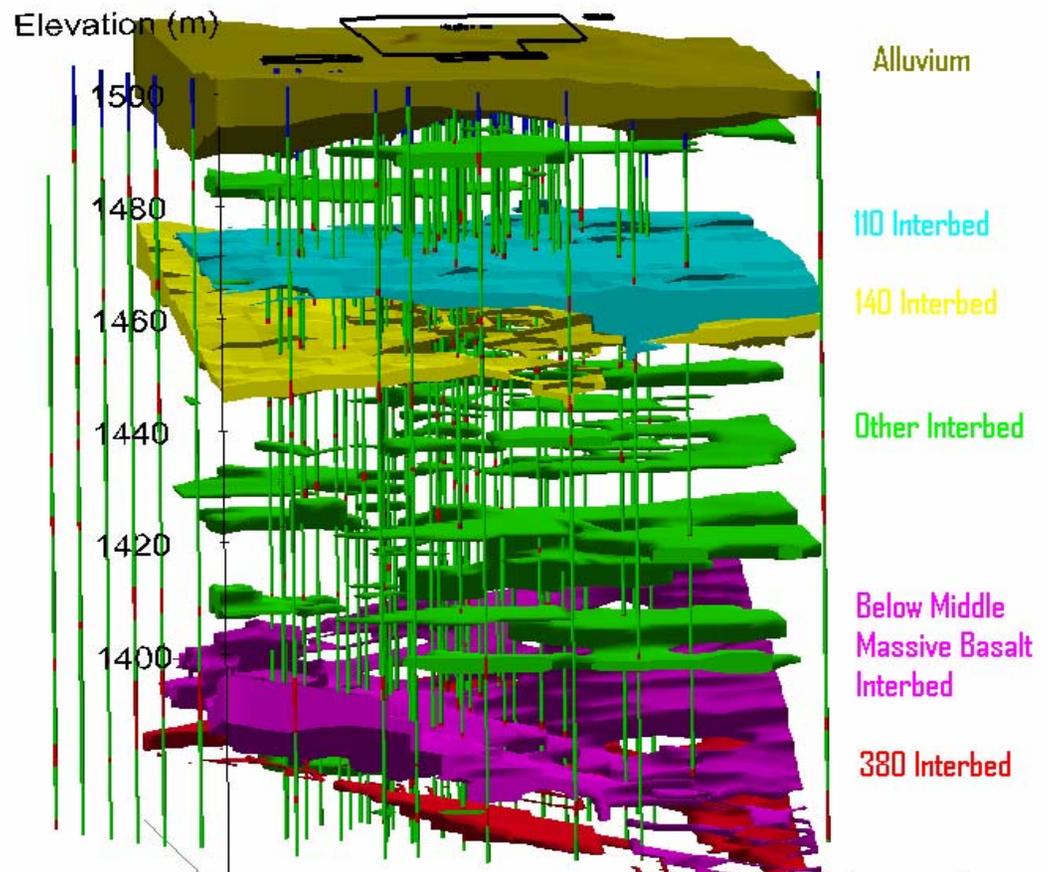
### Hanford

- Sediments
- 100s of ft thick
  - Highly transmissive
- Basalt
- Depth to basalt 100s ft
  - Massive flows

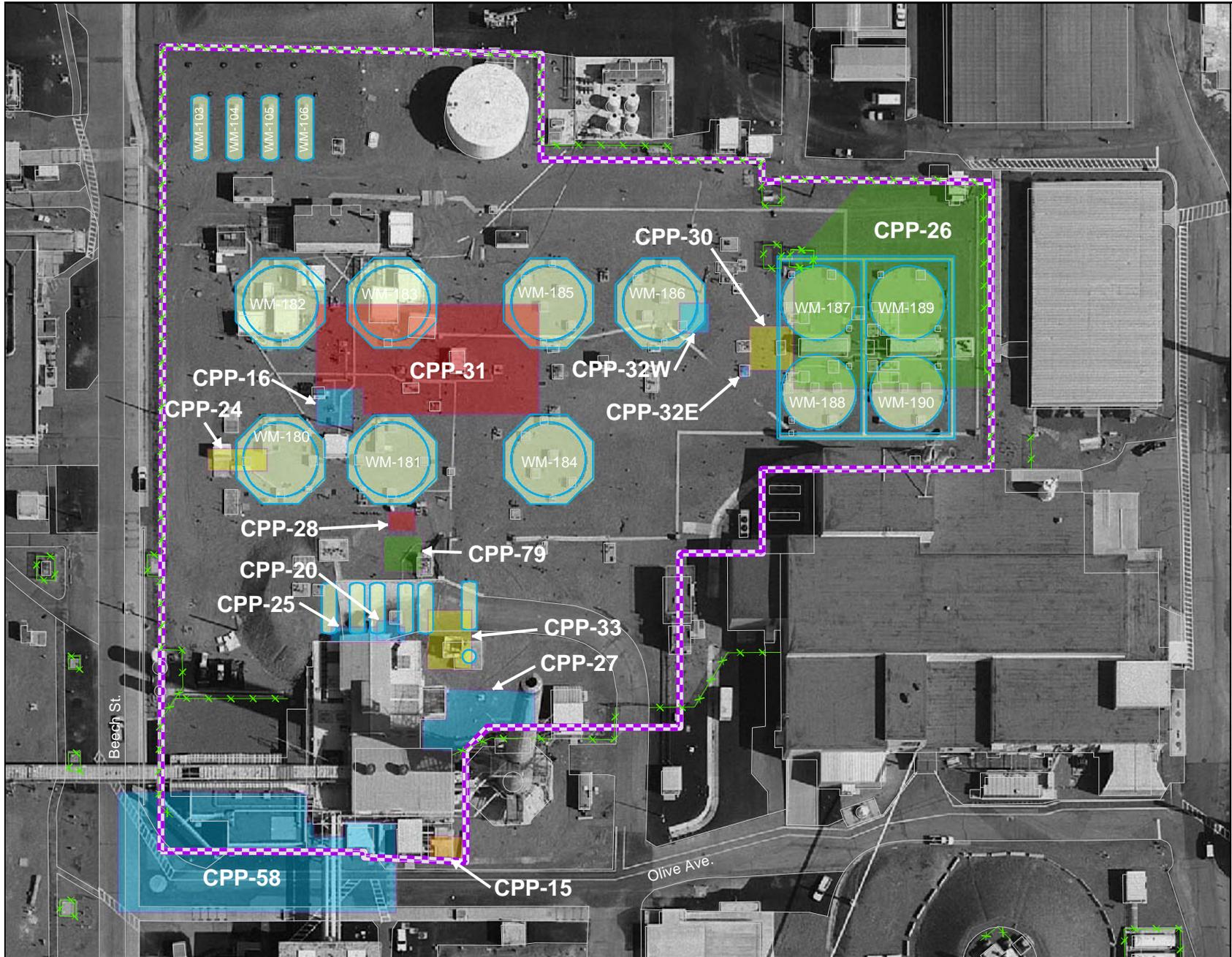


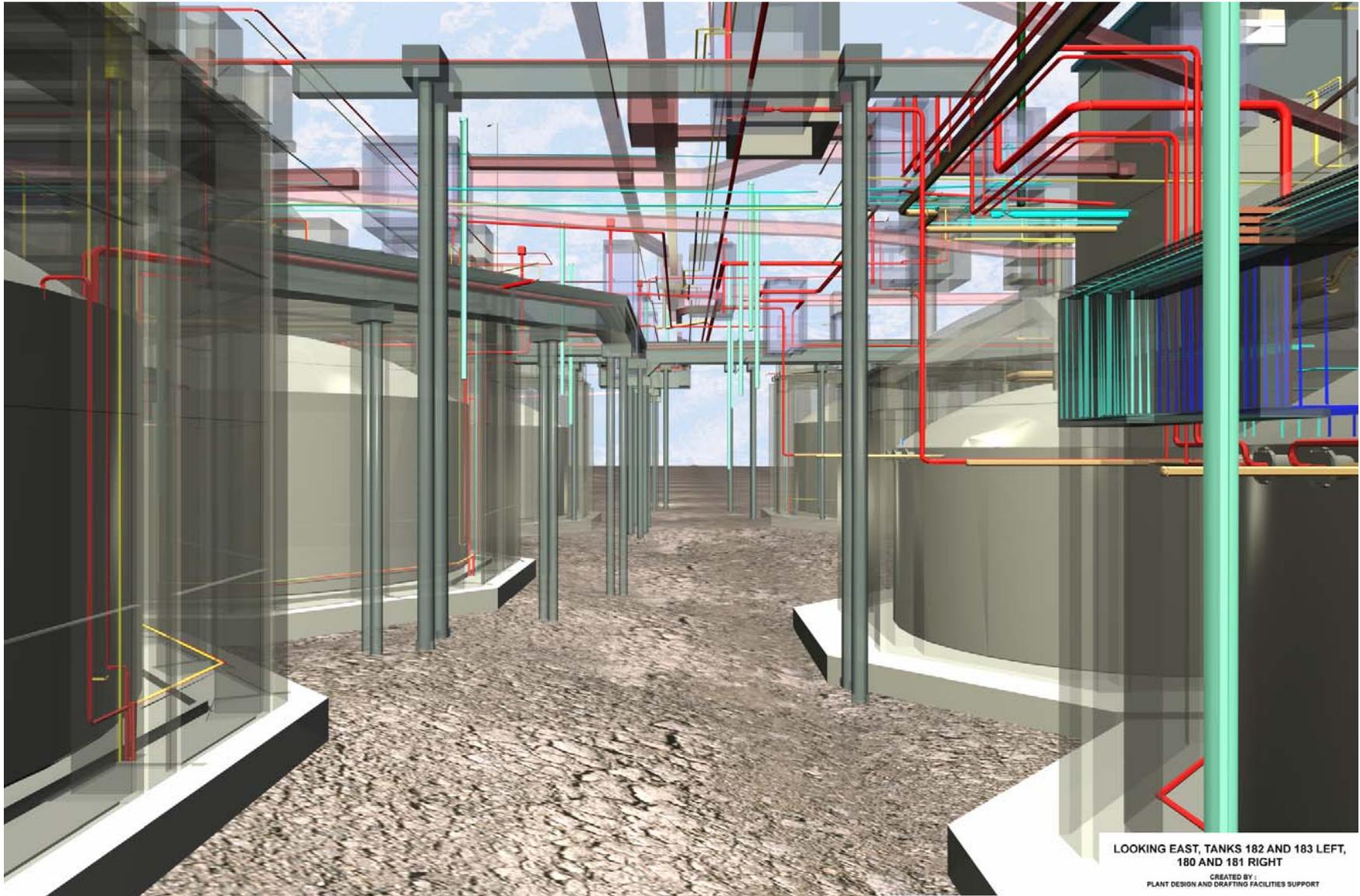
# INTEC Subsurface

- ~450 ft unsaturated zone above Snake River Plain Aquifer
- Surficial sediments 0-40 ft thick
- 14% of vadose zone below the alluvium is comprised of interbed sediment
- The remainder is fractured basalt



# Aerial View of Tank Farm and Contaminated Soil Sites

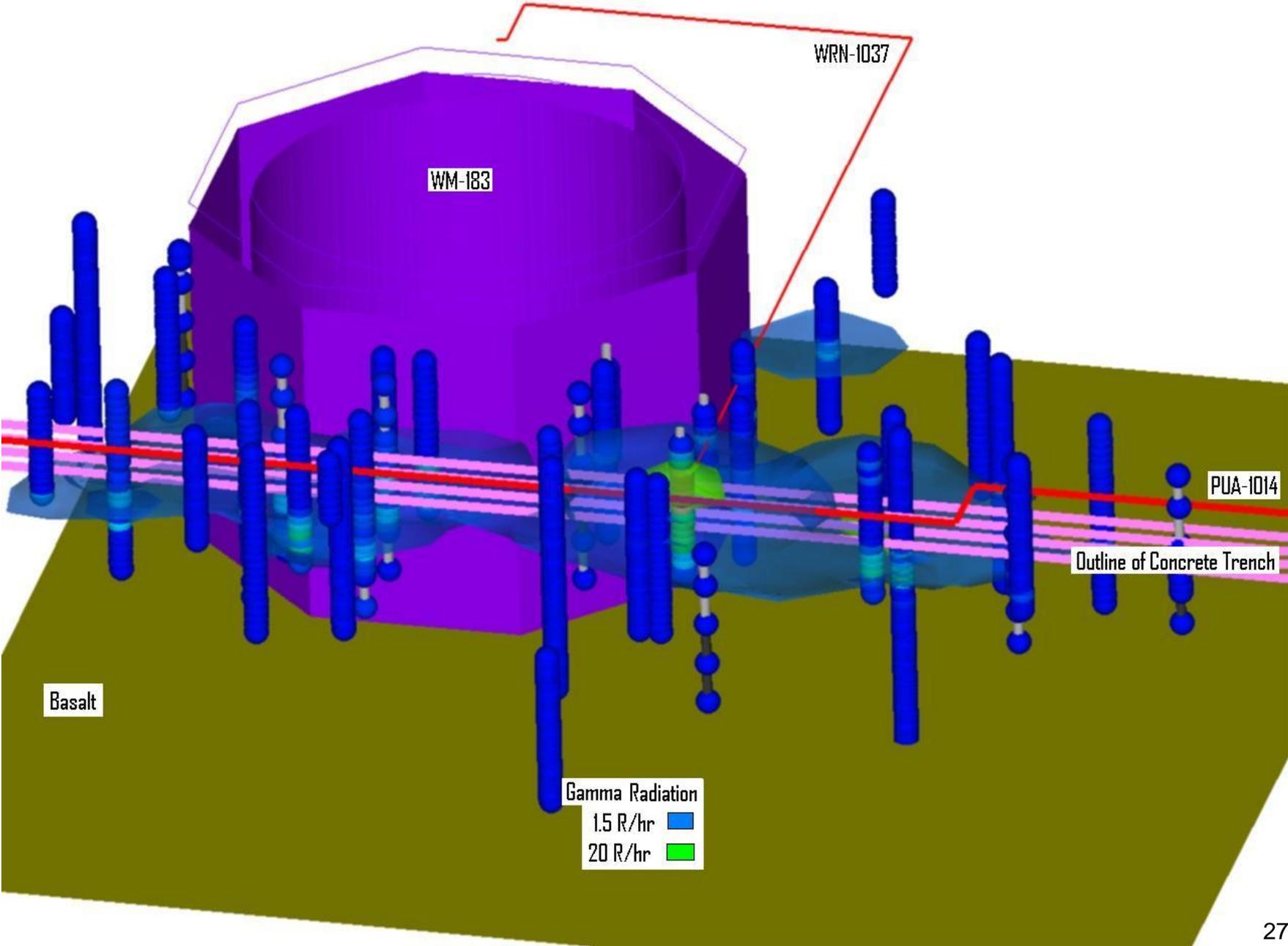




LOOKING EAST, TANKS 182 AND 183 LEFT,  
180 AND 181 RIGHT

CREATED BY :  
PLANT DESIGN AND DRAFTING FACILITIES SUPPORT

# Site CPP-31 Cs-137 contamination



# 3-14 Groundwater and Perched Water Contaminants

- Currently Sr-90 and Tc-99 exceed MCLs in aquifer (~3X), I-129 and nitrate slightly greater than MCLs
- Perched water: Sr-90 50,000 times drinking water standard
- Two sources of groundwater contaminants
  - Historical use of CPP-03 injection well (I-129 and Sr-90)
  - Soil contamination from tank farm leaching through vadose zone (Tc-99 and nitrate)
- Used TETRAD 3D flow and transport model and TOUGHREACT to predict future plumes
- Sr-90 – injection well, failed injection well in vadose zone, perched water, alluvium



# Groundwater Monitoring

- DOE and independent organizations
- Over 125 wells to date at INTEC
- About 50 SRPA wells
- About 75 wells in the vadose zone to monitor perched water
- Monitoring on-going
  - CERCLA: Required as long as contamination remains in place above risk-based levels, predicted to be for at least 100 years
    - Perched water
    - Groundwater
    - INL wide and Long Term Stewardship
  - RCRA:
    - Waste Calcine Facility post closure
    - Post tank closure monitoring will be under CERCLA
  - Independent: USGS, State of Idaho INL Oversight

# INTEC Summary

- There are known tank farm releases to alluvium that have migrated to perched water (Sr-90, Cs-137) and aquifer (Tc-99 and nitrate)
- These releases are under tri-party CERCLA Federal Facilities Agreement and Consent Order between DOE, EPA, and DEQ
- OU 3-14 tank farm soil and groundwater ROD due 2007
- Extensive monitoring network: multiple agencies and programs
- CERCLA monitoring will continue long term as long as contamination remains in place above risk based levels

# RWMC background

- Established in 1952 for buried disposal of Site-generated wastes
  - Originally 13 acres in size
- Beginning in 1954, the RWMC began receiving waste from the Rocky Flats Plant and other off-site generators
- Burial of transuranic waste ended in 1970
- Low-level radioactive waste disposal at the RWMC on going



# Contamination

- Volatile organic compounds (i.e., chemicals) migrating to aquifer
- By late 1980s – Concentrations were at drinking water limits
- Volatile organic compounds are the immediate threat to the aquifer, not radionuclides

# Remediation of Buried Waste



- Treatment of organics by VVE on-going
- Simultaneous retrieval of waste in pits and trenches on-going
  - Maximize TRU curies retrieved, while removing volatile organic compounds
- Comprehensive RI/FS complete by 2007 and Implementation begun before 2012



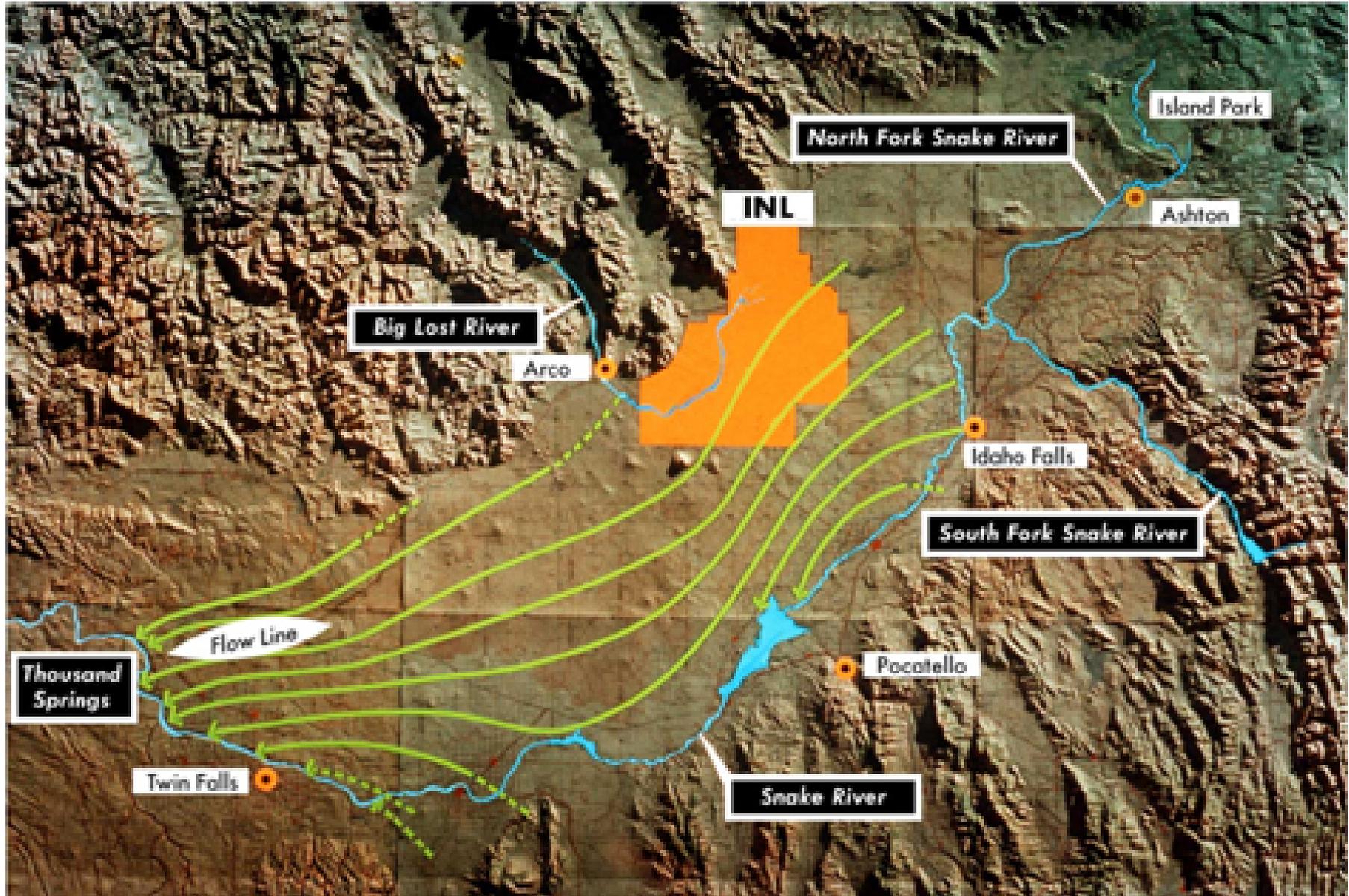
# Schedule

- Remedial Investigation/Baseline Risk Assessment
  - Published May 2006
- Record of Decision
  - Expected to be available to the public in the fall of 2007

# TAN Groundwater Remediation

- Test Area North employed a bioremediation process to remediate contaminated groundwater
- 364 million gallons of contaminated water treated at the New Pump and Treat Facility
  - 470 pounds of trichloroethene removed
- Initiated aquifer contamination rebound test on March 1 to assess effectiveness of pump and treat system

## Eastern Snake River Plain Aquifer protection is #1 concern of Idaho citizens



# Overall CERCLA Clean-up: The Final Four

- **INTEC**

- Tank Farm Soils
- Sr-90 in groundwater

- **TAN**

- Aquifer TCE Cleanup

- ◆ **RWMC**

- Buried Waste Retrieval  
Remote Handled TRU
- Waste Minimization,  
Treatment and Packaging
- Shipment to WIPP

- ◆ **Site-wide**

- Aquifer modeling

# Summary

- Complex hydrogeology
- Contaminants have migrated to perched water (Sr-90), and aquifer (Tc-99, carbon tet, and nitrate) or injected directly into aquifer (TCE, I-129, Sr-90)
- These releases are under CERCLA and cleanup decisions are made by DOE, EPA, and DEQ
- Remedies: Innovative and/or simple
- Extensive monitoring network and data
- Long-term CERCLA monitoring and remediation
- ERSP opportunities
  - modification of remedies when new technologies or information discovered
  - Monitoring