

Overview of Science Programs at Sandia Carlsbad Programs Group in Support of WIPP

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INTRODUCTION

The Waste Isolation Pilot Plant (WIPP) is the world's only licensed and operating deep geologic repository for the disposal of transuranic (TRU) waste. WIPP is operated by Nuclear Waste Partnership, LLC, under contract to the Department of Energy's Carlsbad Field Office (CBFO).

Sandia National Laboratories (SNL) serves as the scientific advisor to CBFO in many areas:

- Modifications to the repository's operating permits
- Periodic recertification of the repository
- On-going monitoring of repository performance against regulatory requirements
- Advancing scientific research for the national transuranic complex

The Repository Performance Department is part of the Defense Waste Management Programs Group, also known as the Carlsbad Programs Group (CPG). The Repository Performance Department provides the experimental and fieldwork capabilities needed to assist CBFO in assuring continued and uninterrupted regulatory certification and permitting of WIPP.

AREAS OF EXPERTISE

SNL-CPG has areas of expertise in:

- Geochemistry
- Hydrology/Geology
- Performance Assessment

SNL-CPG Geochemistry

Thermodynamics (Pitzer Approach):

- Solubility & Complexation of Fe, Pb, Mg, Nd, and B
- Actinide Solubility Baseline and Uncertainty
- MgO Hydration/Carbonation Products
- Fe/Pb Corrosion Products

Kinetics:

- Fe/Pb Corrosion Rates
- MgO Hydration/Carbonation Rates

Thermodynamics + Kinetics of Colloids:

- Production by Corrosion, MgO Hydration/Carbonation reactions, Organic Acids, Minerals
- Evolution and Interactions of Colloids
- Transport of Actinides by Colloids

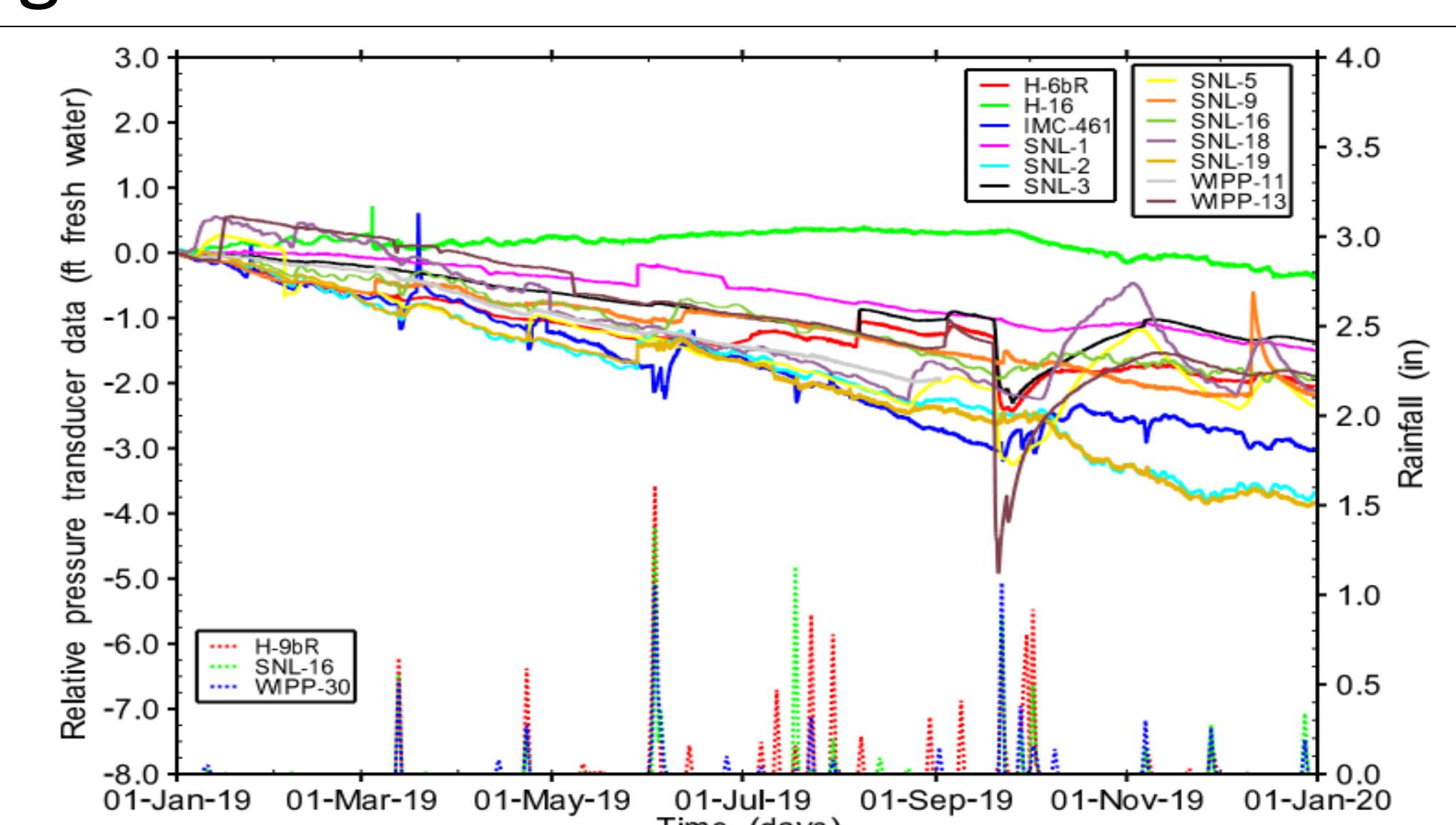
Laboratory Capabilities



XRD, Mössbauer, ASAP 2020, GC, SEM, Laser Diffraction, DLS, Zeta-potentiostat, Interferometer, Raman, TOC, TGA/DSC, UV-Vis, FTIR, IC, ICP-AES, ICP-MS, Material Studio, Corrosion Reactors

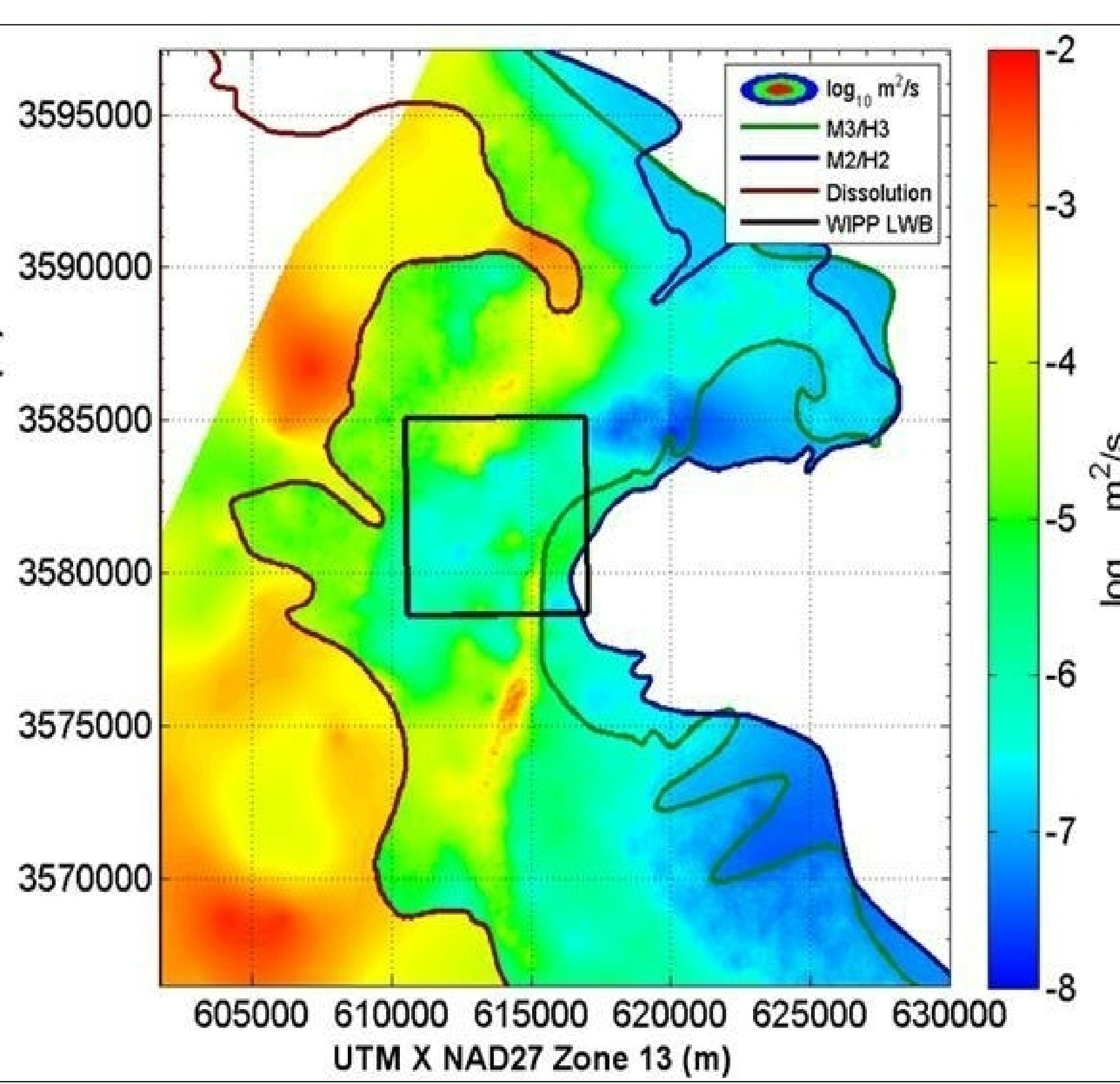
SNL-CPG Hydrology/Geology

The SNL WIPP Hydrology program focuses on the Rustler formation, primarily the Culebra Dolomite Member, which resides above the repository and is monitored through a network of 49 wells. The hydrology team's work focuses on involves a mixture of field work, data/test analysis, and hydrologic modeling.



Example water level fluctuation and corresponding precipitation measurements for select wells in the WIPP Monitoring Well Network¹.

Transmissivity fields are generated and calibrated using field measurements as part of the WIPP Compliance Recertification Application. An illustration of the mean effective transmissivity (T_e) across 100 selected fields is given to the right².



¹Bowman, D.O. and Hayes, A. 2020. WIPP Milestone Report: 2019 Culebra Monitoring Network Groundwater Level Fluctuations. Sandia National Laboratories. Carlsbad, NM. ERMS 573306

²DOE (U.S. Department of Energy). 2014. Title 40 CFR Part 191 Compliance Recertification Application 2014 for the Waste Isolation Pilot Plant, Appendix TFIELD-2014. DOE/WIPP 14-3503. U.S. DOE, Carlsbad Field Office, Carlsbad, New Mexico.