

# AQUIFER MAPPING AND MONITORING PROGRAM

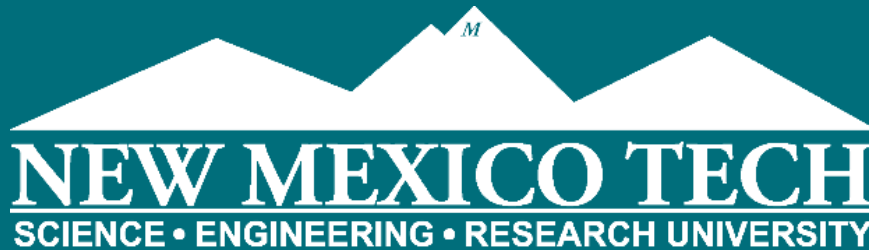
NEW MEXICO BUREAU OF GEOLOGY AT NEW MEXICO TECH



**Stacy Timmons, Associate Director, Hydrogeology Programs**

**Dr. Sean Connell, Senior Research Scientist**

**November 17, 2025**

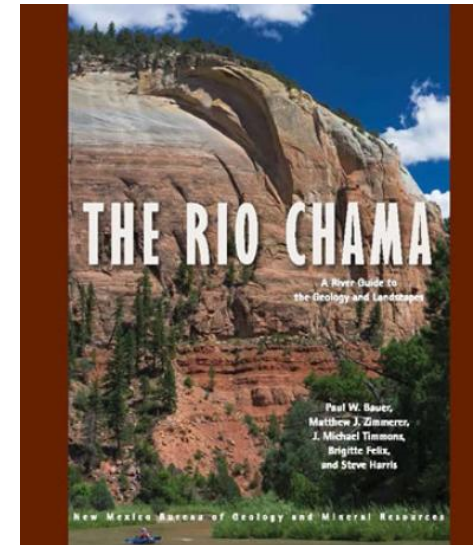


# NM BUREAU OF GEOLOGY (NMBGMR) A RESEARCH DIVISION OF NM TECH



Non-regulatory geologic survey providing science and service to NM since 1927

- Geologic Mapping and Hazards
- Energy Resources
  - Oil/Gas
  - Geothermal
- Mineral Resources
  - Critical Minerals
- Laboratories
- Outreach and Education
- Hydrogeology and Water Programs



# AQUIFER MAPPING AND MONITORING PROGRAM IN NEW MEXICO

## What We Do

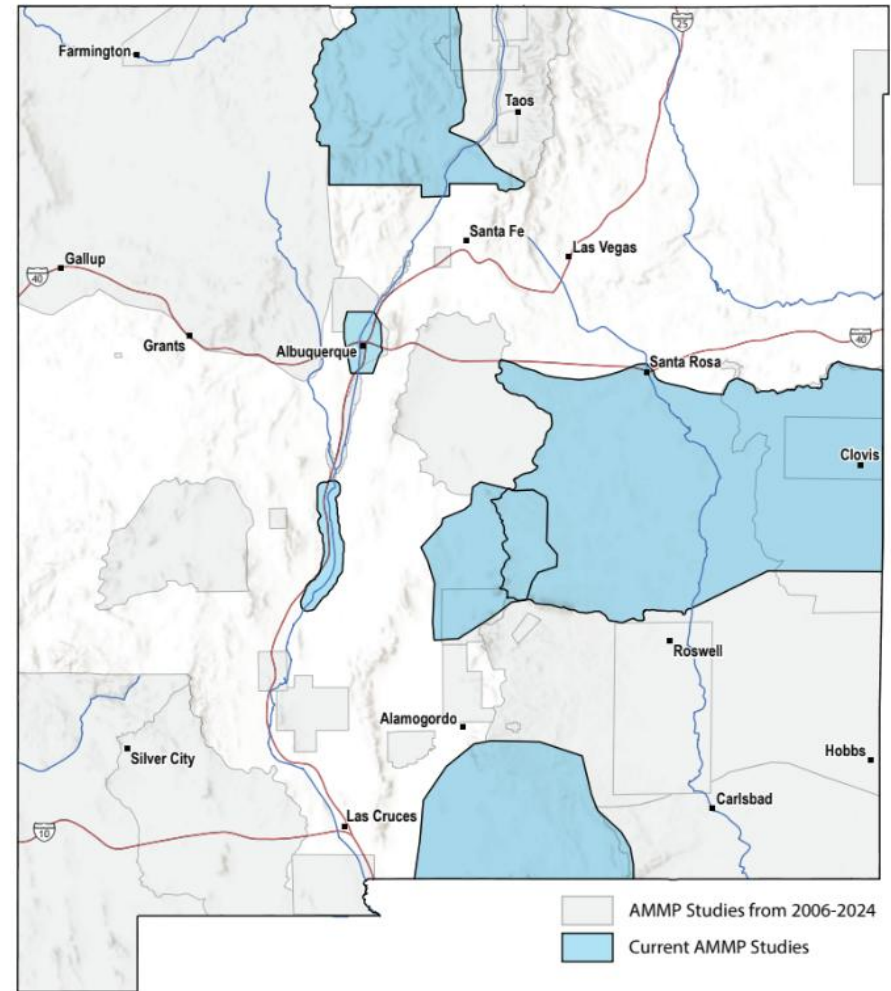
- We analyze the quantity, quality, and distribution of groundwater within aquifers by integrating geological, geophysical, hydrological, and chemical data
- Our work supports communities, agencies, policymakers, and managers in making informed, science-driven decisions on water resources
- We work with funding and support from state, federal, local and philanthropic sources



All together, our team currently has over 250 years of experience!

# PROJECTS AND WORK UNDERWAY NOW

- Rio Arriba County hydrogeology
  - Complete in Summer 2026
- 3D Hydrogeology Models
  - Central High Plains and Salt Basin regions
- Carrizozo regional hydrogeology
  - Year I complete
- Rio Grande – San Acacia reach
  - Groundwater and soil-water monitoring
- Albuquerque region (ABCWUA)
  - Annual groundwater change mapping



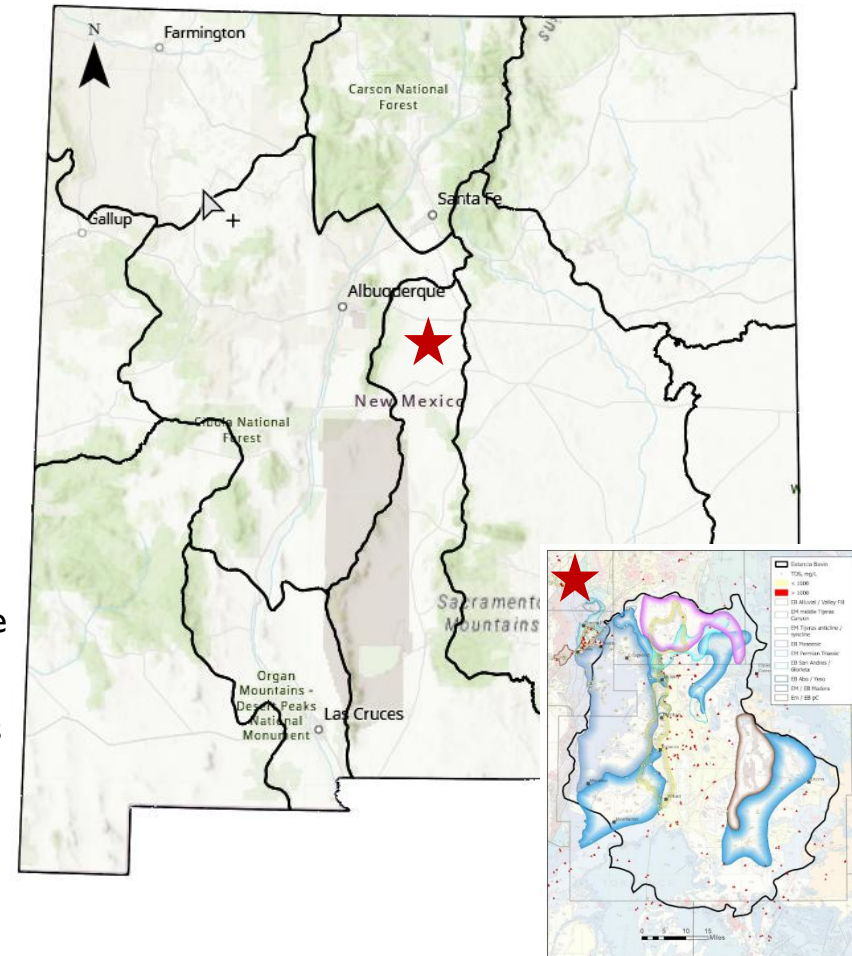
# STATEWIDE PROJECTS: GROUNDWATER SUMMARIES & 2D AQUIFER MAPPING

## Statewide Groundwater Summaries

- Comprehensive groundwater summaries of 10 regions
- Emphasize current understanding and identify data gaps for future research
- Delivered as technical regional summaries and fact sheets
- Online interactive tools and publications planned for release by Summer 2026
- Initial funding provided by Thornburg Foundation

## 2D Aquifer Mapping

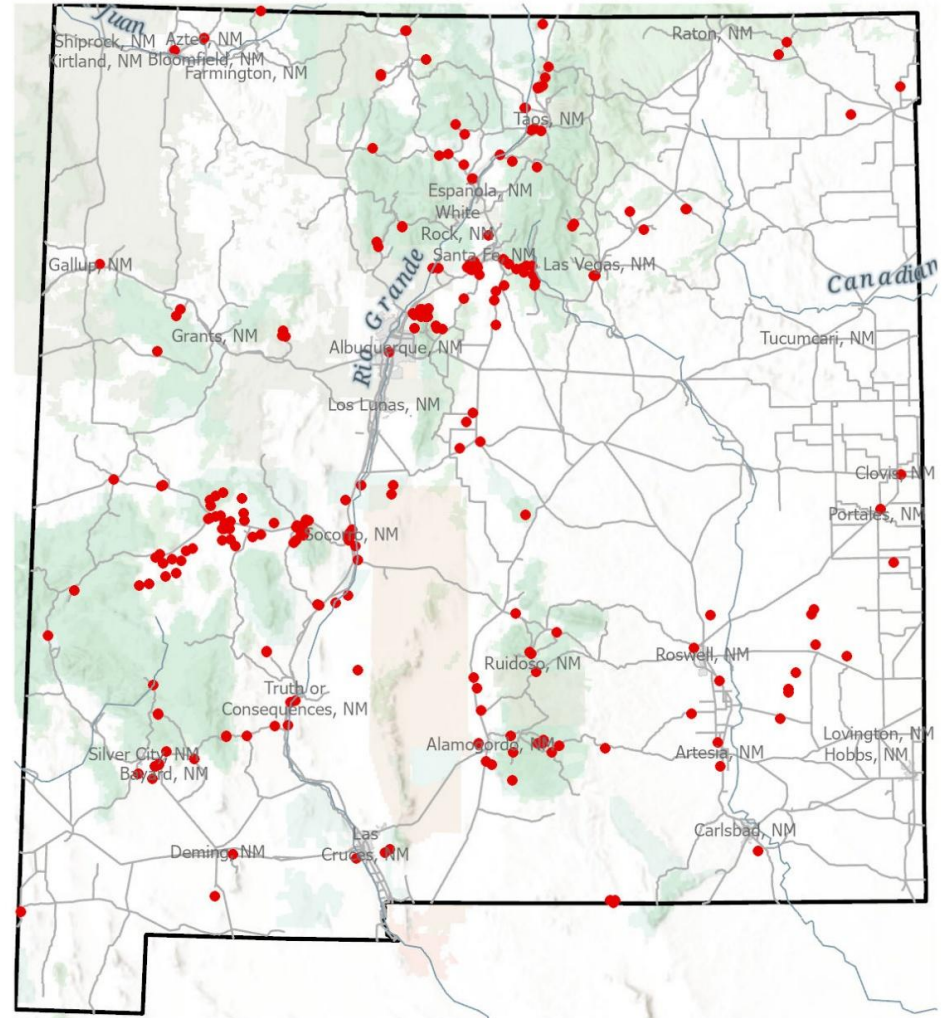
- Delineate extent of major and minor aquifers across state
- Evaluate prior studies and review hundreds of well logs per region to establish formation completions and depths
- Expected completion scheduled for Fall 2026
- Funded by OSE / ISC



Estancia Basin

# HEALY COLLABORATIVE GROUNDWATER MONITORING NETWORK

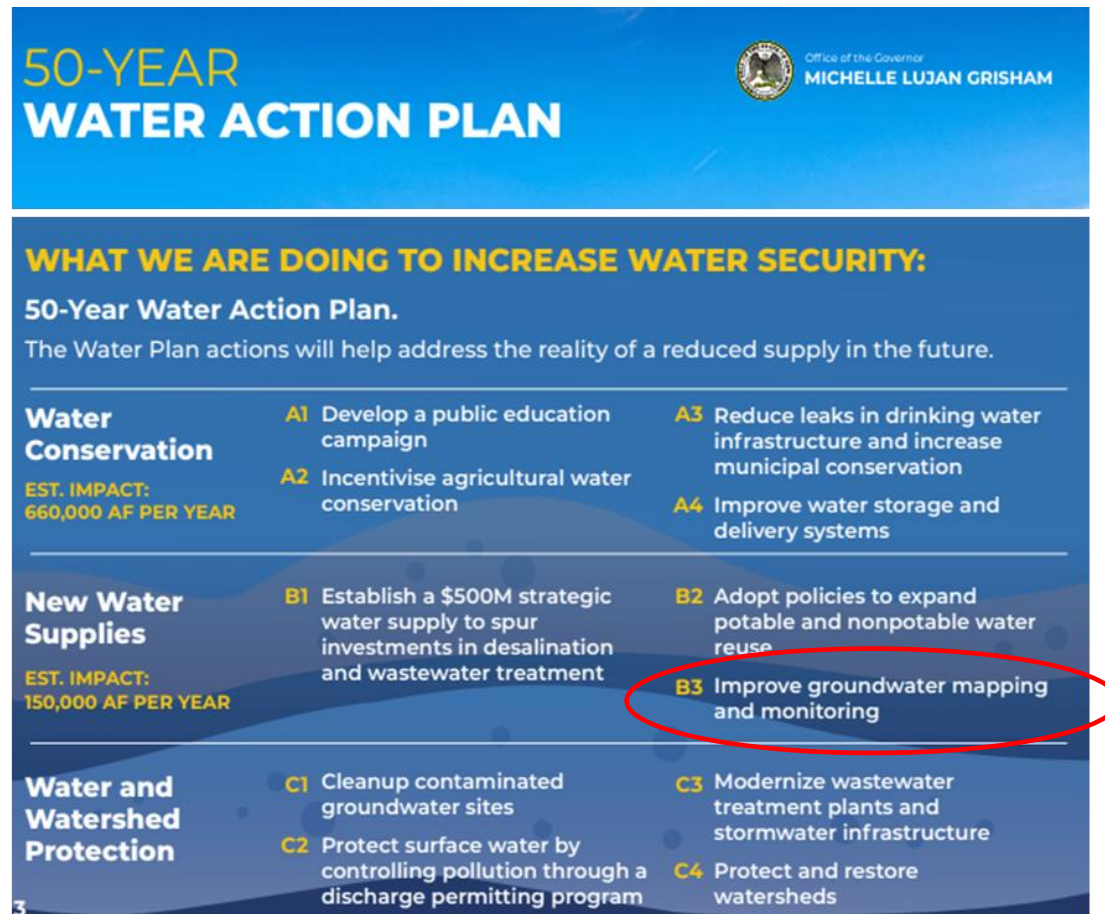
- Free for well owners
- Historically a mixture of data
  - “data sharing”
  - “well sharing”
- NMBGMR visits ~250 wells annually
  - ~150 active manual measurements
  - 50 Pressure Transducers
  - 45 Acoustic Loggers
- Funded by the Healy Foundation



# NEW MEXICO 50-YEAR WATER ACTION PLAN

Upon fulfillment of funding, the NM Bureau of Geology's role is to:

1. Characterize all major aquifers by 2032
2. Characterize all major and minor aquifers in the state (fresh and brackish) by 2037
3. Build a statewide groundwater-monitoring network with ~100 new dedicated wells by 2037



The infographic is titled "50-YEAR WATER ACTION PLAN" and is attributed to the Office of the Governor, Michelle Lujan Grisham. It outlines the plan's goals and actions under three main categories: Water Conservation, New Water Supplies, and Water and Watershed Protection. Each category lists specific actions (A1-A4, B1-B3, C1-C4) and their estimated impacts. Action B3, "Improve groundwater mapping and monitoring," is highlighted with a red circle.

**50-YEAR WATER ACTION PLAN**  
Office of the Governor  
MICHELLE LUJAN GRISHAM

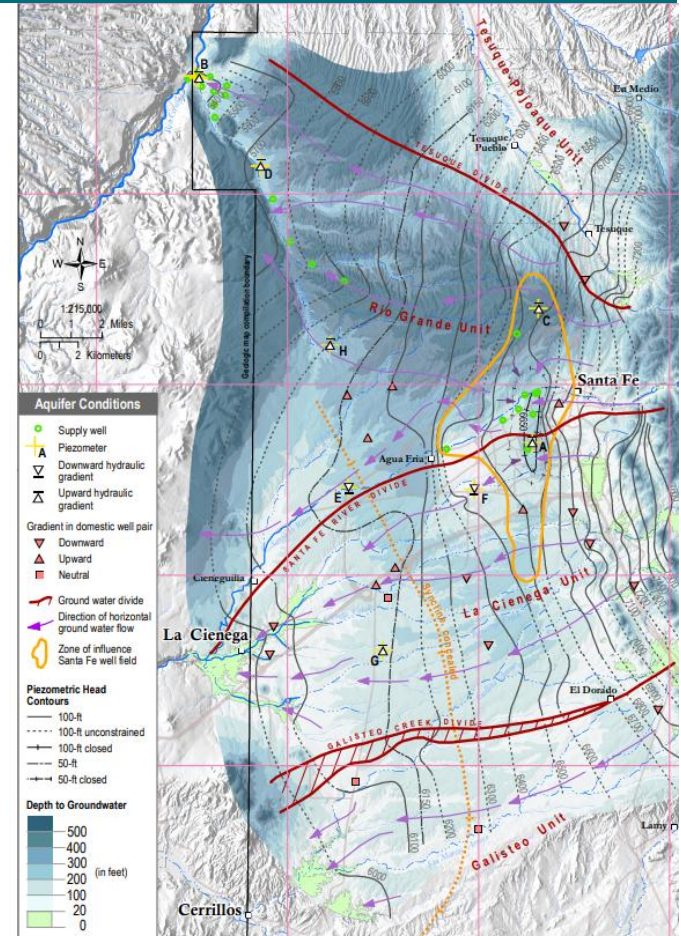
**WHAT WE ARE DOING TO INCREASE WATER SECURITY:**  
50-Year Water Action Plan.  
The Water Plan actions will help address the reality of a reduced supply in the future.

Category	Action	Impact
<b>Water Conservation</b> EST. IMPACT: 660,000 AF PER YEAR	A1 Develop a public education campaign	
	A2 Incentivise agricultural water conservation	
	A3 Reduce leaks in drinking water infrastructure and increase municipal conservation	
	A4 Improve water storage and delivery systems	
<b>New Water Supplies</b> EST. IMPACT: 150,000 AF PER YEAR	B1 Establish a \$500M strategic water supply to spur investments in desalination and wastewater treatment	
	B2 Adopt policies to expand potable and nonpotable water reuse	
	<b>B3 Improve groundwater mapping and monitoring</b>	
<b>Water and Watershed Protection</b>	C1 Cleanup contaminated groundwater sites	
	C2 Protect surface water by controlling pollution through a discharge permitting program	
	C3 Modernize wastewater treatment plants and stormwater infrastructure	
	C4 Protect and restore watersheds	

<https://www.nm.gov/wp-content/uploads/2024/01/New-Mexico-50-Year-WaterAction-Plan.pdf>

# AQUIFER MAPPING AND MONITORING LONG-TERM GOALS

1. Identify and characterize major and minor aquifers within the state, including fresh and brackish sources
  - Develop comprehensive subsurface datasets and model layers to support groundwater management and planning efforts
  - Produce accurate estimates of aquifer boundaries, water quality, and production potential for fresh and brackish aquifers
  - Create online visual tools to provide accessible aquifer visualizations
2. Establish a statewide groundwater-monitoring network by installing 100 new dedicated wells by 2037
  - Regional and statewide dashboards to effectively monitor groundwater levels

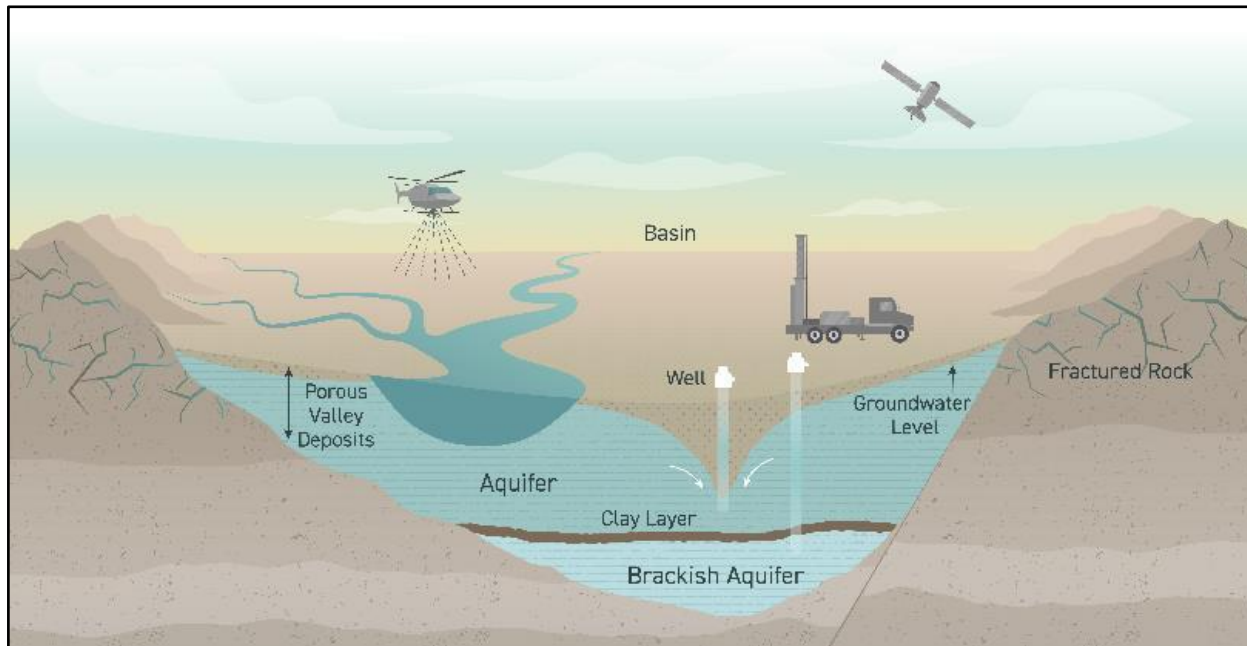


Aquifer mapping example from Santa Fe region 8



# HOW DO WE CHARACTERIZE AQUIFERS?

- Establish robust foundations from existing data, information, and reports (NMWDI)
- New geophysics (e.g., aerial electromagnetic (AEM) surveys)
- Measure groundwater depths & fluctuations including geochemical sampling
- Drill new wells for exploration and long-term monitoring
- Analyze & characterize aquifers to build comprehensive hydrogeologic models



# BENEFITS OF HAVING BETTER INFORMATION AND MODELS OF OUR AQUIFERS

- Better understanding and management of our available groundwater resources
- Protection of groundwater quality
- Long-term tracking of changes in water quality and quantity
- Numerous side benefits and research opportunities include:
  - Geothermal resource exploration
  - Aquifer recharge sites
  - Improved geologic and resource mapping
- Education and improved data for water planning

It takes sufficient time and funding!

# GEOPHYSICS FOR GROUNDWATER RESOURCES: AIRBORNE ELECTROMAGNETIC SURVEYS (AEM)

## AEM surveys help to identify fresh & brackish groundwater

- Facilitate mapping of aquifers & locate sites for new monitoring wells
- Enable coverage of extensive areas without disturbing the ground
- Depth of investigation: ~1500 ft (*depending on equipment & local conditions*)

## Numerous successful case studies

- California alluvial basins: used to map 95 groundwater basins
- Mesilla Basin: ISC Santa Teresa brackish water assessment

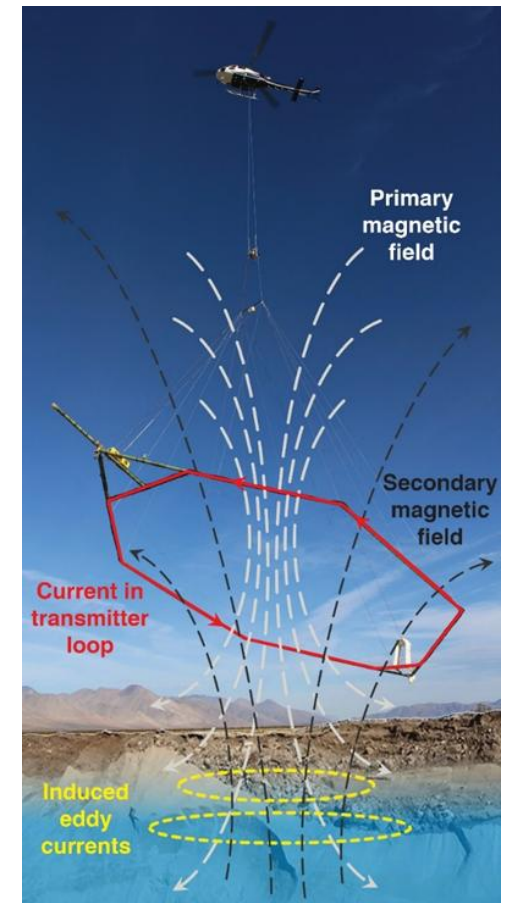
## Ongoing evaluation of technologies tailored for New Mexico basins

- FY26 initiatives: assess tools, optimize survey coverage, and manage costs



## Typical Configuration

- 66-ft diameter hoop
- Suspended 100 ft above ground
- Speeds of 50-60 MPH
- Winds <15 MPH



AEM Survey Schematic (from CA DWR)

# AEM METHODS IN GROUNDWATER RESOURCES: WELL-LOG CALIBRATION

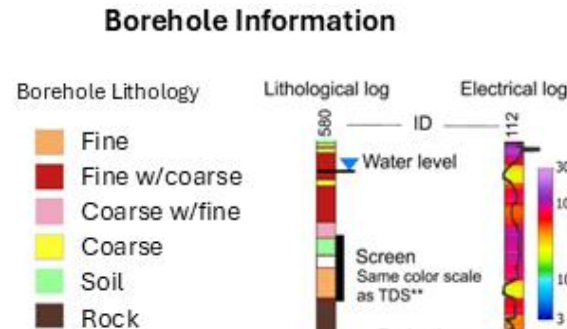
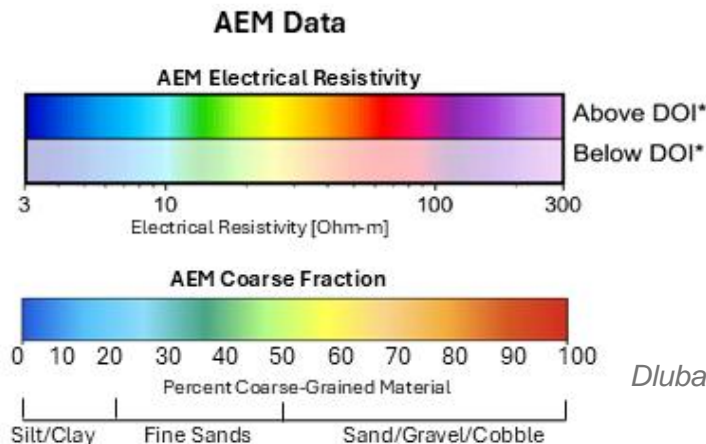
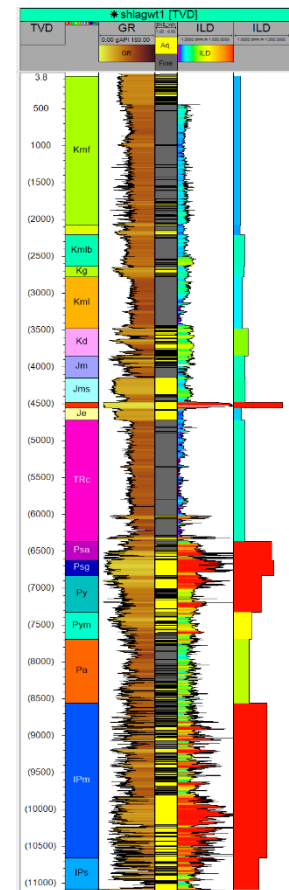
## Factors that influence electrical resistivity

- Salinity: well-logs and water sampling
- Lithology: well-log interpretation and geologic mapping
- Temperature: well-logs and collaboration with Geothermal Programs\*

## Well logs: lithology, salinity, and resistivity

- Formation Tops: define structural surfaces
- Borehole geophysical logs: Temperature, resistivity, porosity, etc.
  - Acquire thousands of geophysical well logs (i.e., water, oil/gas, geothermal)
- Lithologic logs: AEM calibration & aquifer characterization
  - AI/ML tools to convert ~169k driller's logs into machine-readable formats

## Geophysical log



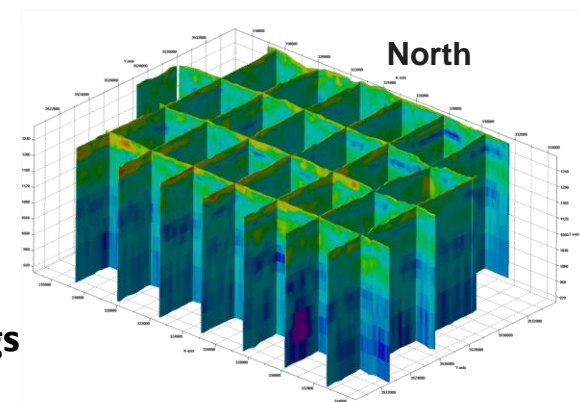
*Dlubac et al. (2024)*

\*Generally minor temperature corrections in shallow aquifers.

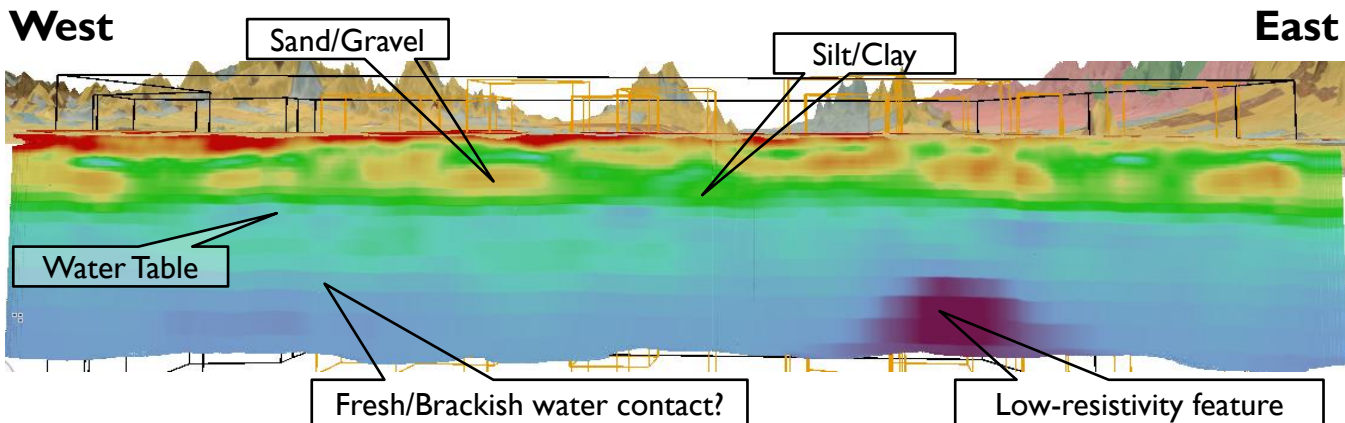
# EXAMPLE AEM SURVEY IN NEW MEXICO: SANTA TERESA STUDY

- **Identify brackish water sources in the Mesilla Basin**
  - Santa Teresa Border Area Brackish Groundwater Availability study (Intera, 2025, funded by NM-ISC)
- **Key hydrogeological characteristics discovered**
  - Buried river channels representing ancient Rio Grande pathways
  - Geothermal anomalies detected
- **Next steps involve drilling exploratory wells to validate findings**

NMBGMR 3D model

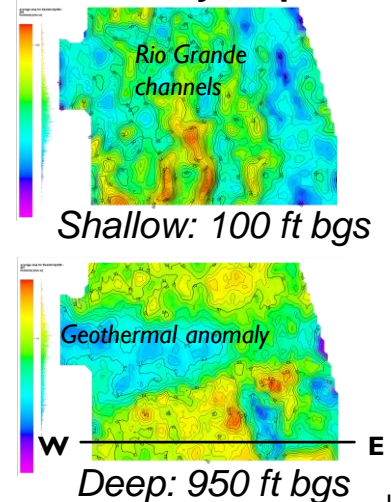


Resistivity cross-section, looking north



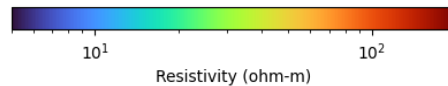
Data courtesy of NM ISC

Resistivity Maps

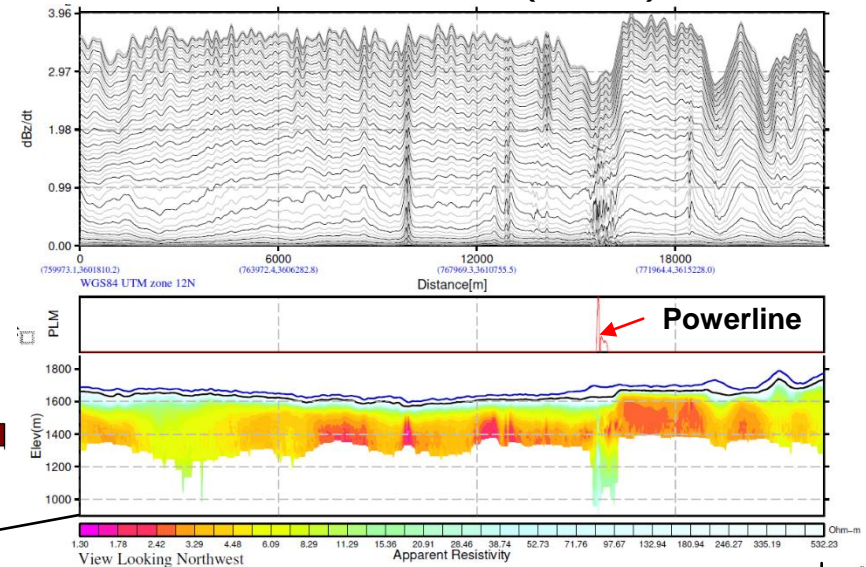


# AEM SURVEYS: OBJECTIVES AND DATA

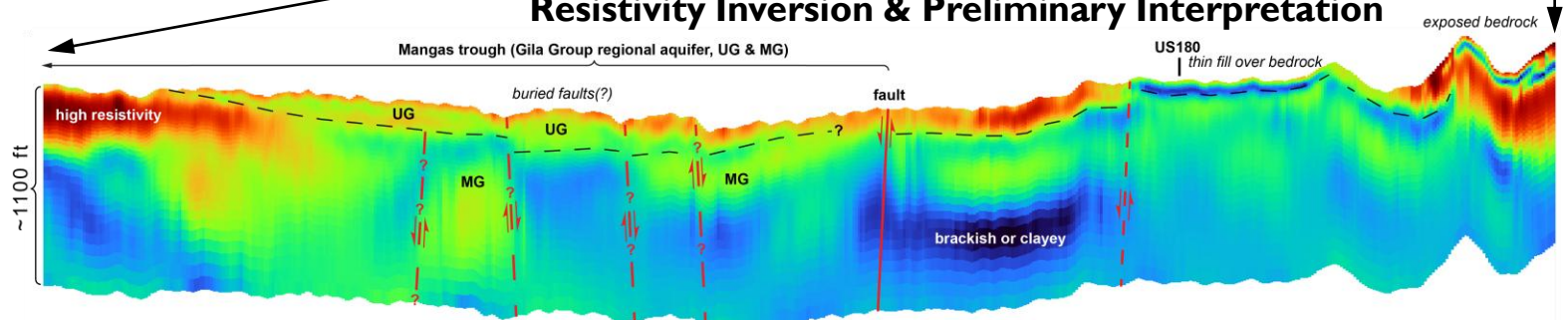
- **Delineate aquifer geometry and boundaries**
  - Structural controls (e.g., faults and folds)
- **Delineate lithologic patterns**
  - Calibrate to lithology (well logs)
  - Hydrostratigraphic units (coarse- vs. fine-grained)
- **Salinity mapping**
  - Fresh vs. brackish water
- **Create 3D geologic framework models**
  - Aquifer characteristics
  - Identify recharge areas
- **Identify drill sites**
  - Ground truth



## Mimbres Basin AEM (VTEM) Test



## Resistivity Inversion & Preliminary Interpretation

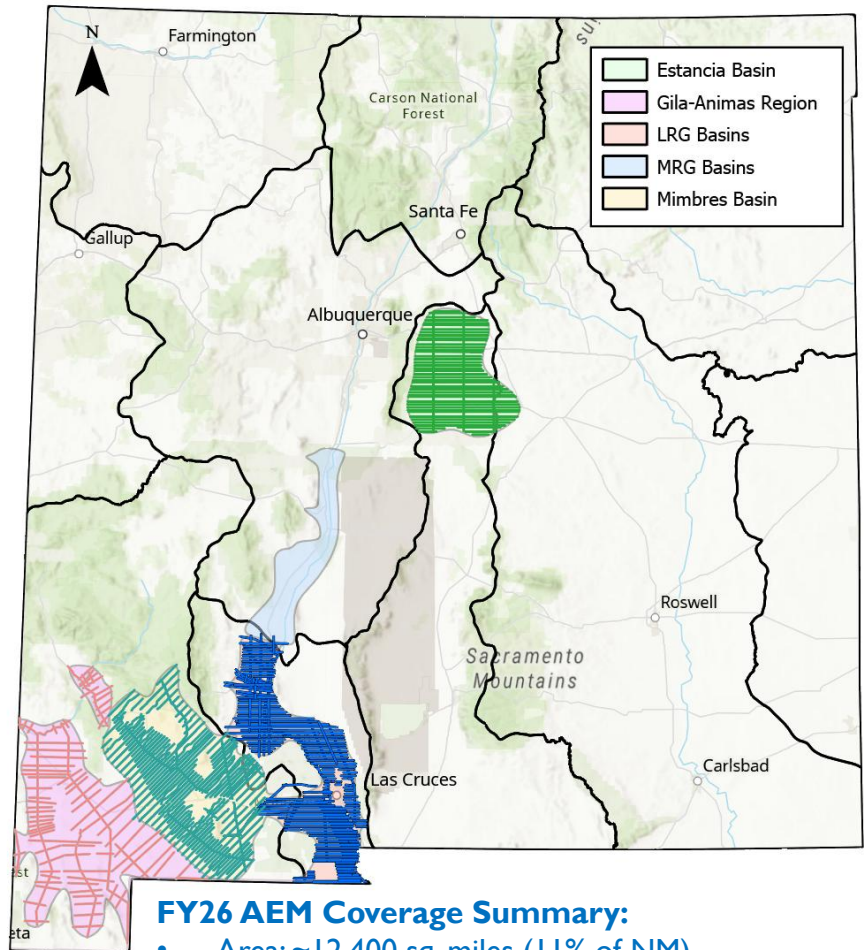


Test line collected by GeoTech near Grant County Regional Airport (Oct. 2025)

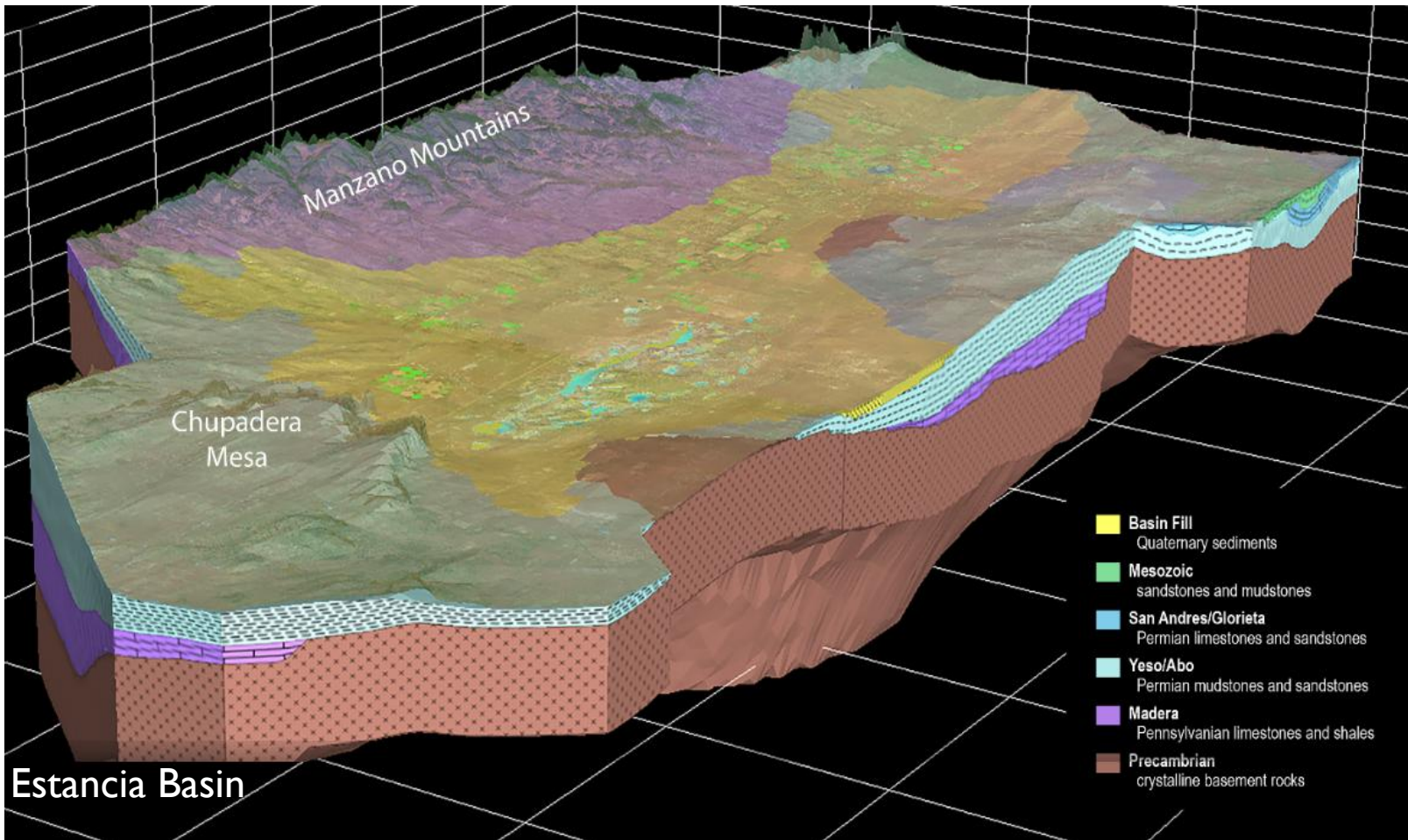
# FY26 - OUR PILOT YEAR

## REGIONAL AEM SURVEYS UNDERWAY NOW

- **Lower Rio Grande Basins (Intera/GIP)**
  - NOV 16-DEC 2
  - Area: ~2400 sq. miles
  - Total Line Length: ~2500 miles
- **Mimbres Basin (WSP/AGF)**
  - ~NOV 19-DEC 6
  - Area: ~3450 sq. miles
  - Total Line Length: ~2000 miles
- **Gila–Animas Valley Region (Geotech)**
  - ~ NOV 20 - DEC 7
  - Area: ~3750 sq. miles
  - Total Line Length: ~1250 miles
- **Estancia Basin (DBSA/Geotech)**
  - NOV - DEC (dates TBD)
  - Area: ~2350 sq. miles
  - Total Line Length: ~1700 miles
- **Middle Rio Grande Basins (SSPA/Ramboll)**
  - DEC (dates TBD)
  - Area: ~1100 sq. miles
  - Total Line Length: ~2000 miles

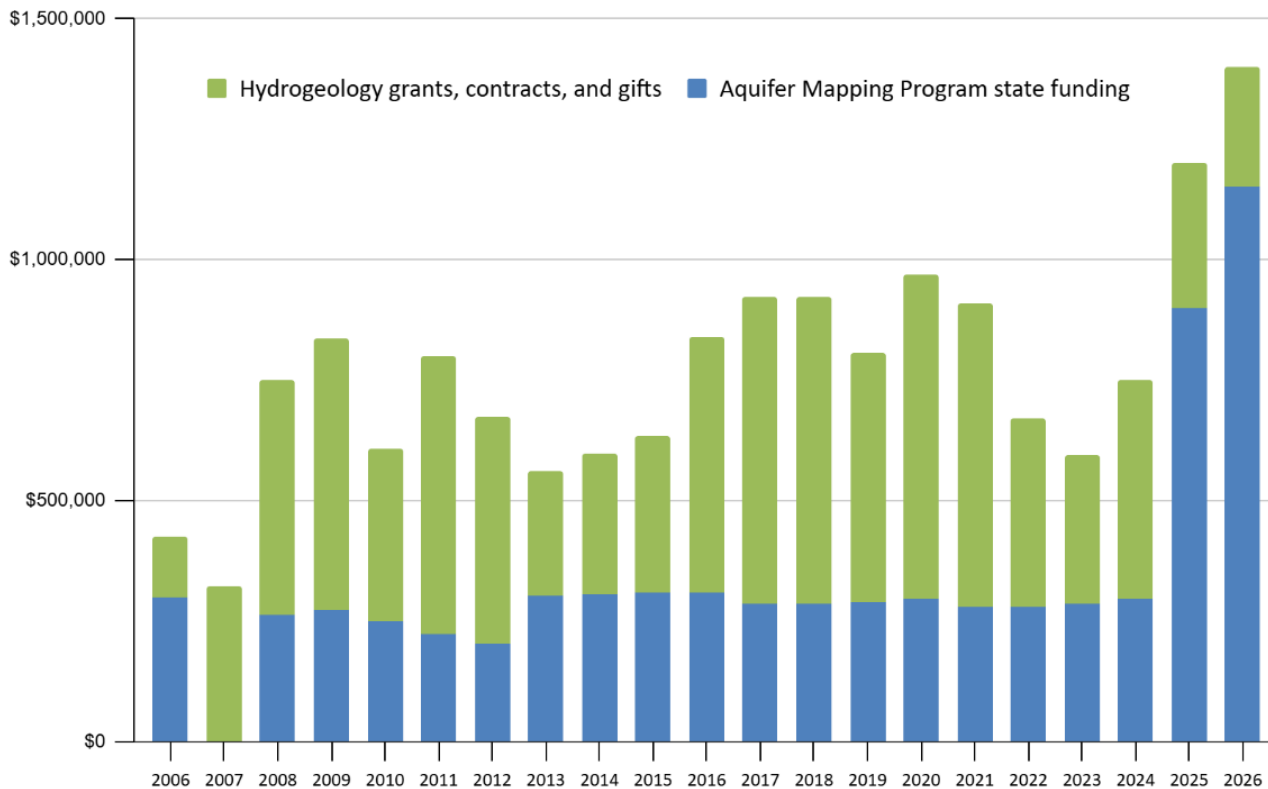


# NEXT STEPS: BUILD IMPROVED MAPS AND MODELS TO DETERMINE BEST LOCATIONS FOR WELL DRILLING





# AQUIFER MAPPING PROGRAM BUDGET OVER THE YEARS



## FY 2026

- \$1.1M recurring budget
- \$7.5M non-recurring

### Tasks this year:

- Convene Aquifer Characterization Steering Committee
- Convene new Groundwater Monitoring Working Group
- Hire new positions (5 FTEs hired since July)
- **Complete RFP and initiate contracts**
- Establish new program workflow and data services

# ONE YEAR AT A TIME: LOOKING AHEAD TO THE NEXT SEVERAL YEARS

- ~\$175M estimated total funding to complete characterization of aquifers across the state and establish a groundwater-monitoring network over next 10 years
- ~\$20-25M / year for next 5 years to accomplish the bulk of new data collection

Major tasks per region	Staff task	Consultant task	Cost Estimate	Dependencies
Data compilation and analysis	X	X	\$20-50K	how much previous work in region
Collect new data – Geophysics		X	\$350K - \$1.5M / region	depth target, region size, line spacing, techniques uses
Collect new data - water sampling	X		\$50-100K	number of wells available
Building framework models; evaluating data gaps	X	X	\$50 - 500K	existing information, new data collection
Drill wells for exploration and potential monitoring		X	\$400K-\$1.5M / well	depth of well, location, permitting

# AQUIFER CHARACTERIZATION AND MONITORING: TARGET FUNDING

## Recurring funding

- Cover staff to collect and interpret new data, build/run models, prepare reports, manage projects, and workforce development
- Annual funding now at \$1,150,000 (FY26)
- **Additional funding needed: \$1M**
  - Cover recurring costs for additional new staff (FTE), advanced software licenses / training, and enhanced project/data management

## Non-recurring funding

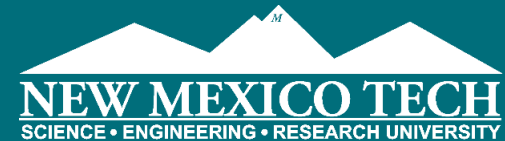
- Covers large one-time expenses, including geophysical surveys, scientific exploratory well permitting, drilling, and sampling, and development / management of large and growing datasets
- Received \$7.5M for FY26
- **Target funding for FY27: \$22M for water programs**  
*(includes water data)*

# NEW MEXICO WATER DATA ACT

NOVEMBER 2025 UPDATE

FROM THE NEW MEXICO BUREAU OF GEOLOGY AND MINERAL RESOURCES AT  
NEW MEXICO TECH

RACHEL HOBBS, WATER DATA PROGRAM MANAGER



# THE PROBLEM: FINDING THE DATA TO MAKE INFORMED DECISIONS

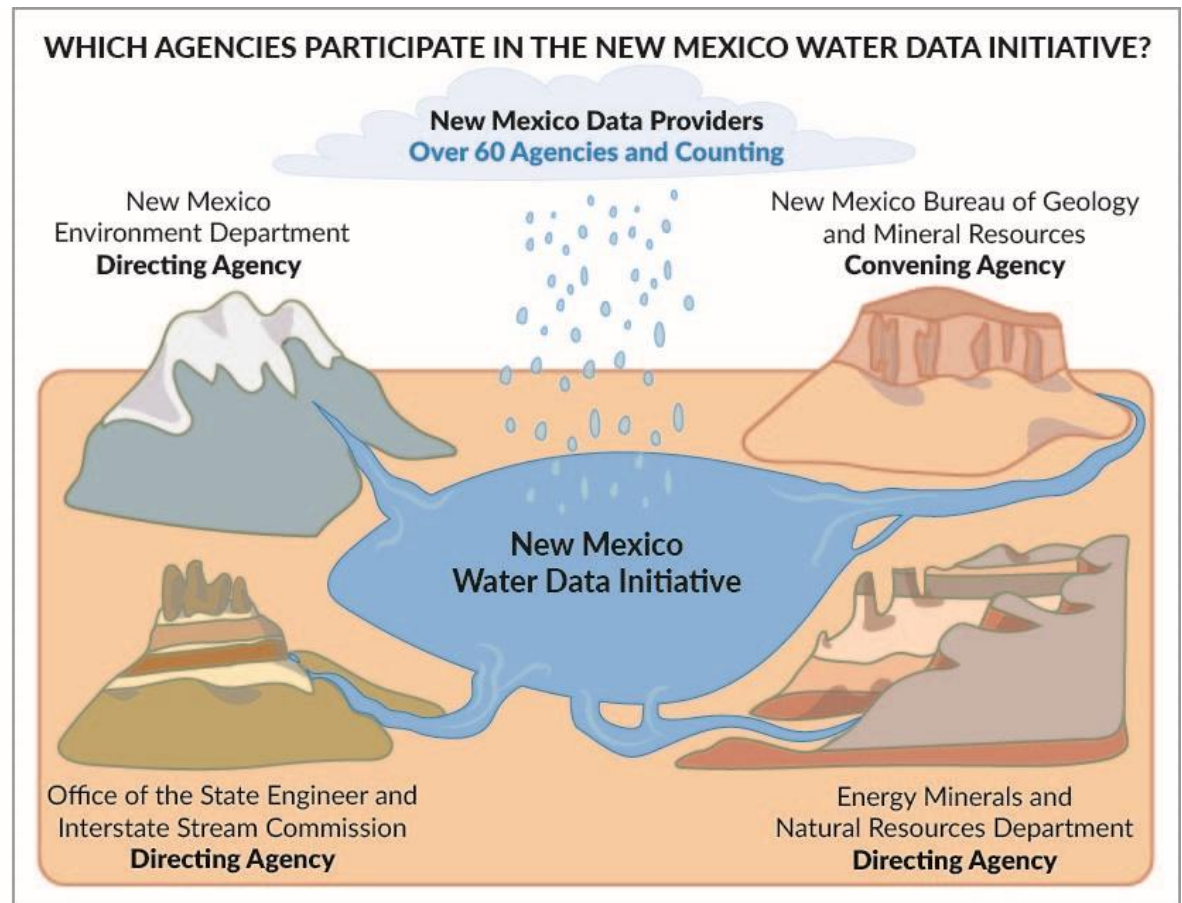
- As we face warmer, drier years ahead, water managers, planners and decision makers need quick access to robust water data!
- New Mexico's water data can be disconnected and hard to access:
  - In file cabinets
  - In different formats
  - Available from many different providers



# THE SOLUTION: NEW MEXICO WATER DATA ACT

NMSA 1978, § 72-4B

- New Mexico agencies will *share, integrate and manage* our water data
- Federated data model: data providers control their own data
- The goal is not to put data in a central location or database, but to make all water data more accessible and usable





**OUR MISSION: TO MAKE FINDING WATER DATA SIMPLE!**

**OUR VISION: NEW MEXICANS WILL HAVE ACCESSIBLE AND USEFUL DATA FOR WATER  
MANAGEMENT AND PLANNING**

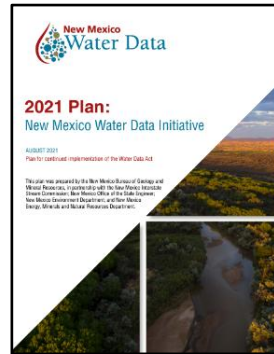
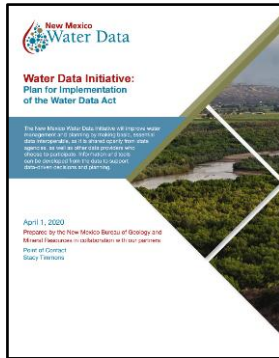
# ACCORDING TO STATUTE...

- Water research conducted with state funding shall comply with the data standards and best practices developed by the agencies.
- The agencies shall collaborate with other regional and national efforts to share, integrate and manage water data.
- By September 1 of each year, the agencies shall develop and submit a plan to the governor and the appropriate interim legislative committee that details:
  - an assessment of water data and information needs to support water management and planning;
  - goals, targets and actions to carry out the purposes of the Water Data Act in the upcoming fiscal year;
  - budgetary resources to carry out the purposes of the Water Data Act; and
  - metrics for achieving the purposes of the Water Data Act.



# ANNUAL PLANS

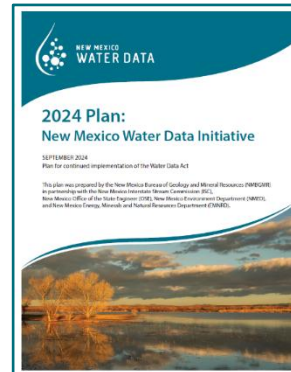
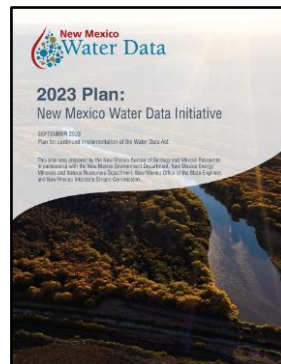
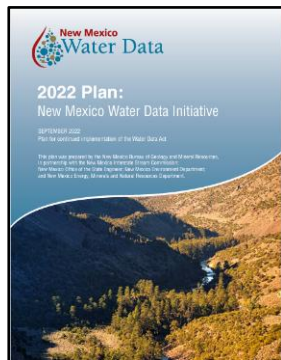
<https://newmexicowaterdata.org/resources/>



## 2025 Plan: New Mexico Water Data Initiative

SEPTEMBER 2025  
Plan for continued implementation of the Water Data Act

This plan was prepared by the New Mexico Bureau of Geology and Mineral Resources (NMBGMR) in partnership with the New Mexico Interstate Stream Commission (ISC), New Mexico Office of the State Engineer (OSE), New Mexico Environment Department (NMED), and New Mexico Energy, Minerals and Natural Resources Department (EMNRD).



# WAYS THE WATER DATA ACT IS MAKING A DIFFERENCE

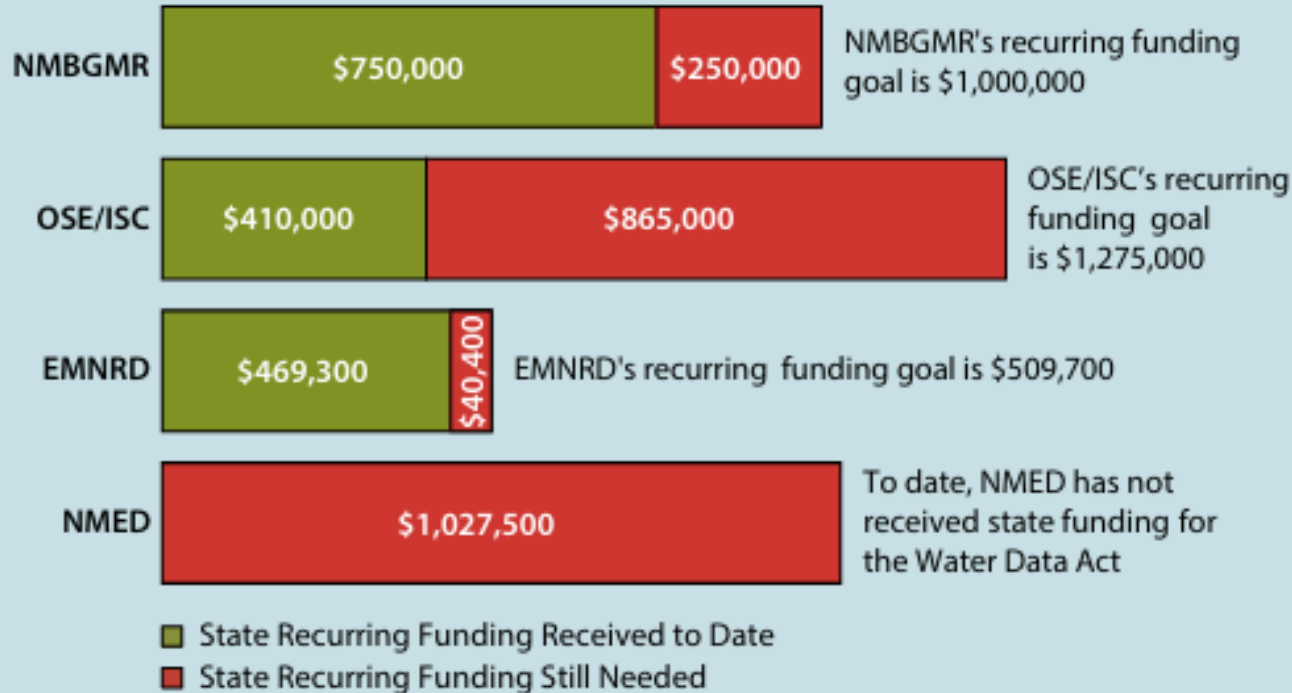
- More water data available digitally!
- Improved coordination between agencies working in water and data (federal state and local)
- All agencies building data literacy and implementing more modern data sharing practices with new APIs  
*\*that did not exist prior to the Water Data Act\**
- Funding improvements at most of the state directing agencies
- Working toward integrated/combined datasets so that data users do not have to hunt down siloed data in each agency, reducing data cleaning processing time
- Building momentum with annual water data workshop



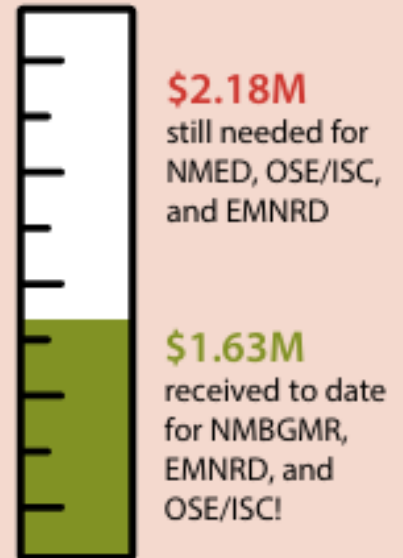
# FY2027 FUNDING NEEDS BY AGENCY

(FROM SEPTEMBER 2025 WATER DATA PLAN)

## Recurring State Funding Received and Still Needed for Each Water Data Act Directing Agency



## Total Recurring State Funding Received and Still Needed for all Water Data Act Directing Agencies



# PILOT GRANT PROGRAM 2025-2026

State appropriation: Bringing funding to state agencies for 1-year projects

**Total Recurring State Funding Received and Still Needed for all Water Data Act Directing Agencies**



**\$2.18M**  
still needed for  
NMED, OSE/ISC,  
and EMNRD

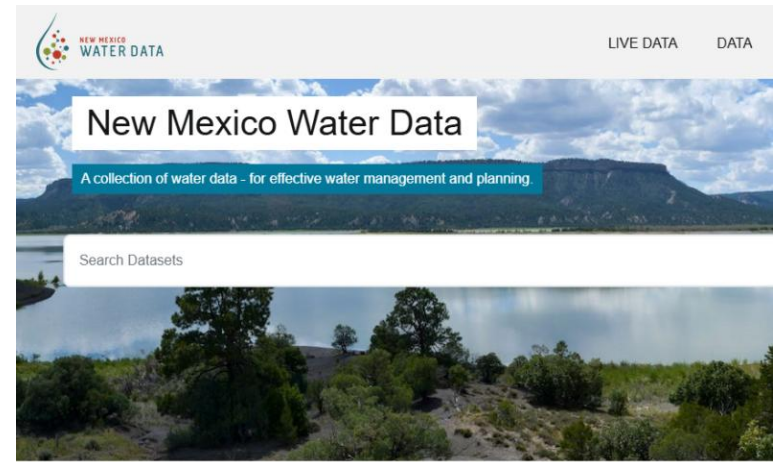
**\$1.63M**  
received to date  
for NMBGMR,  
EMNRD, and  
OSE/ISC!

Filling this gap



# WAYS WE ARE IMPROVING DATA SHARING: THE WATER DATA CATALOG

- Data Catalog is a repository and gateway for NM Water Data
- Close to 300 datasets from over 60 organizations
- User-friendly, intuitive. A way to find what is out there
- Ongoing updates and improvements to the Data Catalog based on user research
- [catalog.newmexicowaterdata.org](https://catalog.newmexicowaterdata.org)

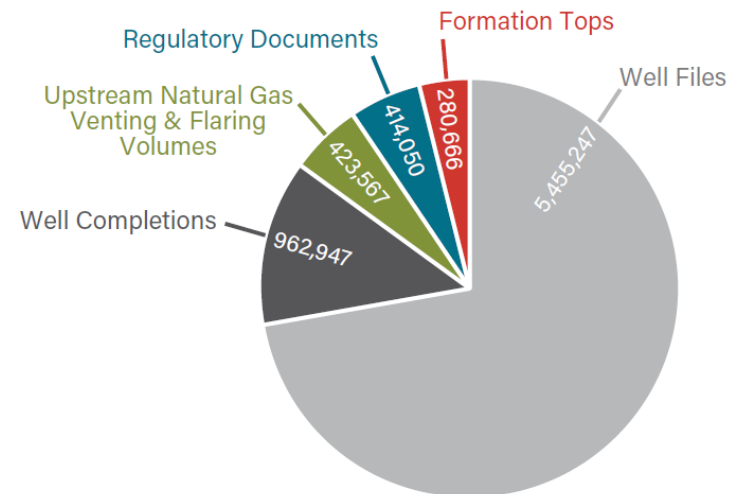


# ENERGY MINERALS AND NATURAL RESOURCES DEPARTMENT

## Building Water Data APIs

- 119 APIs that provide water-related regulatory data collected from the oil, gas, and coal mining industries.
- Piloting a natural language query tool to make EMNRD data more accessible.
- Continue focus on digitizing data and making more datasets available via APIs.
- Looking forward, EMNRD will work with other convening agencies to make water data consistent, comprehensive, and up to date.

EMNRD's Top API Endpoints  
(by number of queries)



**Upstream Natural Gas Venting and Flaring Volumes:** Volume, and other data, related to releases from oil and gas wells, either by venting or flaring, as reported in regulatory documents.

**Regulatory Documents:** Scanned images of all regulatory documents pertaining to oil and gas wells, such as permits to drill, deepen, or abandon the well.

**Formation Tops:** The depth below ground surface of individual geologic formations encountered during drilling.

**Well Files:** Comprehensive data about oil and gas wells, including formation tops, casings, completions, production, history, and more.

**Well Completions:** Data related to how a wellbore was completed, or constructed, as a producing oil and gas well following drilling.

# OFFICE OF THE STATE ENGINEER AND INTERSTATE STREAM COMMISSION

- Enhanced water data accessibility for several efforts across the state
- ISC received two separate fundings through a Junior Bill and Special appropriations to spend towards Water Data Initiatives
- **On Going projects:**
  - Statewide interactive map showing Evaporation and Evapotranspiration estimates using real-time OpenET data
  - Regional Water Planning mapping tool and Public Water Supply Decision support tool
  - NMBGMR funded project to build a pilot geodatabase with Riparian ET Data using OpenET and other remote sensing datasets



## Future Projects:

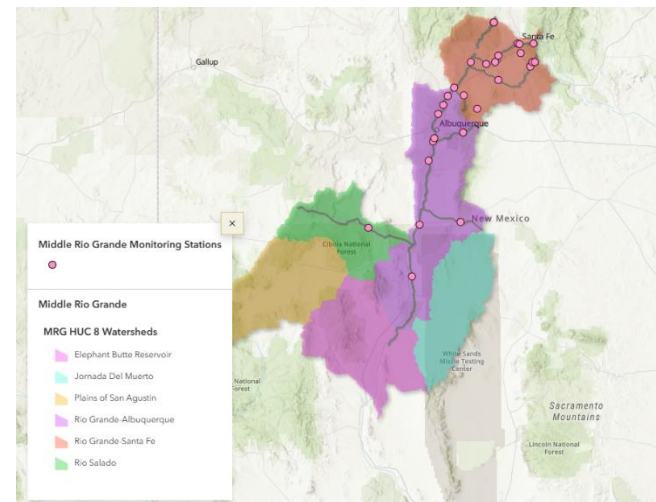
- Collect additional groundwater datasets for filling the gaps in understanding aquifer recharge and groundwater usage
- Trend analysis in water use, depletions, and deliveries to Elephant Butte
- Scale the pilot Riparian ET framework to major river systems in New Mexico

# NEW MEXICO ENVIRONMENT DEPARTMENT

- Improving APIs on Open Data Portal
- Digitizing paper data
- Water quality permitting database
- Making data accessible through EPA's Water Quality Portal
- Collecting and publishing PFAS data
- Creating a database of emerging contaminant data for small water systems
- Funding need: data steward

## NMED Open Data Portal

Welcome to the New Mexico Environment Department (NMED) Open Data Portal!





# BUREAU OF GEOLOGY AND MINERAL RESOURCES

- Improving internal data management and sharing with new Bureau database
- Building tools and applications to integrate data from multiple sources
  - Data Integration Engine
  - Weaver –weaving together New Mexico water data
- User research project on Water Data Catalog, making updates and improvements
- Developing best practices guides for data formatting and sharing



Thanks for your support!  
Questions?



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STACY.TIMMONS@NMT.EDU

SIGN UP FOR OUR NEWSLETTER

