SAND2007-2407P

Training Iraqi Scientists in Modern Practices for Management of Radioactive Waste as part of Iraq NDs Program week 2

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[1] Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000. (SAND2006-xxxx)

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Sandia National Laboratories

Itinerary

- Day 1 to 2 - Travel to Tucson, Arizona
- Day 3 to 9 - Waste Management'07 Symposium & Training
- Day 10 to 11 – Travel Las Vegas, Nevada & rest
- Day 12 - Tour U.S. gov rad waste disposal facility
- Day 13 - Travel to Salt Lake, Utah
- Day 14 - Tour commercial rad disposal facility
- Day 15 to 17 - Travel to Baghdad

Tour Radioactive Waste Disposal Facility at Nevada Test Site

- U.S. Department of Energy's (DOE's) largest facility for disposal of radioactive wastes
- Not open to public

- Licensed for almost all types of LLW, including very high-specific activity LLW
- Self-regulated by the U.S. DOE
- For LLW from U.S. government only
- 65 hectares (160 acres)
- Over 370,000 cubic meters disposed to date
- No on-site treatment of waste, only receive and dispose
- Wastes have been placed in unlined trenches and boreholes from 4 to 36 m below surface

Tour Radioactive Waste Disposal Facility at Nevada Test Site

- **Long-Term Safety provided by:**
  - **Many, many studies**
  - **235 m to groundwater**
  - **130 mm precipitation per year & very high evaporation rates**
  - **Rain water never infiltrates to groundwater**
  - **Remote location**
  - **On very large government reservation**

Tour Radioactive Waste Disposal Facility at Nevada Test Site

NTS is 105 km from Las Vegas, Nevada. Stopped on road to observe arid, unpopulated setting

NTS and adjacent Air Force Base cover 14,000 km^2 (5,500 mile^2) of government controlled land

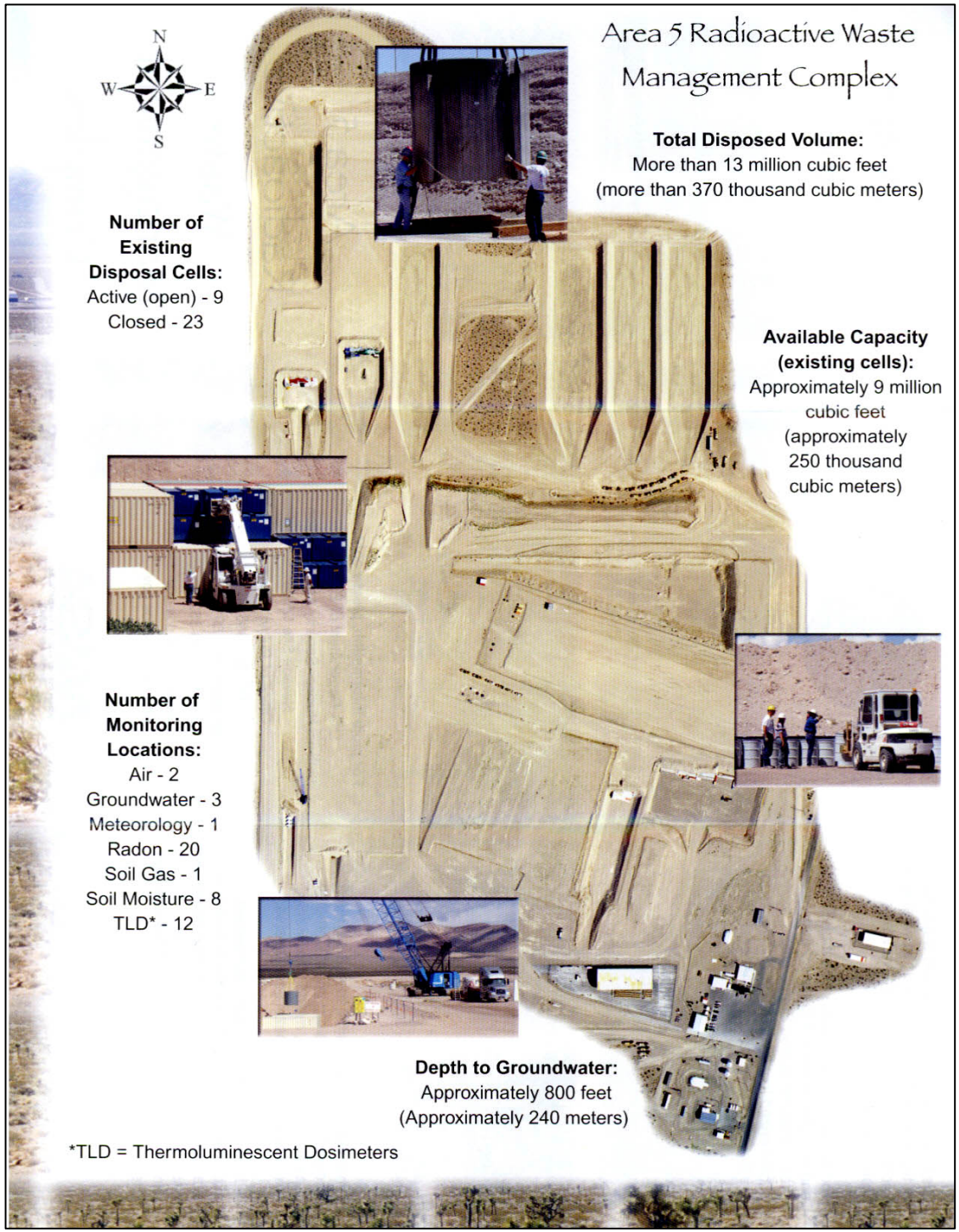
Tour Radioactive Waste Disposal Facility at Nevada Test Site

Because of ongoing national security work, significant paperwork required to bring foreign visitors onto NTS.

Recording devices not allowed beyond gate to NTS.

Aerial photograph from literature.

Operational facilities in lower right for scale



Tour Radioactive Waste Disposal Facility at Nevada Test Site

Placing wastes in unlined trench, all wastes covered with a temporary cover of 2.5 m of soil

Area 5 Radioactive Waste Management Complex disposal cell.

Historic, remote, disposal of reactor fuel rods in 36-m deep, 3-m in diameter boreholes (spend nuclear fuel had been removed from rods prior to disposal)

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Tour Energy*Solutions* Clive, Utah Radioactive Waste Disposal Facility

- One of three commercial facilities in the U.S. for disposal of radioactive wastes
- Frequently give public tours

- Licensed for the “least hazardous” LLW, called Class A LLW
- Class A LLW decays to safe levels for human intruder in 100 years
- Wastes placed in *above* ground level cells
- Similar to disposal of uranium mill tailings

- 270 employees
- $60 M USD in capital improvements *since 2005*
- Treatment Capabilities:
  - Macro-Encapsulation
  - Liquid Solidification
  - Thermal Desorption
  - Stabilization
  - Shredding

Tour Energy*Solutions* Clive, Utah Radioactive Waste Disposal Facility

- **Long-Term Safety Provided by:**
  - **Many, many studies**
  - **Limiting the inventory to Class A, least hazardous LLW**
  - **Groundwater 10 m deep & twice as saline as sea water (not drinkable)**
  - **200 mm precipitation per year & high evaporation rates**
  - **Remote location**

- **Regulatory Oversight:**
  - **Tooele County Health Department**
  - **Utah Division of Radiation Control**
  - **Utah Division of Solid and Hazardous Waste**
  - **Utah Division of Air Quality**
  - **Utah Division of Water Quality**
  - **U.S. Nuclear Regulatory Commission**
  - **U.S. Environmental Protection Agency**

Tour Energy*Solutions* Clive, Utah Radioactive Waste Disposal Facility

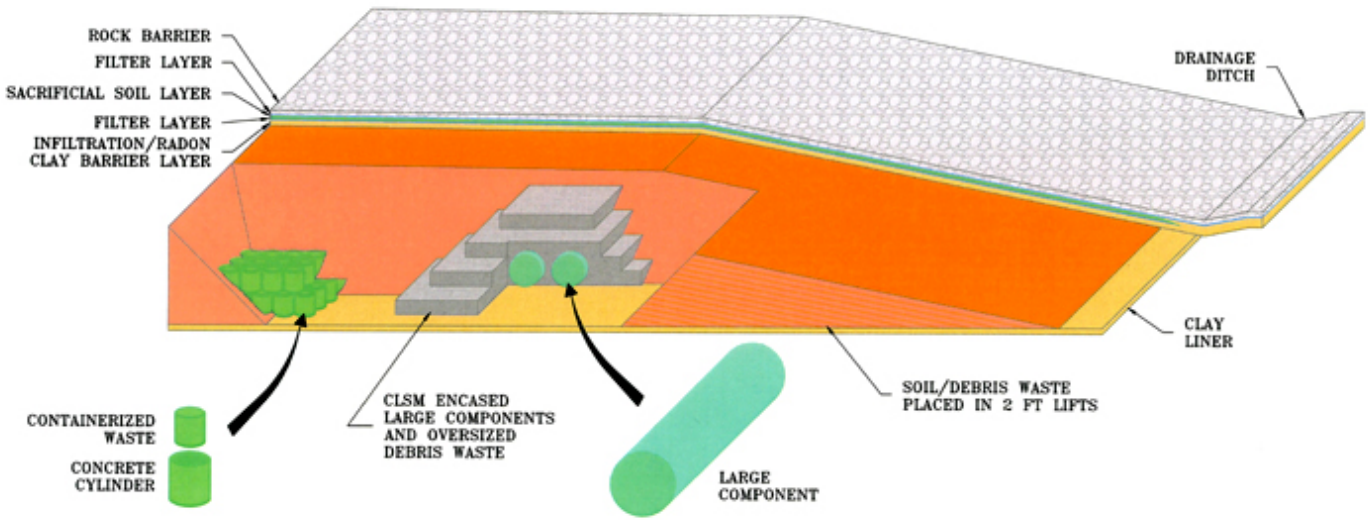
Like the NTS, the Clive Facility is a long drive from a population center.

Tour Energy*Solutions* Clive, Utah Radioactive Waste Disposal Facility

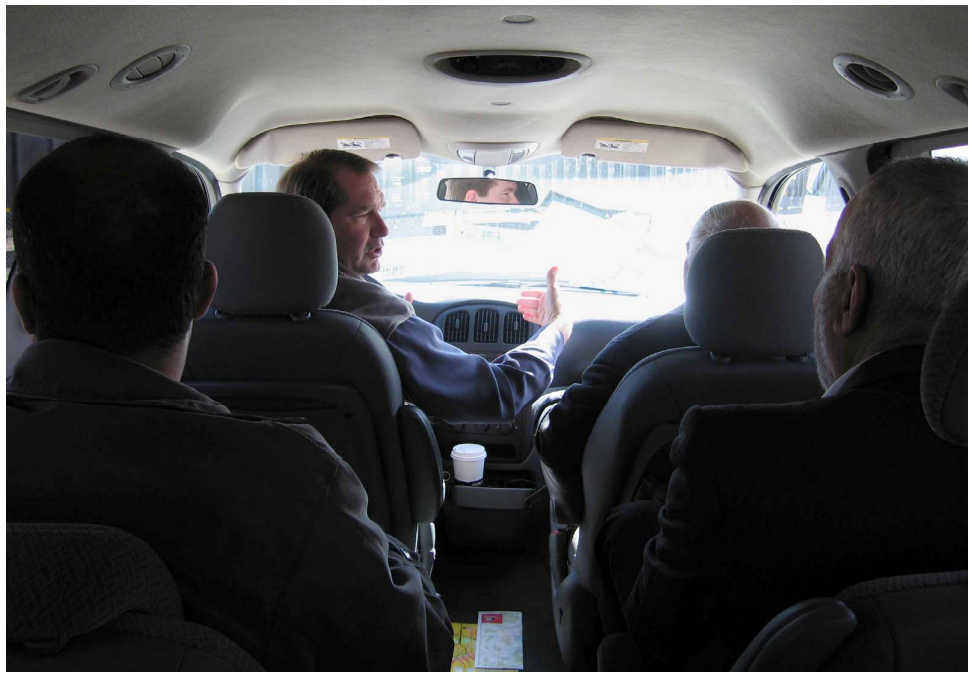
Aerial view showing scale of operations. Note two closed cells in center and active cell in upper right.

Tour Energy*Solutions* Clive, Utah
Radioactive Waste Disposal Facility

Cross-section of an above-ground disposal cell at EnergySolutions.



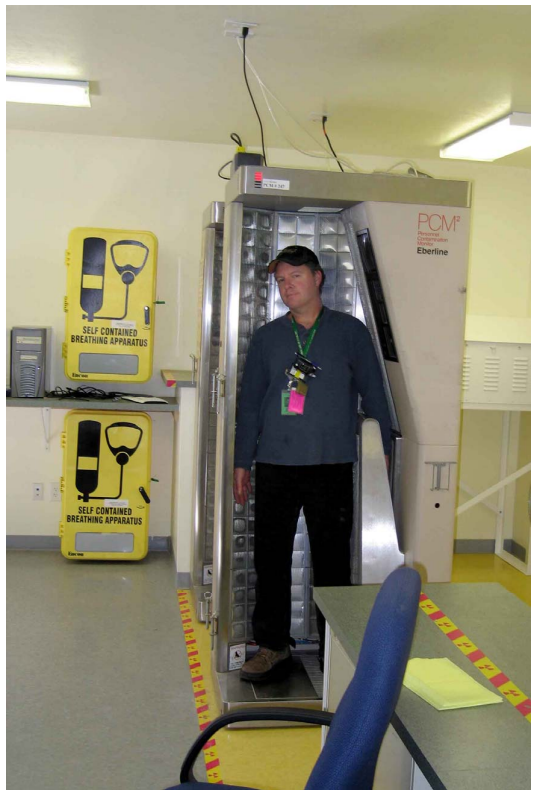
Tour Energy*Solutions* Clive, Utah Radioactive Waste Disposal Facility



Van tour

Live video monitoring of work areas

Tour Energy*Solutions* Clive, Utah Radioactive Waste Disposal Facility



Clear boundaries between “clean” and “contaminated” work areas

Tour Energy*Solutions* Clive, Utah Radioactive Waste Disposal Facility

“Tipper” empties entire railroad car of waste, note people on right for scale

Tour Energy*Solutions* Clive, Utah Radioactive Waste Disposal Facility

EnergySolutions goes to great lengths to eliminate voids in the disposal cells

Metal Shredder:
- **6000 HP electric motor**
- **Reduce debris to 10 cm or less**
- **1500 tons per shift**

Tour Energy*Solutions* Clive, Utah Radioactive Waste Disposal Facility

Placing backfill around waste too heavy to shred

Tour Energy*Solutions* Clive, Utah Radioactive Waste Disposal Facility

Summary of Week 2

- Toured two very different, licensed and operating radioactive waste disposal facilities in the U.S.
- Learned many lessons that can be applied to the situation in Iraq
- Identified sources of information for use by Iraqis scientists
- Exposed scientists to modern radioactive waste management practices and equipment
- Created professional relationships for Iraqis with U.S. waste management experts
- Spent 2 weeks together, improving English and squeezing 4 people and lots of luggage in small cars
- Hopefully showed that working with radioactive waste can be interesting.

Overall Summary

- **Completed two weeks training & tours for Iraqi scientists in modern practices for management & disposal of radioactive waste**
- **Participated in world's largest radioactive waste symposium with over 600 technical & regulatory presentations**
- **Met U.S. & international vendors specializing in radioactive waste and decontamination equipment**
- **Received training in project management techniques**
- **Toured two very different, licensed and operating radioactive waste disposal facilities in the U.S**