# Railroad Commission of Texas

# Optimizing GIS and Office 365 Applications to Manage Energy-related Regulatory Activities

Jared Ware, Oil & Gas Division
October 23, 2024

# Agenda

- Overview
- GIS applications by regulatory function
- GIS applications used by staff and stakeholders
- Administrative and technical requirements
- Summary

# Railroad Commission of Texas (RRC)

## COMMISSIONERS

**Christi Craddick**
Chairman

**Wayne Christian**
Commissioner

**Jim Wright**
Commissioner

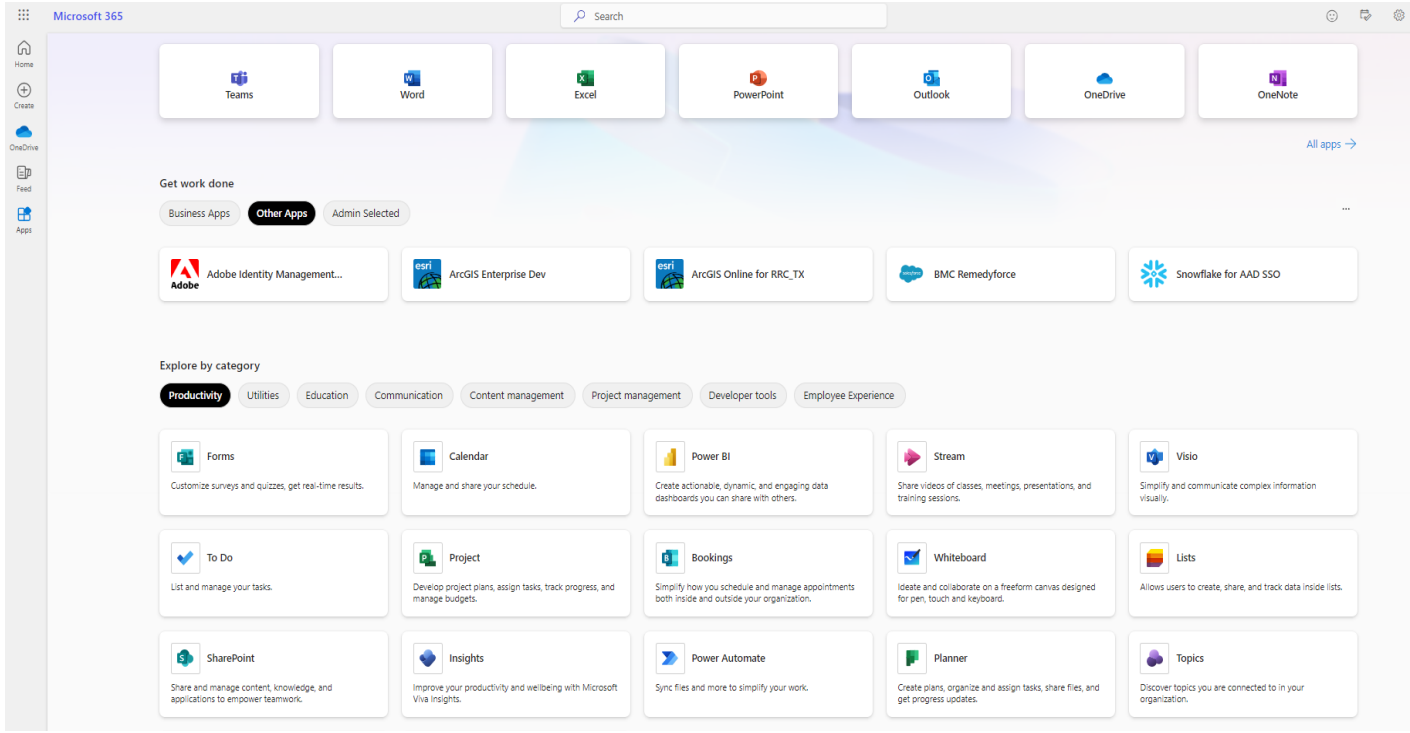
### RRC Mission Statement

Our mission is to serve Texas by our stewardship of natural resources and the environment, our concern for personal and community safety, and our support of enhanced development and economic vitality for the benefit of Texans.

The Railroad Commission of Texas (Commission) is the state agency with primary regulatory jurisdiction over the oil and natural gas industry, pipeline transporters, natural gas and hazardous liquid pipeline industry, natural gas utilities, the LP-gas industry, critical natural gas infrastructure, and coal and uranium surface mining operations.

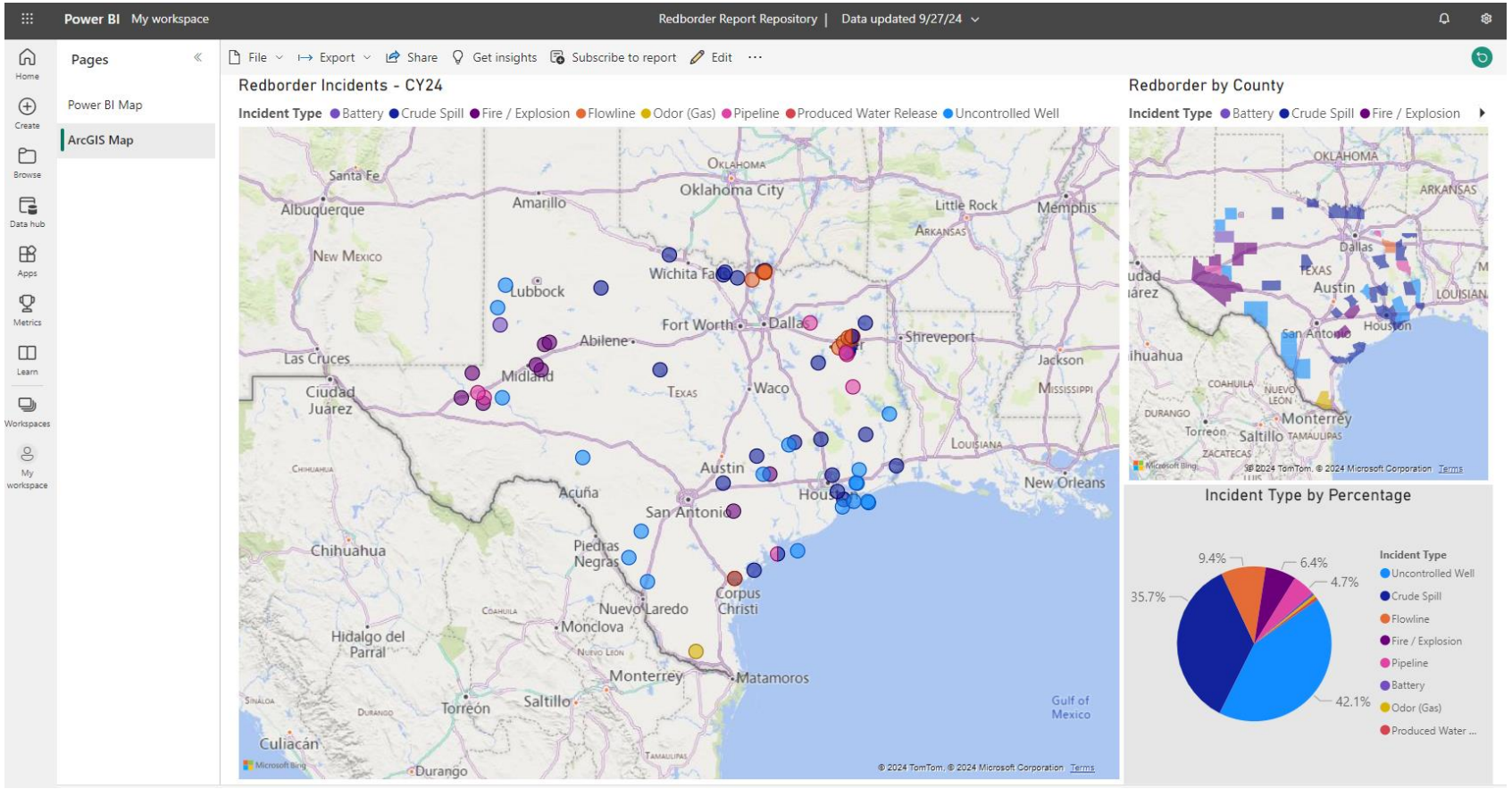
# GIS and Office 365 for Regulatory Requirements

- Common applications in the public sector
  - Most agencies use Microsoft products applications
  - Esri's ArcPro is used throughout the public sector
- Cost effective support
  - Lower maintenance costs
  - Lower training costs
- Ease of use
  - Recognized data types
  - Sharable information

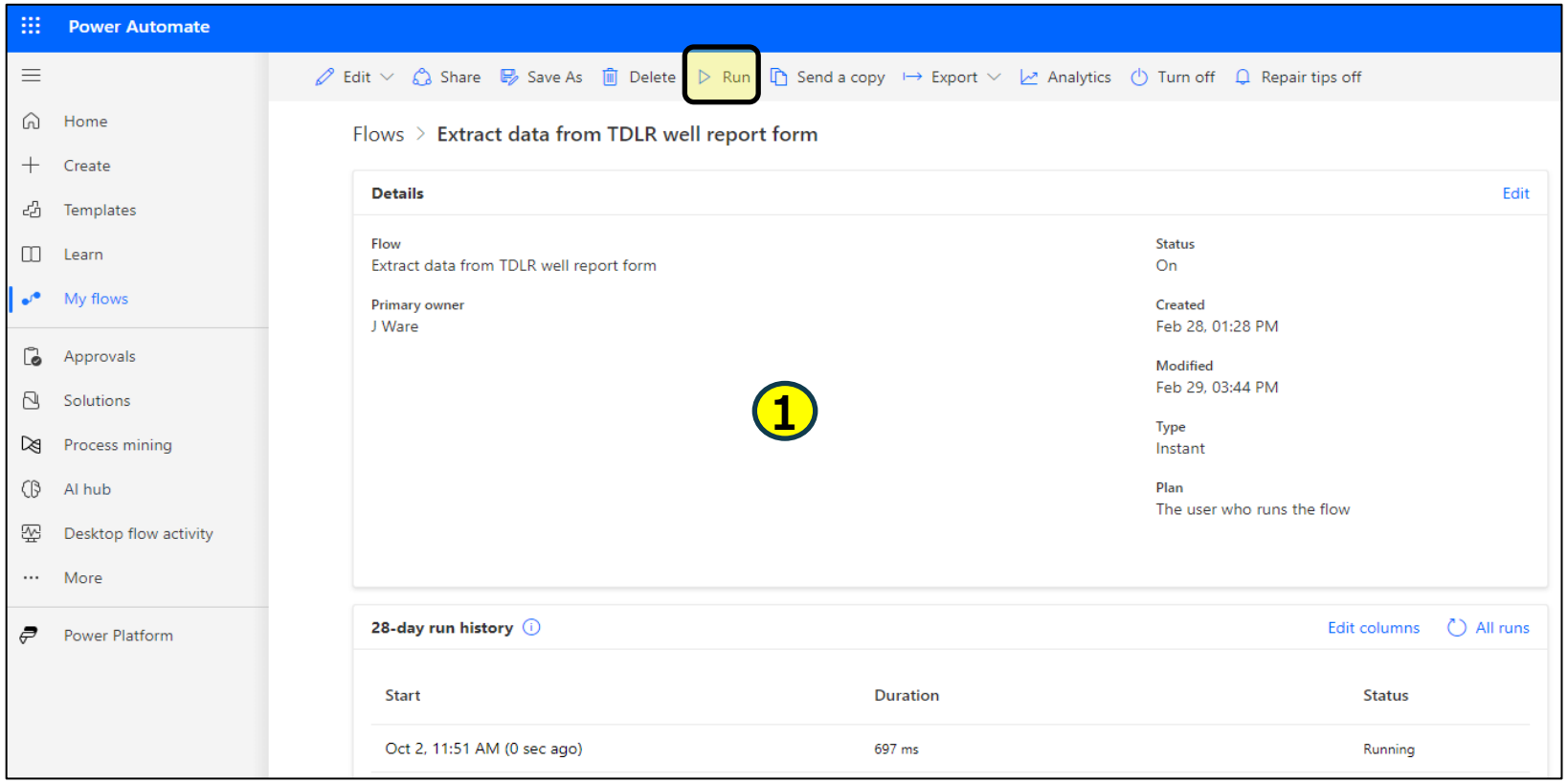


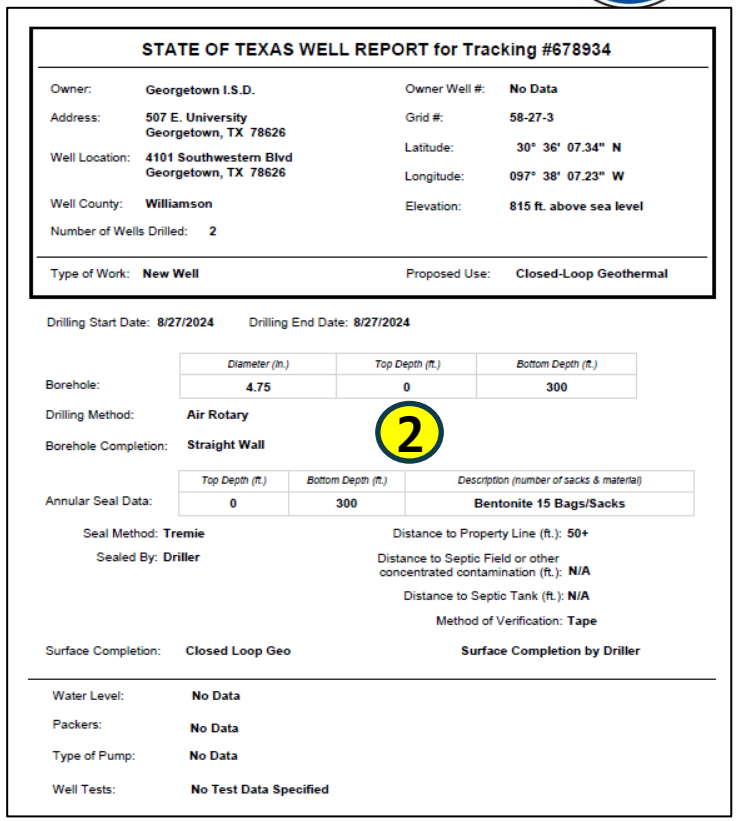
# Power BI

- **Enhance data access and security by connecting ArcGIS Maps for Power BI to ArcGIS Online / Enterprise**
- **Enables secure data distribution in dashboards and reports**



# Power Automate



**STATE OF TEXAS WELL REPORT for Tracking #678934**

| | | | |
|---|---|---|---|
| Owner: | Georgetown I.S.D. | Owner Well #: | No Data |
| Address: | 507 E. University Georgetown, TX 78626 | Grid #: | 58-27-3 |
| Well Location: | 4101 Southwestern Blvd Georgetown, TX 78626 | Latitude: | 30° 36' 07.34" N |
| | | Longitude: | 097° 38' 07.23" W |
| Well County: | Williamson | Elevation: | 815 ft. above sea level |
| Number of Wells Drilled: | 2 | | |
| Type of Work: | New Well | Proposed Use: | Closed-Loop Geothermal |

Drilling Start Date: **8/27/2024** Drilling End Date: **8/27/2024**

| | Diameter (in.) | Top Depth (ft.) | Bottom Depth (ft.) |
|---|---|---|---|
| Borehole: | 4.75 | 0 | 300 |

Drilling Method: **Air Rotary**

Borehole Completion: **Straight Wall**

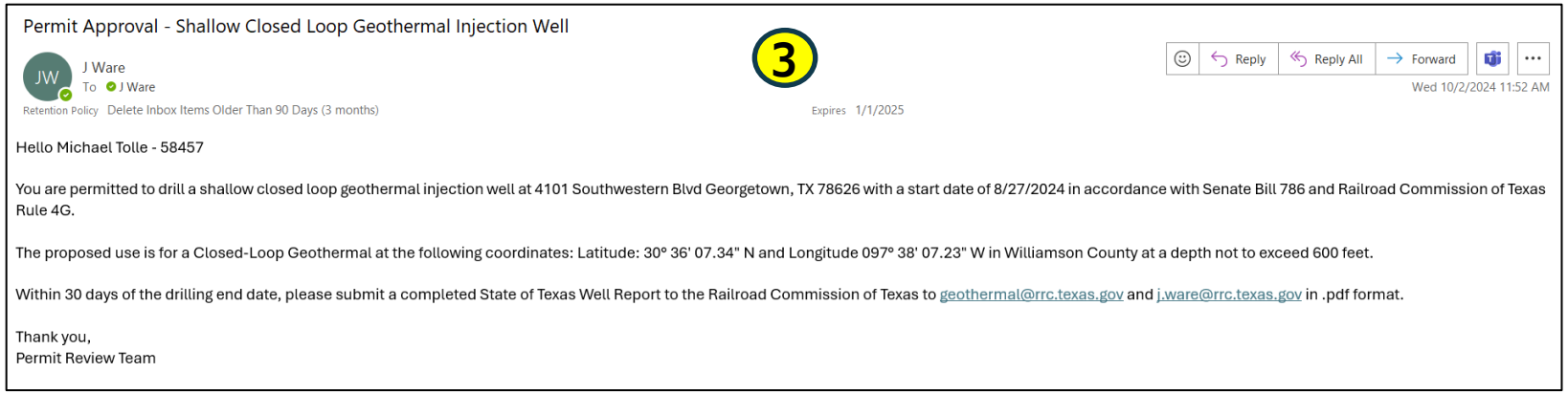
2

| Annular Seal Data: | Top Depth (ft.) | Bottom Depth (ft.) | Description (number of sacks & material) |
|---|---|---|---|
| | 0 | 300 | Bentonite 15 Bags/Sacks |

Seal Method: **Tremie**
Sealed By: **Driller**
Distance to Property Line (ft.): **50+**
Distance to Septic Field or other concentrated contamination (ft.): **N/A**
Distance to Septic Tank (ft.): **N/A**
Method of Verification: **Tape**

Surface Completion: **Closed Loop Geo** **Surface Completion by Driller**

Water Level: **No Data**
Packers: **No Data**
Type of Pump: **No Data**
Well Tests: **No Test Data Specified**

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Bore Hole Bottom Depth (feet): 300
Drilling Method: Air Rotary
Company Information: Michael Tolle 6556 Indian Trail Sanger, TX 76266
Driller Name: Michael Tolle
License Number: 58457

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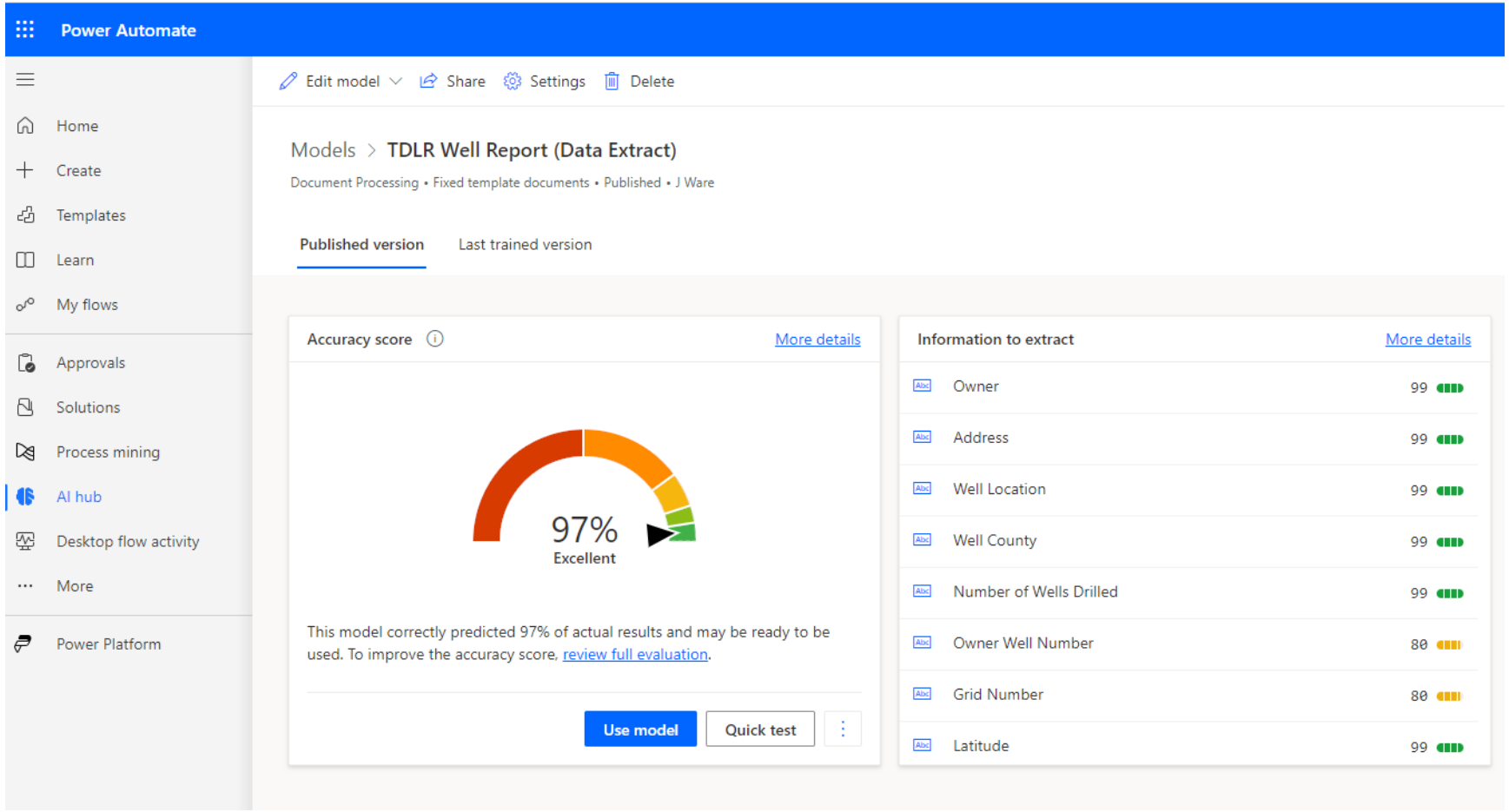
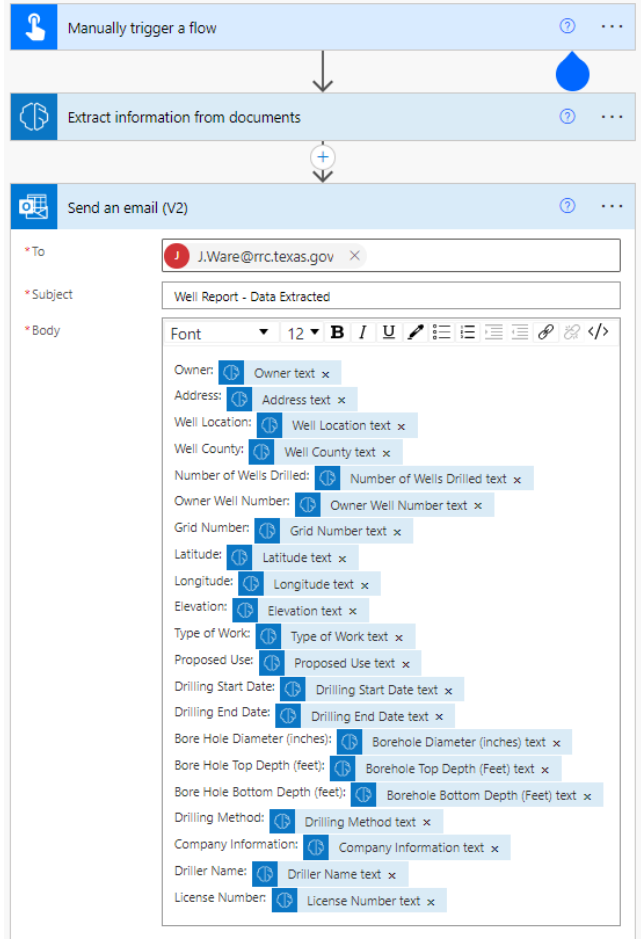
# AI Modeling (in Power Automate)

- Use a consistently formatted form to train the AI model
- Ensure form fields have data or the training results will vary



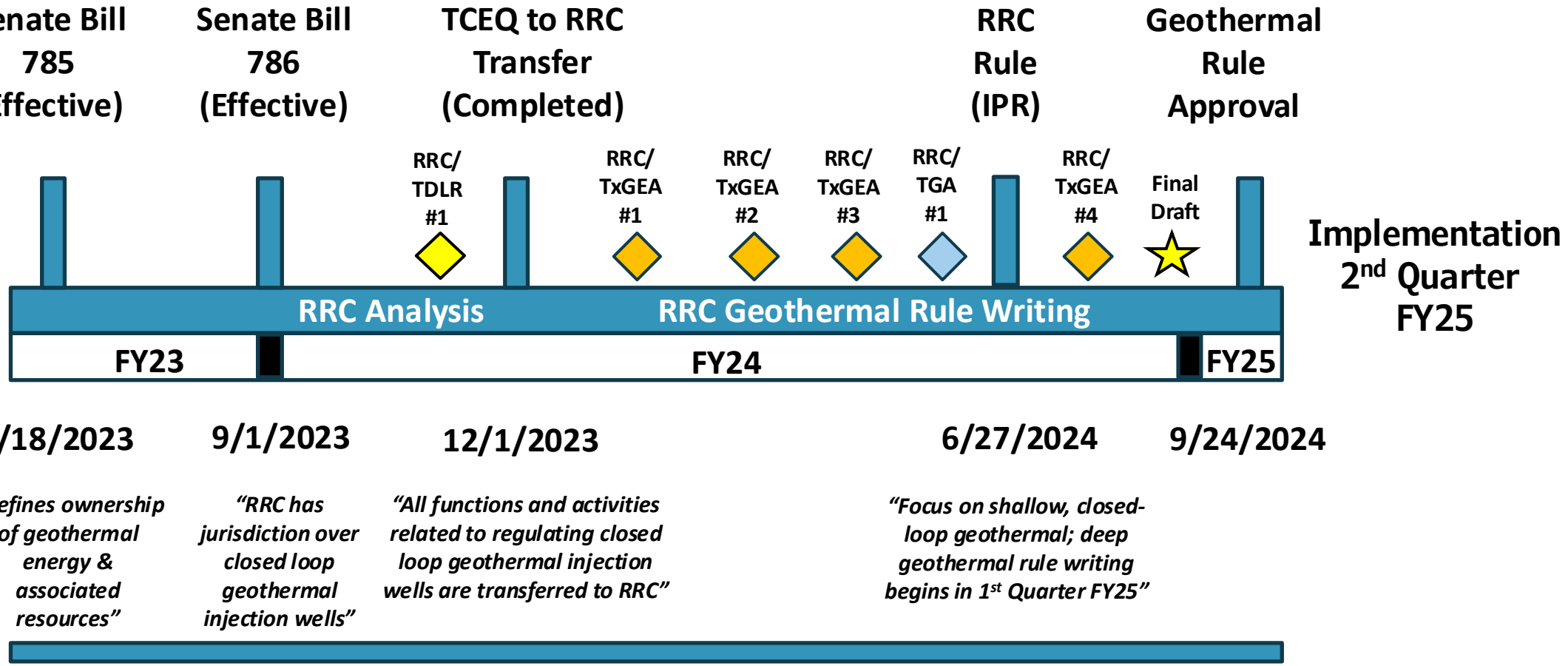
# Class V Geothermal Defined

- **Closed-loop geothermal injection well means a closed system geothermal well**
  - **used to circulate water, other fluids, or gases**
  - **through the earth as a heat source or heat sink**
  - **to generate power or heat or cool a structure.**

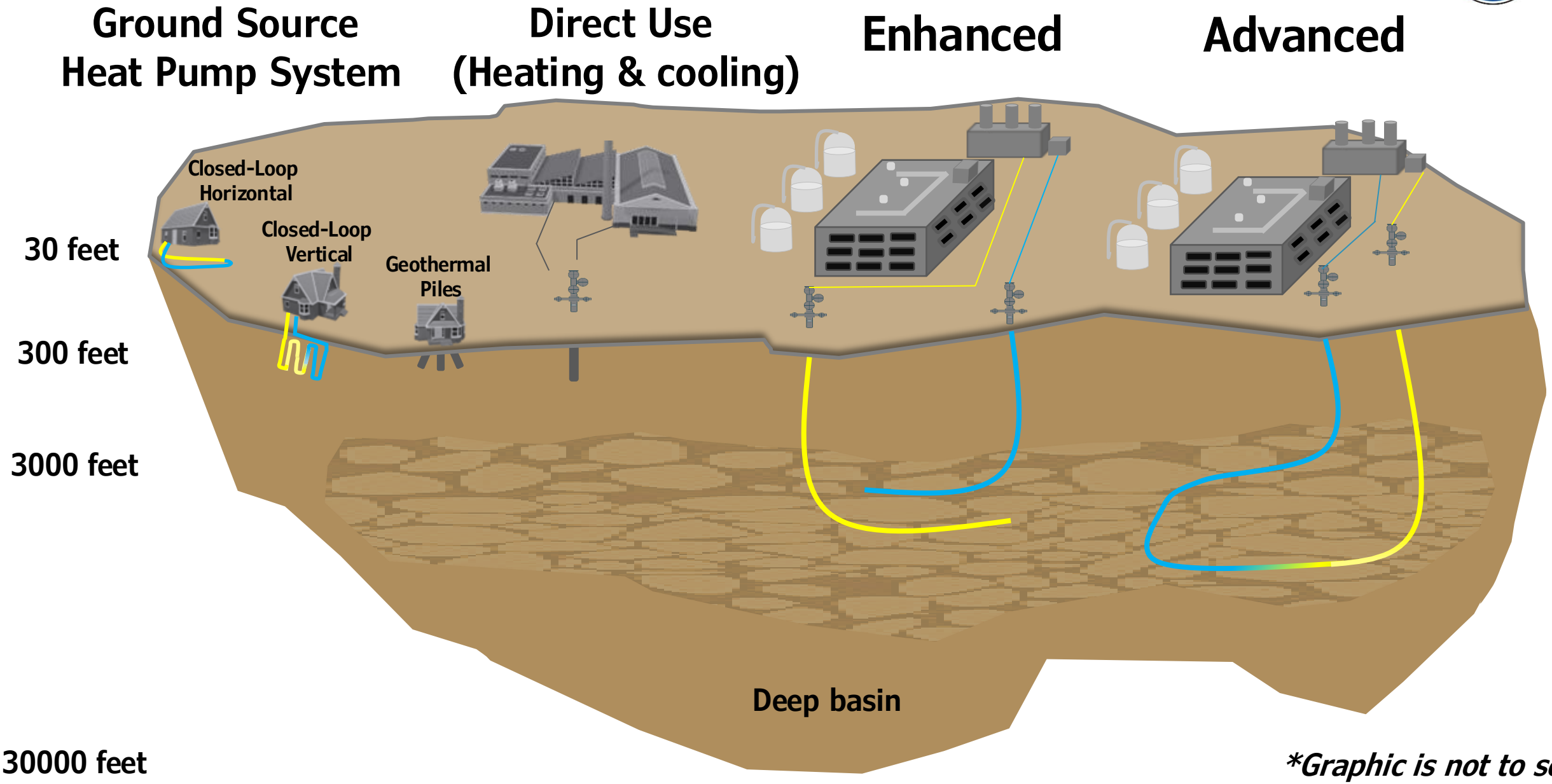
- **Designated as a Class V well under the underground injection control program administered by RRC**

# Regulatory Timeline & Key Events

- **Timeline of events over the past 15+ months**



# Categories of Class V Geothermal Wells

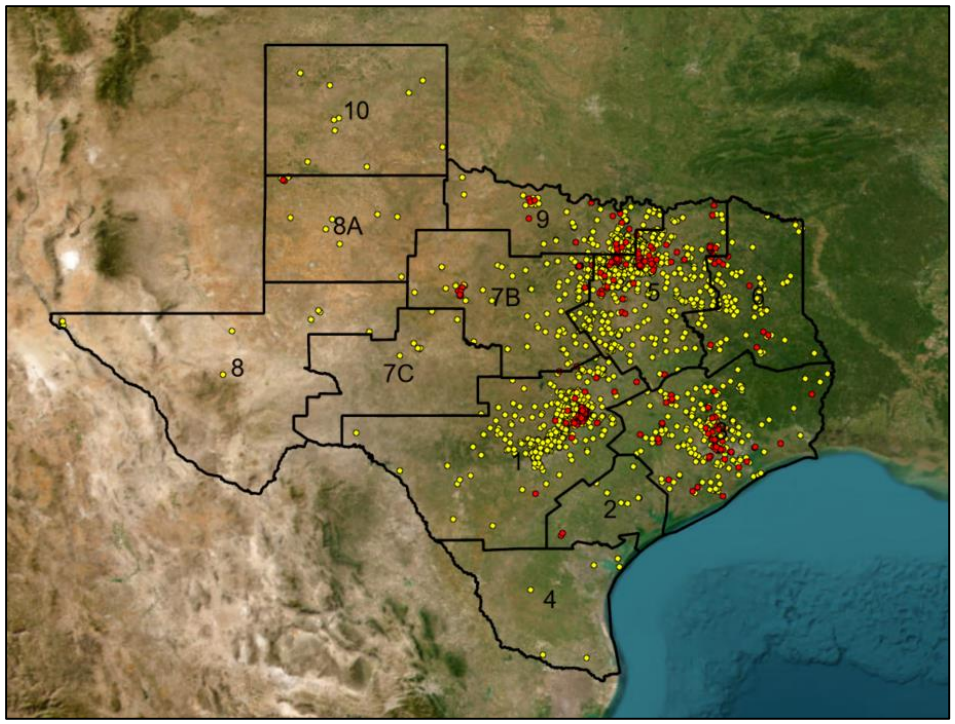



*Graphic is not to scale

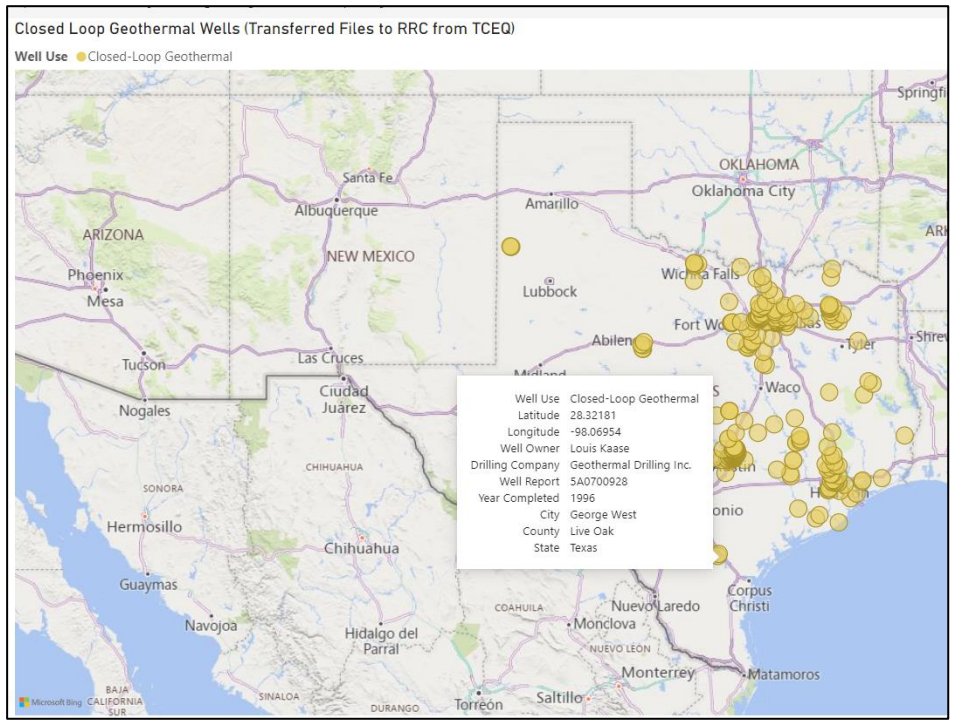
# Tracking Class V Wells Using GIS and Power BI

- **Tracking legacy and new well reports**
  - **Determining the proper digital data model**
  - **Ensuring all regulatory information is captured**

**Geographic Information System**

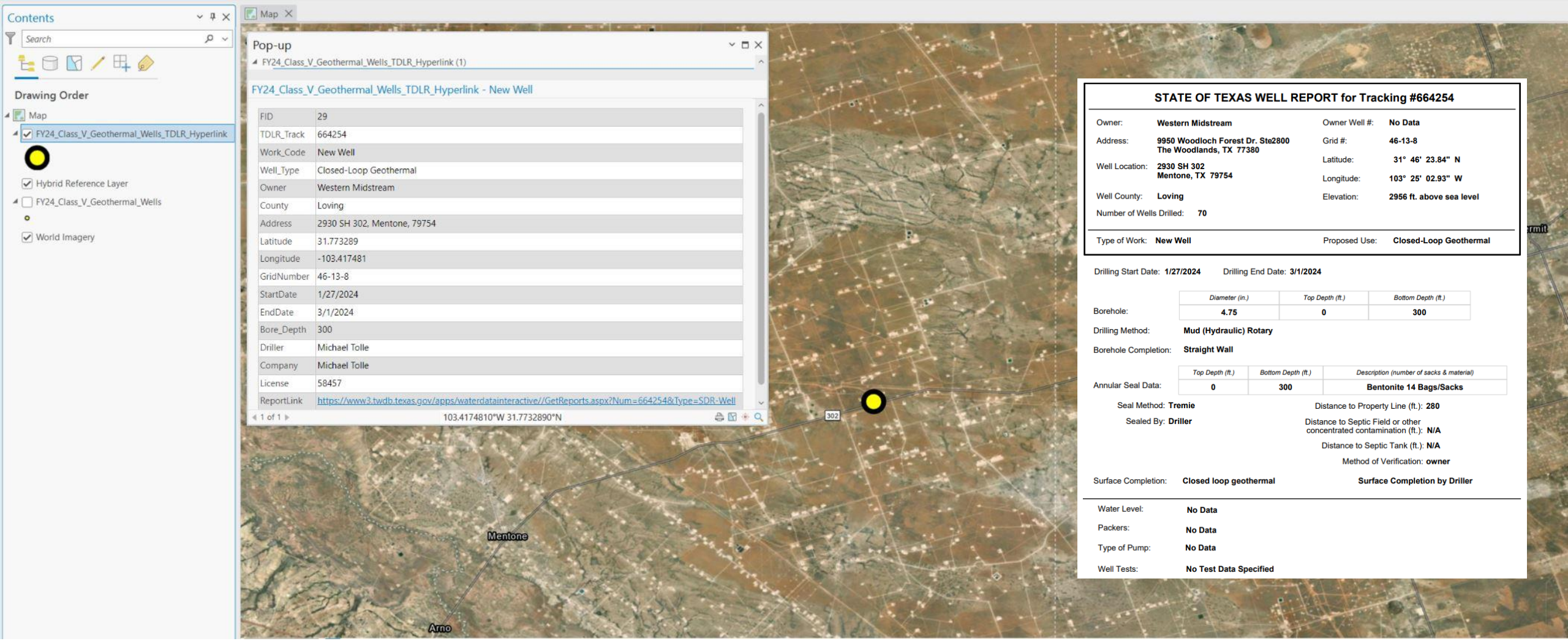



**Microsoft Power BI**



# Class V Geothermal Wells – Data Modeling

- **Attributes: Capturing requirements from permitting to plugging**



# Geothermal Wells - Regulatory Requirements

- Track lifecycle of the well: pre & post construction
  - Permitting, Completion, and Plugging
  - Well characteristics (bore hole depth, drilling method)
- Establish well accountability
  - Transfer of authority (TCEQ to RRC)
  - Transfer of ownership (facility owners)
- Achieve well design and construction standards
  - Type of permit required based on methodologies
  - Informed inspection process
- Protect drinking water
  - Location and depth of well
  - Total dissolved solids

# Setting up the process

- Download report from TDLR in Excel or .CSV format
- Edit the columns/rows to set up required attribute fields
- Import into ArcPro and assign XY coordinates using latitude/longitude
- Save as a shapefile or feature class
- Extract data from individual reports using Power Automate and AI modeling
- Add extracted data to ArcPro
- Establish an email contact list of owners and operators
- Use Power Automate to send an email to owner upon receipt of well report

# Technical

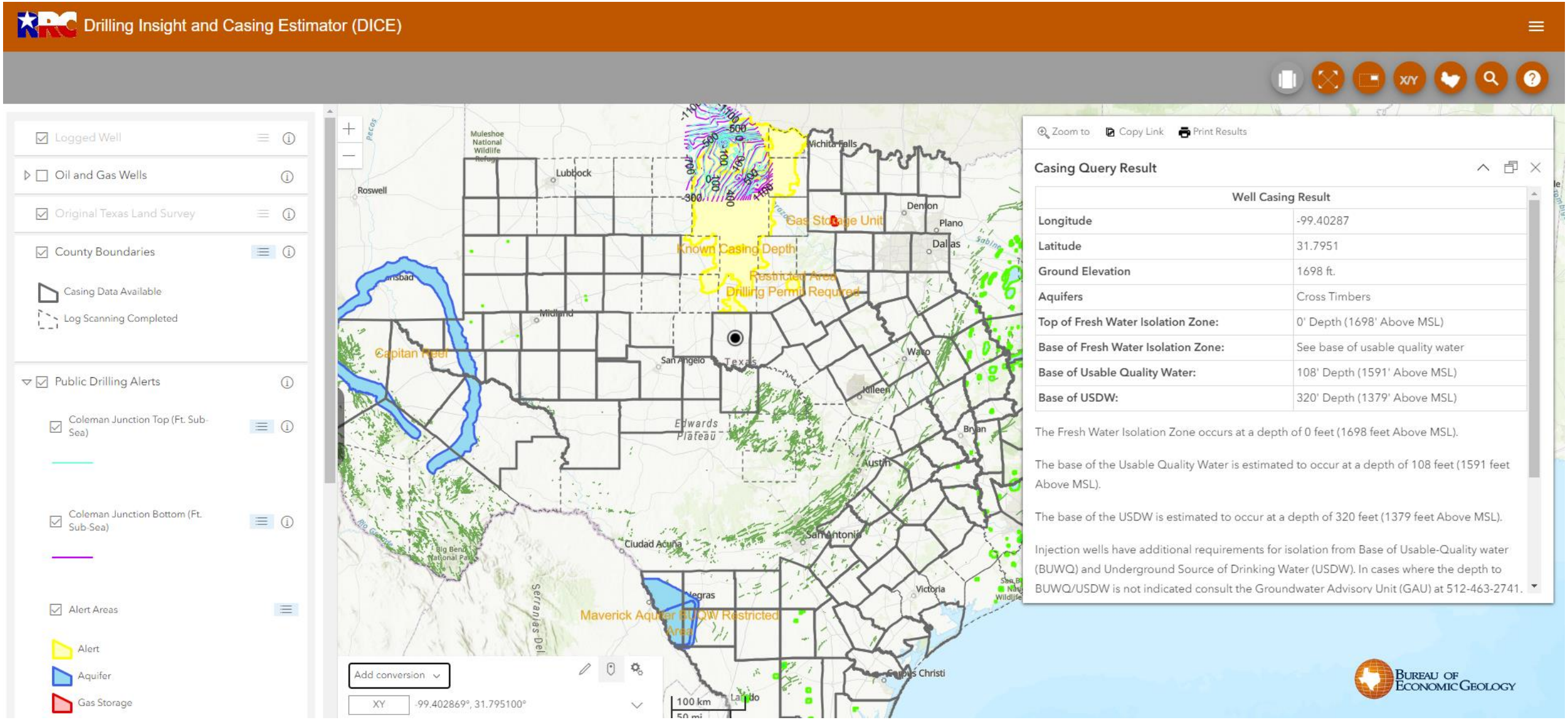
- **Refining the Geothermal Injection Well categories**
  - **Geothermal wells are classified as "Class V Geothermal"**
  - **Taxonomy to define construction and design methodologies**
  - **Address technology innovations in shallow and deep wells**

- **Updating permitting requirements**
  - **Consolidate several rules into a single geothermal rule**
  - **Construction specifications to permit-by-rule**
  - **Well compliance and enforcement standards**

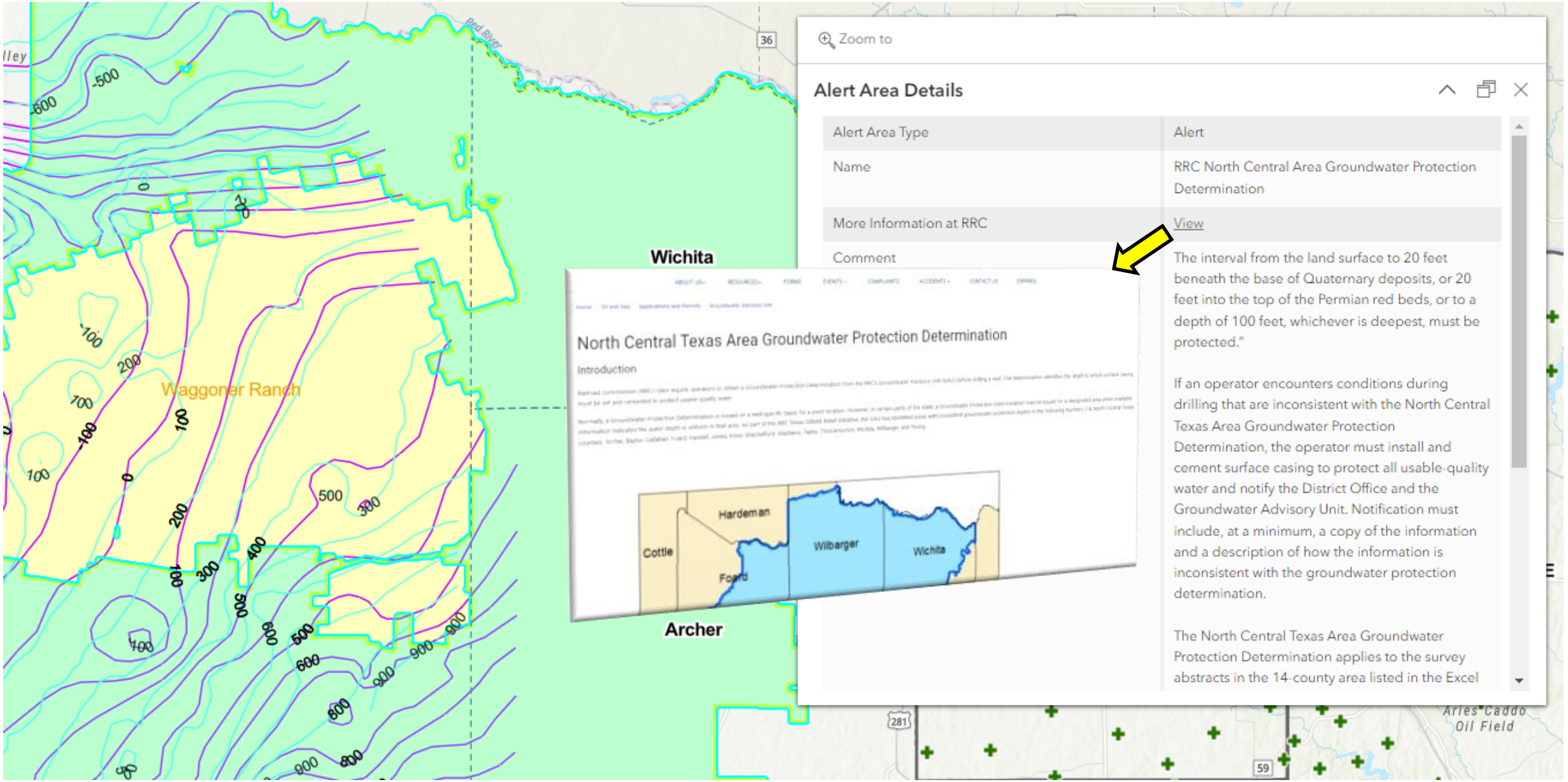
# Drilling Insight and Casing Estimator (DICE)

- Interactive website that provides depth and elevation estimates for select subsurface water-quality zones
  - Base of usable quality water (BUQW)
  - Base of underground sources of drinking water (BUSDW)
- Displays various layers
  - Water-bearing stratigraphic units
  - Aquifers
  - Drilling alerts
  - Well locations
- Partnering with Bureau of Economic Geology (BEG)
  - Common GIS Software (Esri)
  - Common Desktop Software (Microsoft Office 365)

# Drilling Insight & Casing Estimator (DICE)



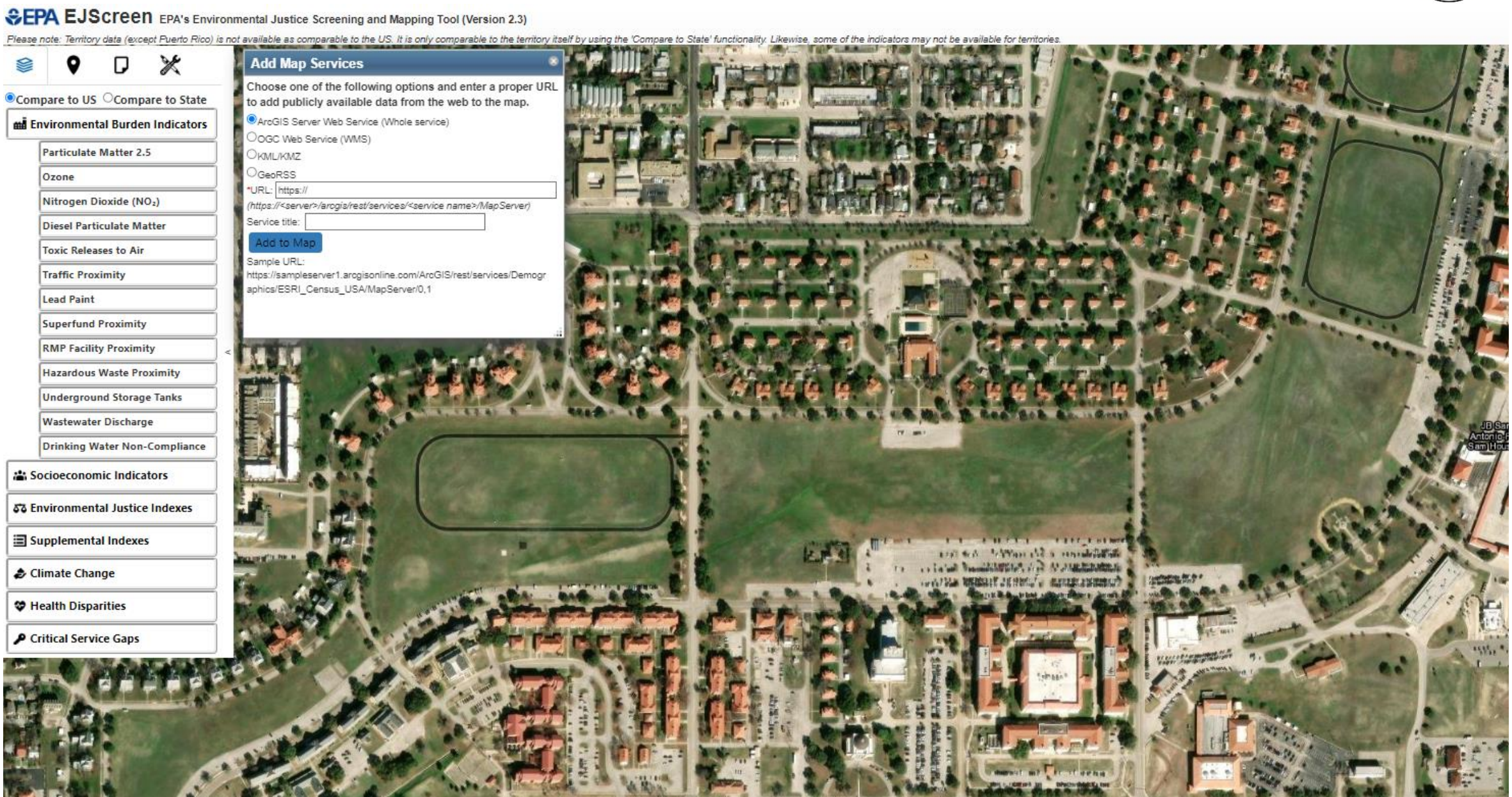
# DICE: A Full-Service Application & Website



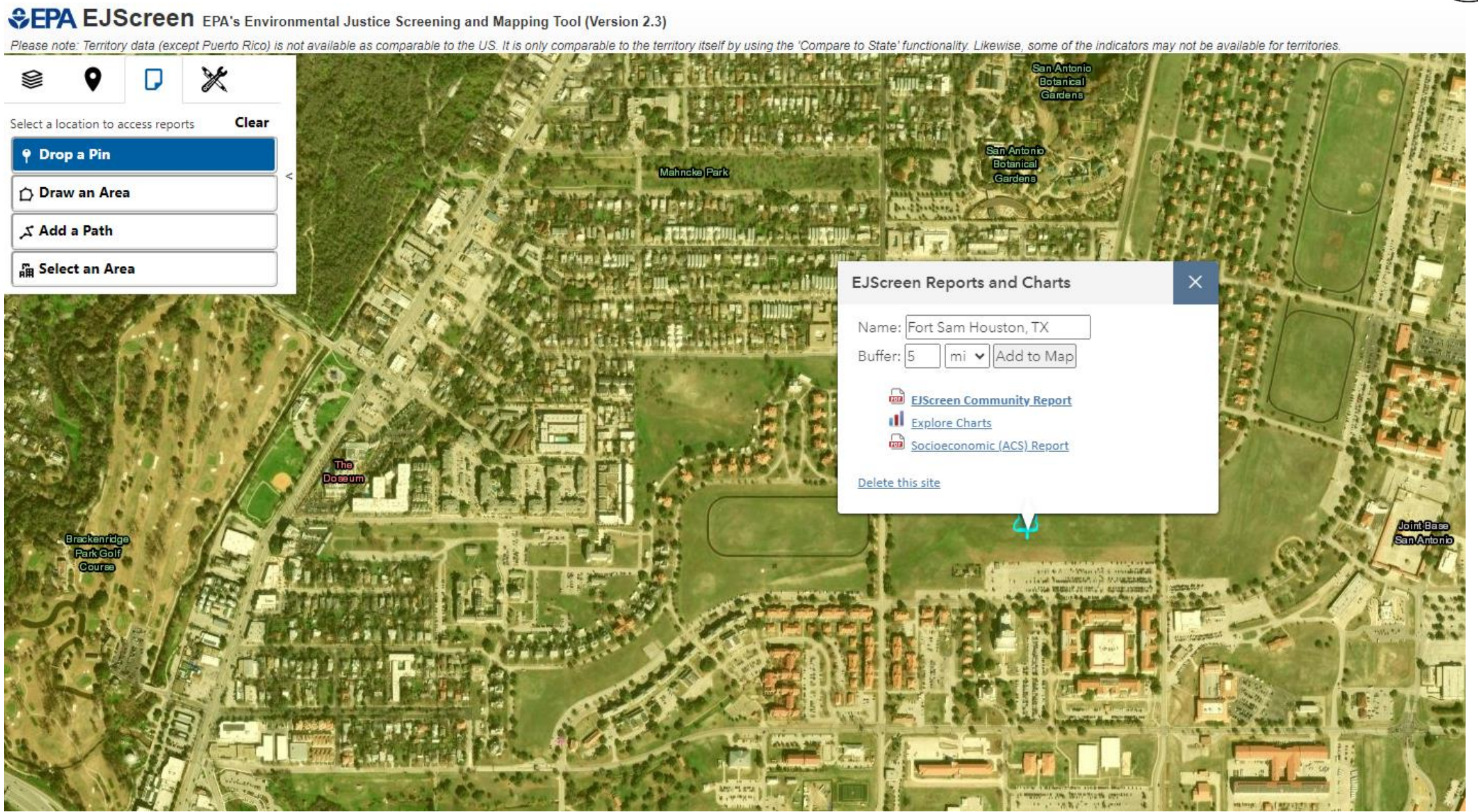
# Class VI Permitting: Technical Reviews

- Geologic Storage of Carbon Dioxide (Class VI Well)
- Environmental Justice (Federal guidelines for permitting)
- Federal-level Online GIS Applications
    - Environmental Protection Agency: *EJScreen Tool*
    - Department of Energy: *Energy Justice Dashboard*
    - Department of Agriculture: *Food Access Research Atlas (FARA)*
    - Council on Environmental Quality: *Climate and Economic Justice Screening Tool*
    - Based on U.S. Census Data and a version of Esri online GIS applications

# Federal agency GIS applications: EJScreen 2.3



# Technical review process: Site analysis



# Technical review process: Reports

EPA

## EJScreen Community Report

This report provides environmental and socioeconomic information for user-defined areas, and combines that data into environmental justice and supplemental indexes.

## Fort Sam Houston, TX

5 miles Ring Centered at 29.451514,-98.457921
Population: 290,841
Area in square miles: 78.53

### COMMUNITY INFORMATION

| | | | |
|---|---|---|---|
| Low income: 46 percent | People of color: 76 percent | Less than high school education: 21 percent | Limited English households: 10 percent |
| Unemployment: 6 percent | Persons with disabilities: 16 percent | Male: 50 percent | Female: 50 percent |
| 76 years | N/A | Number of households: 113,023 | Owner occupied: 48 percent |
| Average life expectancy | Per capita income | | |

### BREAKDOWN BY RACE

| | | | |
|---|---|---|---|
| White: 24% | Black: 7% | American Indian: 0% | Asian: 1% |
| Hawaiian/Pacific Islander: 0% | Other race: 0% | Two or more races: 2% | Hispanic: 66% |

### BREAKDOWN BY AGE

| | |
|---|---|
| From Ages 1 to 4 | 6% |
| From Ages 1 to 18 | 23% |
| From Ages 18 and up | 77% |
| From Ages 65 and up | 14% |

### LANGUAGES SPOKEN AT HOME

| LANGUAGE | PERCENT |
|---|---|
| English | 57% |
| Spanish | 41% |
| Total Non-English | 43% |

| | |
|---|---|
| Selected location contains American Indian Reservation Lands* | No |
| Selected location contains a "Justice40 (CEJST)" disadvantaged community | Yes |
| Selected location contains an EPA IRA disadvantaged community | Yes |

## EJScreen Environmental and Socioeconomic Indicators Data

| SELECTED VARIABLES | VALUE | STATE AVERAGE | PERCENTILE IN STATE | USA AVERAGE | PERCENTILE IN USA |
|---|---|---|---|---|---|
| **ENVIRONMENTAL BURDEN INDICATORS** | | | | | |
| Particulate Matter 2.5 ($\mu g/m^3$) | 8.83 | 8.86 | 45 | 8.45 | 70 |
| Ozone (ppb) | 66.9 | 63 | 81 | 61.8 | 77 |
| Nitrogen Dioxide ($NO_2$) (ppbv) | 12 | 9.5 | 74 | 7.8 | 88 |
| Diesel Particulate Matter ($\mu g/m^3$) | 0.224 | 0.151 | 84 | 0.191 | 70 |
| Toxic Releases to Air (toxicity-weighted concentration) | 120 | 12,000 | 36 | 4,600 | 26 |
| Traffic Proximity (daily traffic count/distance to road) | 2,300,000 | 1,000,000 | 87 | 1,700,000 | 75 |
| Lead Paint (% Pre-1960 Housing) | 0.5 | 0.16 | 88 | 0.3 | 74 |
| Superfund Proximity (site count/km distance) | 0.08 | 0.11 | 73 | 0.39 | 56 |
| RMP Facility Proximity (facility count/km distance) | 1.8 | 0.95 | 86 | 0.57 | 92 |
| Hazardous Waste Proximity (facility count/km distance) | 3.3 | 1.5 | 88 | 3.5 | 70 |
| Underground Storage Tanks (count/$km^2$) | 3.9 | 2.3 | 79 | 3.6 | 74 |
| Wastewater Discharge (toxicity-weighted concentration/m distance) | 200 | 3800 | 82 | 700000 | 61 |
| Drinking Water Non-Compliance (points) | 0.077 | 2.3 | 75 | 2.2 | 74 |
| **SOCIOECONOMIC INDICATORS** | | | | | |
| Demographic Index USA | 2.28 | N/A | N/A | 1.34 | 84 |
| Supplemental Demographic Index USA | 2.26 | N/A | N/A | 1.64 | 83 |
| Demographic Index State | 2.28 | 1.72 | 70 | N/A | N/A |
| Supplemental Demographic Index State | 1.94 | 1.49 | 75 | N/A | N/A |
| People of Color | 76% | 58% | 64 | 40% | 81 |
| Low Income | 46% | 34% | 70 | 30% | 77 |
| Unemployment Rate | 6% | 5% | 69 | 6% | 68 |
| Limited English Speaking Households | 10% | 8% | 73 | 5% | 84 |
| Less Than High School Education | 21% | 16% | 70 | 11% | 83 |
| Under Age 5 | 6% | 6% | 57 | 5% | 64 |
| Over Age 64 | 14% | 15% | 56 | 18% | 42 |

*Diesel particulate matter index is from the EPA's Air Toxics Data Update, which is the Agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the Air Toxics Data Update can be found at: https://www.epa.gov/haps/air-toxics-data-update.

### Sites reporting to EPA within defined area:

| | |
|---|---|
| Superfund | 0 |
| Hazardous Waste, Treatment, Storage, and Disposal Facilities | 11 |
| Water Dischargers | 774 |
| Air Pollution | 75 |
| Brownfields | 38 |
| Toxic Release Inventory | 56 |

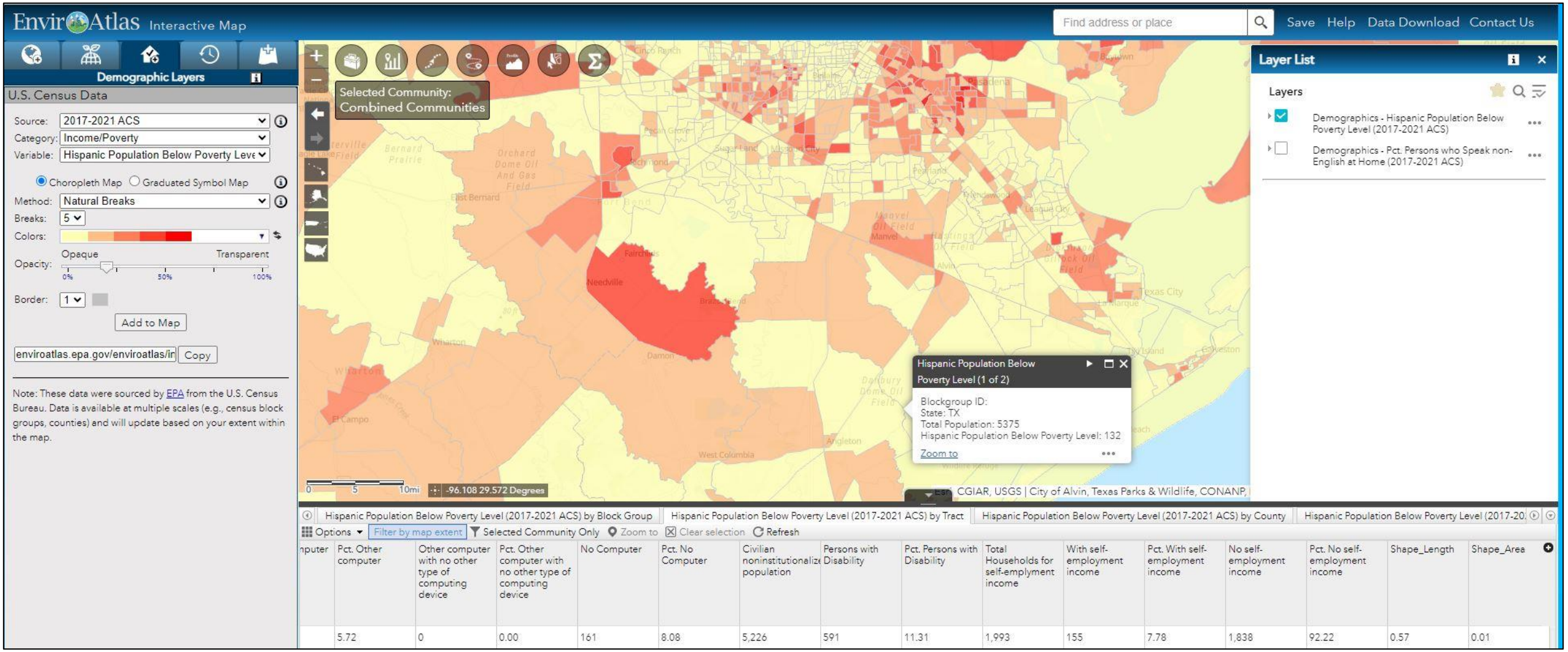
### Other community features within defined area:

| | |
|---|---|
| Schools | 141 |
| Hospitals | 12 |
| Places of Worship | 449 |

### Other environmental data:

# GIS Analysis – Review and Assessment Tools

- **EPA: EnviroAtlas (or Esri's *ArcGIS Living Atlas of the World*)**

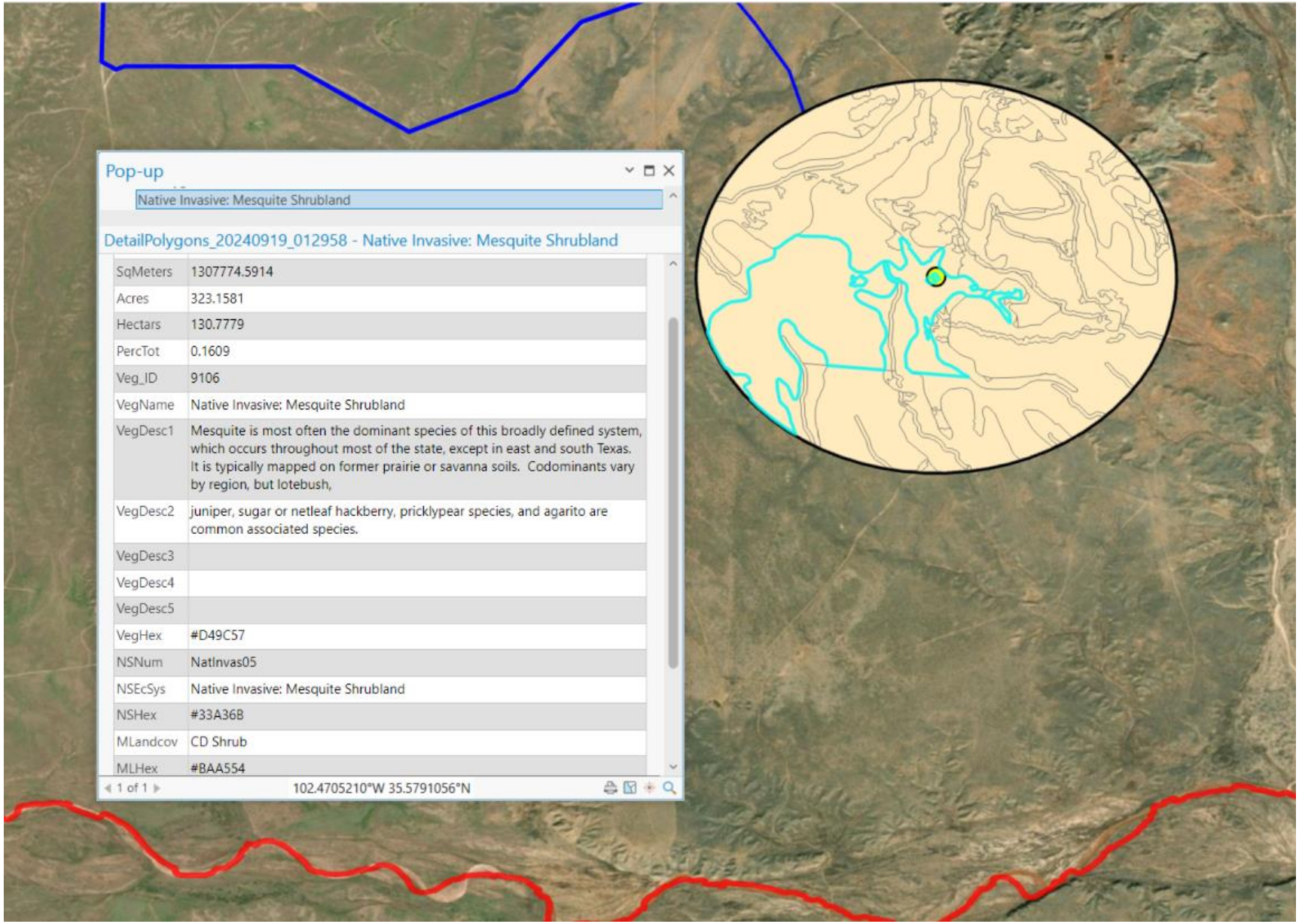


# Well Plugging - Tracking federally funded projects

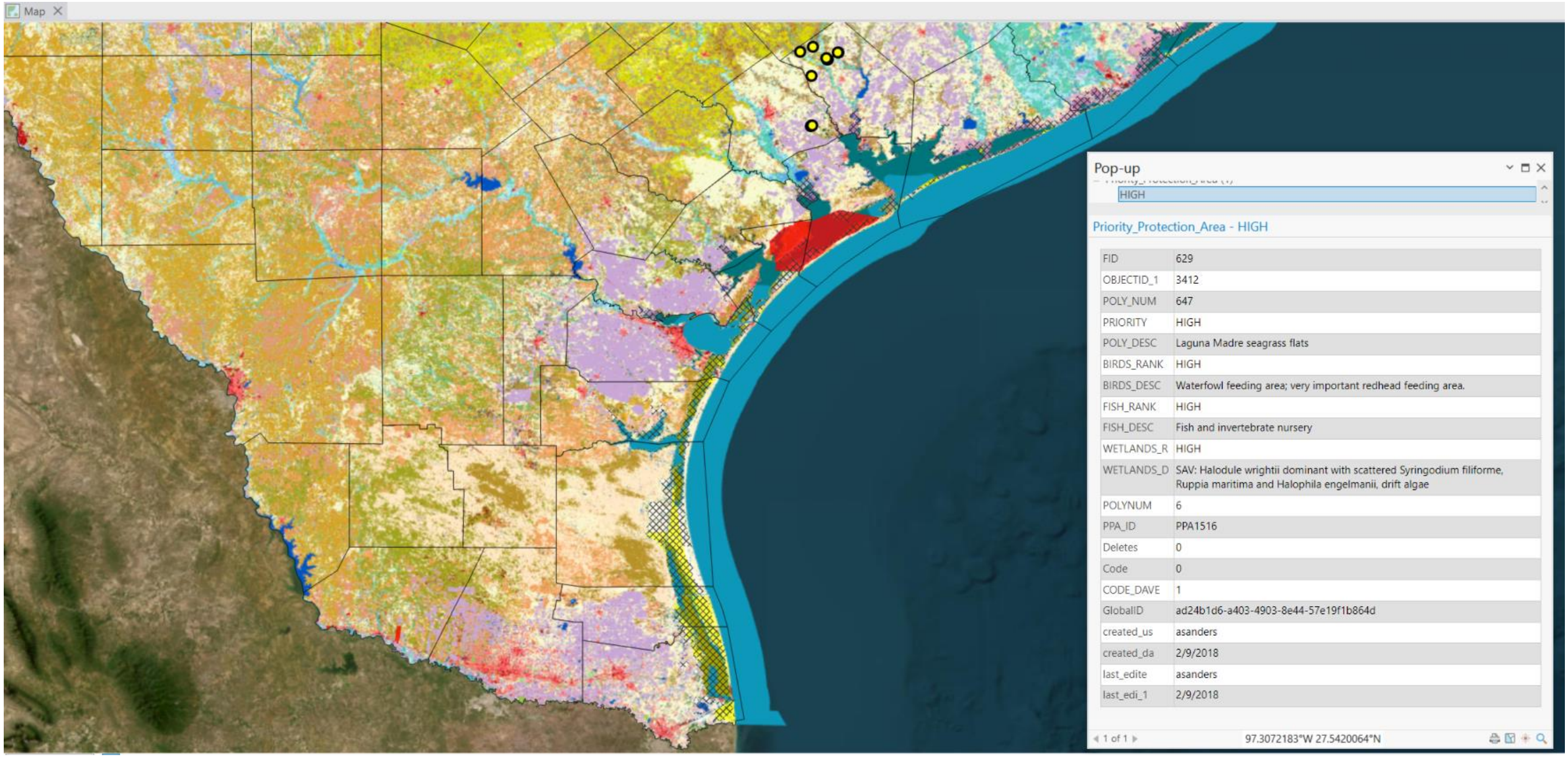
- State grants to plug abandoned/orphaned oil & gas wells
- Confirmation of well bore locations
- Geospatial analysis requirements
  - Internal data (well locations and geospatial analysis)
  - External data (GIS applications and services)
- Environmental (Environmental Species Act)
  - Biological Landscape (Types of grasslands)
  - Cultural Landscape (Types of land use)
- Historical (National Historic Preservation Act)
  - Historical Resources (Texas Historic Commission)

# Well Plugging – Site Analysis

- **ArcPro Project**
- **Credible data sources for analysis (federal or state sources)**
- **Analysis conducted to meet or exceed DOI or federal requirements**
- **Sharable from one repository**



# Ecological Analysis of a Specific Area (Habitat)



# Administrative & Technical Considerations

- Applications & Data Governance (The Plan)
  - Who needs what and why
  - How often is it used and to what extent
- IT & Cybersecurity (The Practice)
  - Access to applications
  - Exchange and storage of information
- Technical (The Process)
  - Hardware and Software
  - Training and education

# Summary: Optimizing the regulatory requirements

- **Enhancing GIS applications and data for the agency's regulatory requirements**
  - Ability to "scale up" as required using existing resources
- **Embracing common digital applications (Esri and Office 365) and sharable data formats**
  - Speeds up the review process and eliminates silos
- **Extending GIS throughout the lifecycle of a regulated activity**
  - "Permitting to Production to Plugging" using a consistent data set

# RRC Webpage

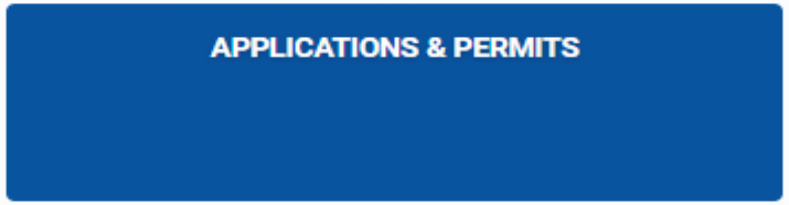
## Railroad Commission of Texas Website

## www.rrc.texas.gov

## For information on the newer programs, navigate to the agency homepage

Select this icon

Then select this tab




Then select

https://www.rrc.texas.gov/oil-and-gas/applications-and-permits/injection-storage-permits/geothermal