

UNIVERSITY LANDS

3D web interface for visualizing complex subsurface well/lease relationships

Draft

ESRI Energy Resources
GIS Conference

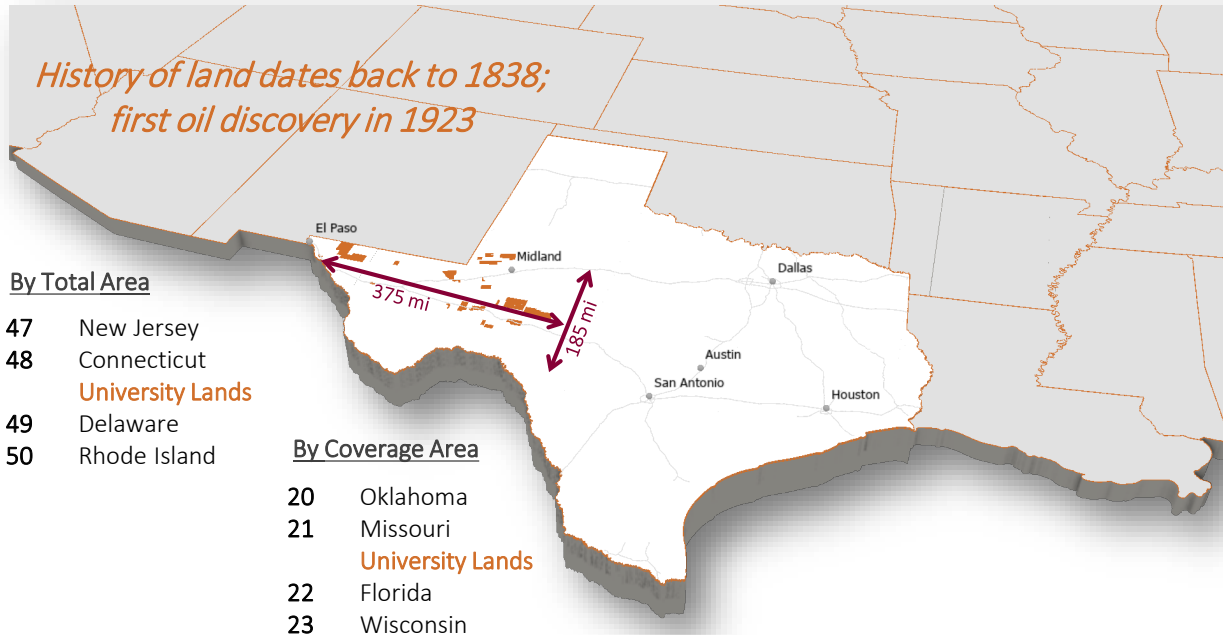
4-5 May 2022



The PUF & University Lands Organization

University Lands (UL) manages the surface and mineral interests of 2.1 million acres of land across nineteen counties in West Texas for the benefit of the Permanent University Fund (PUF).

The PUF is the largest public university endowment in the U.S. and benefits more than 20 educational and health institutions across both The University of Texas System and Texas A&M University System.



24,400

Wells drilled to-date

9,800

Wells currently producing

250+

Operators

79,000

Acres of renewable energy leases

22,000

Miles of pipeline & powerline easements

SURFACE LEASES

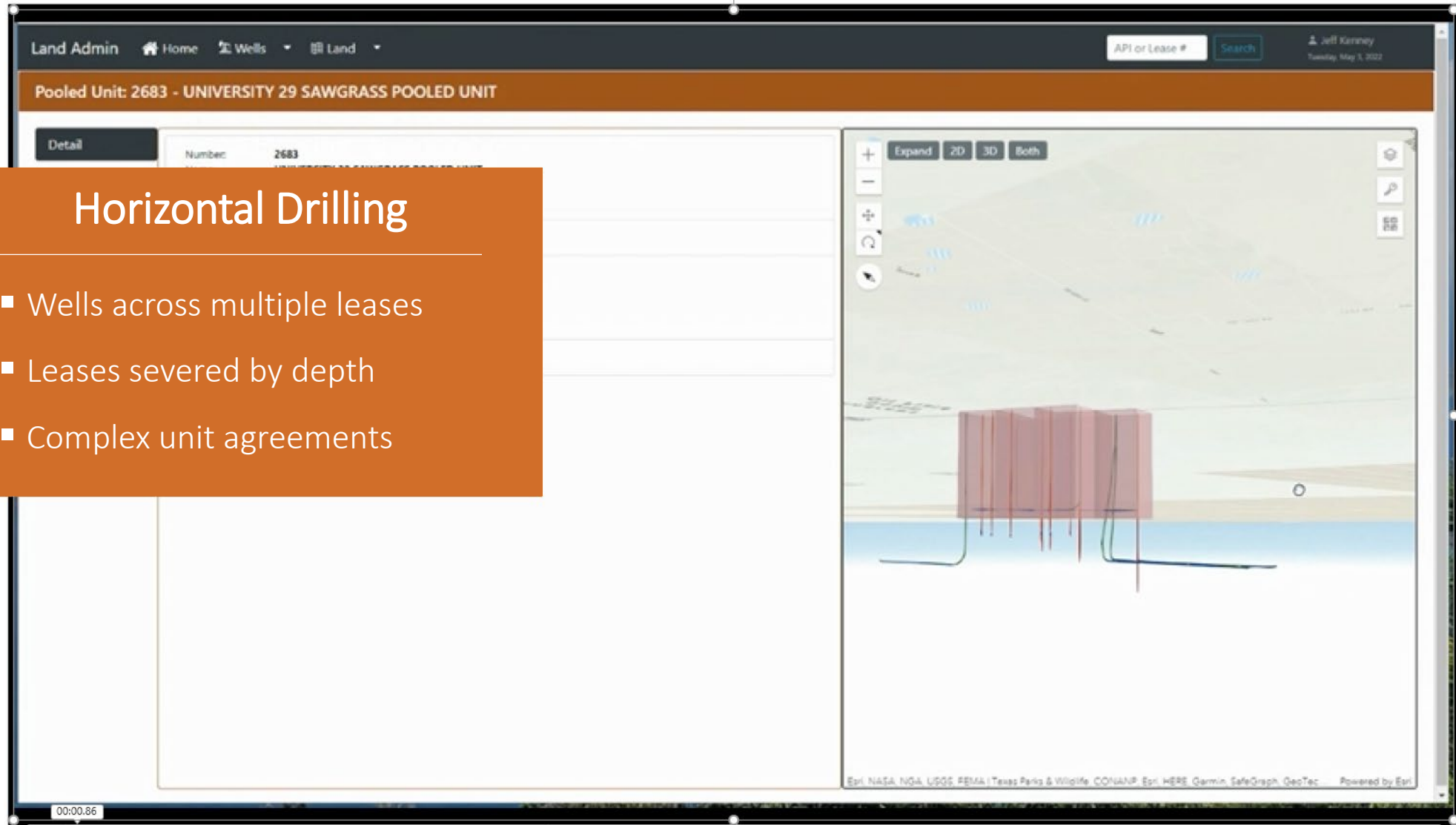
- Pipelines and power lines
- Grazing and ranching
- Renewables – wind and solar
- Groundwater sales
- Environmental programs

Primary revenue driver is mineral royalty revenue.

Project Background - Drivers

Horizontal Drilling

- Wells across multiple leases
- Leases severed by depth
- Complex unit agreements

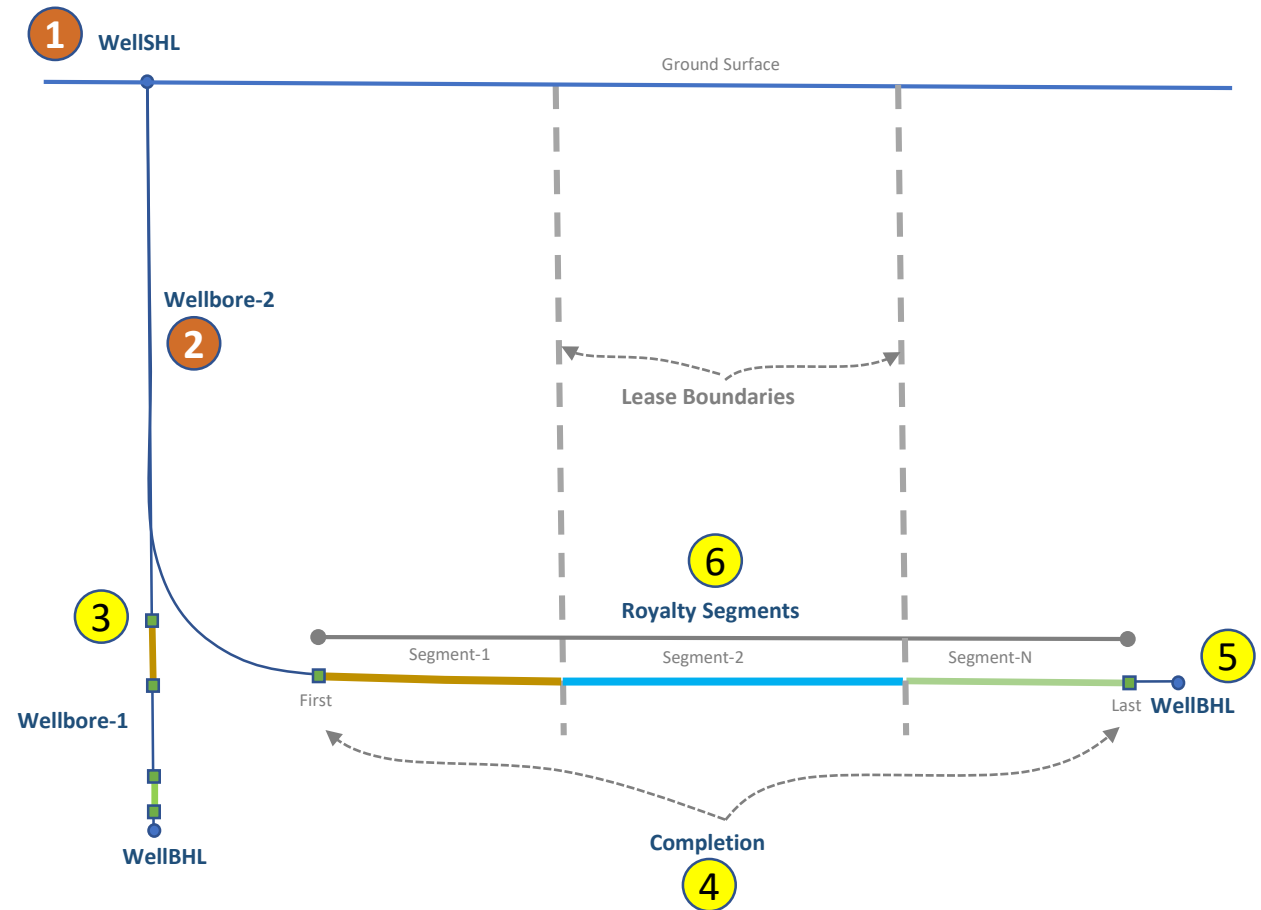


Well Features

- ① **WellSHL (pt)** – Surface Hole Location
- ② **Wellbore (line)** – drilled well path

Derivative Layers

- ③ **Perfs (pts)** first & last takes
- ④ **Completion (line)** production interval
- ⑤ **WellBHL (pt)** End point of Wellbore
- ⑥ **Royalty Segment (line)** Completions split by Oil & Gas Lease boundaries. Used to calculate % wellbore allocation within each lease.



Visualization Value

Land Admin Home Wells Land API or Lease # Search Jeff Kenney Tuesday, May 3, 2022

Pooled Unit: 2683 - UNIVERSITY 29 SAWGRASS POOLED UNIT

Detail

- Tracts 4
- Wells 2
- Production 111
- Status 1
- Operators 1/2
- Flags 1
- Documents 2
- Notes 1

Number:	2683
Name:	UNIVERSITY 29 SAWGRASS POOLED UNIT
Type:	POOLED UNIT (P)
Operator:	ZARVONA ENERGY LLC
Status:	Active (8/1/2012) 9 Years 9 Months 2 Days
Formation:	Surface to 100' below the top of the Upper Clearfork
Contract Interval:	From Surface to 7740 Feet
Acreage:	1046.687
Product:	Both
Well Operators:	ZARVONA ENERGY LLC

Appears to be 4 active wells participating in Pooled Unit

The map displays a grid of tracts numbered 21 through 37. A pink shaded area represents the pooled unit, which includes tracts 24, 29, 30, and 32. Four wells are marked with red dots and labeled with yellow boxes containing numbers 1, 2, 3, and 4. Well 1 is located in tract 30, well 2 in tract 24, well 3 in tract 32, and well 4 in tract 31. A blue line indicates a well path or boundary. The map also shows roads like Andrews South Field and Highway 385.

Esri, NASA, NGA, USGS, FEMA | Texas Parks & Wildlife, CONANP, Esri, HERE, Garmin, SafeGraph... Powered by Esri

Visualization Value

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Notes 1

Producing (2)

API	Tract(s)	Status	Operator	RRC	RRC Lease Name	TVD
4200344574	1,2,3	Producing (10/31/2012)	ZARVONA ENERGY LLC (0000950523)	43529-8-O	UNIVERSITY "29" SAWGRASS #5H	7161
4200344926	1,3,4	Producing (2/7/2013)	ZARVONA ENERGY LLC (0000950523)	43529-8-O	UNIVERSITY 29 SAWGRASS #2H	7155

Export

Unit agreement records indicate only 2 wells

Esri, NASA, NGA, USGS, FEMA | Texas Parks & Wildlife, CONANP, Esri, HERE, Garmin, SafeGraph... Powered by Esri

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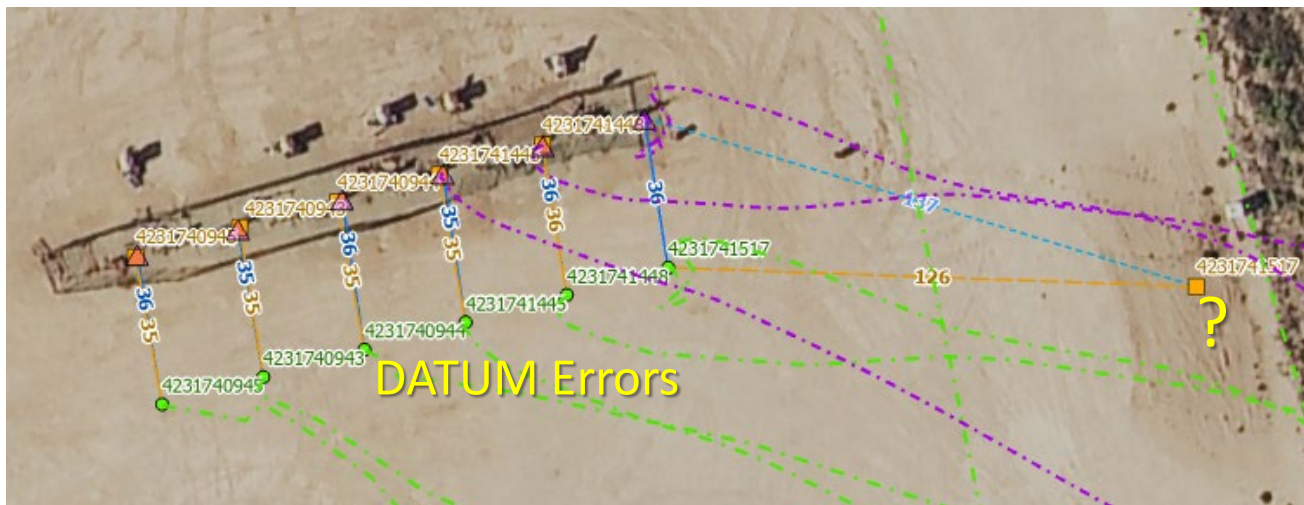
Additional 2 wells clearly below the severed Unit depth

Maxar | Source: USGS, NGA, NASA, CGIAR, GEBCO, N Robinson, NCEAS, NLS, OS, NMA, Geodatas... Powered by Esri

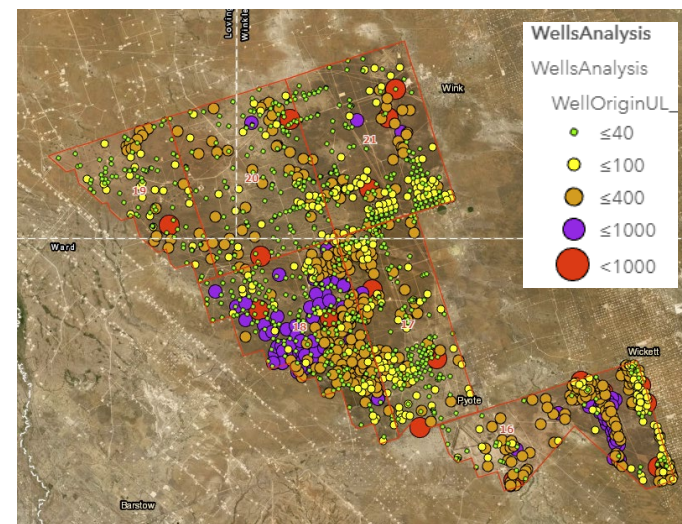
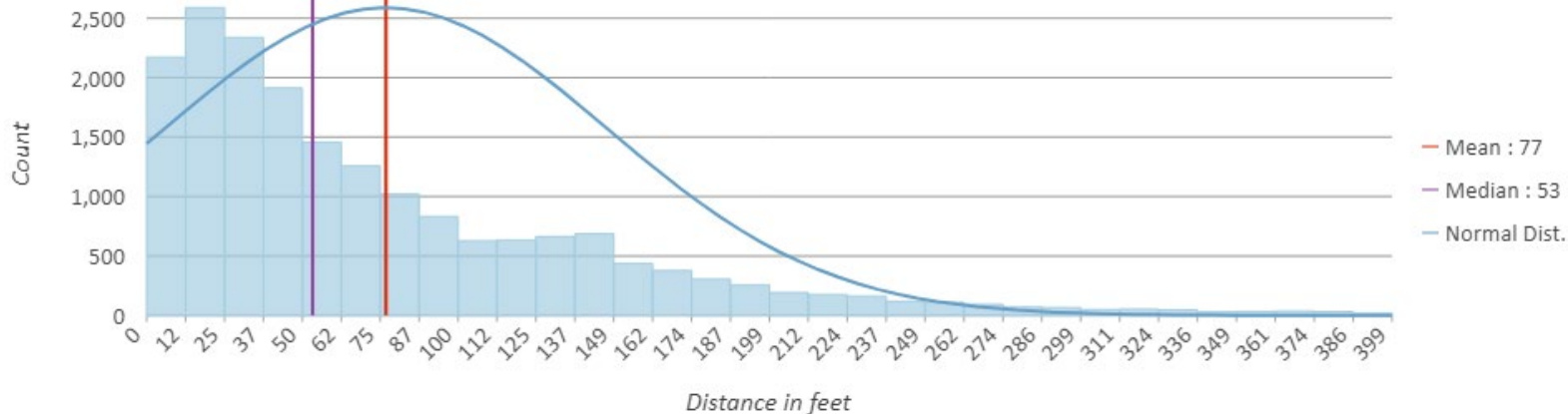
Challenges – Data Quality

Location Accuracy

A variety of Surface Hole Location (SHL) discrepancies between different well data sources.



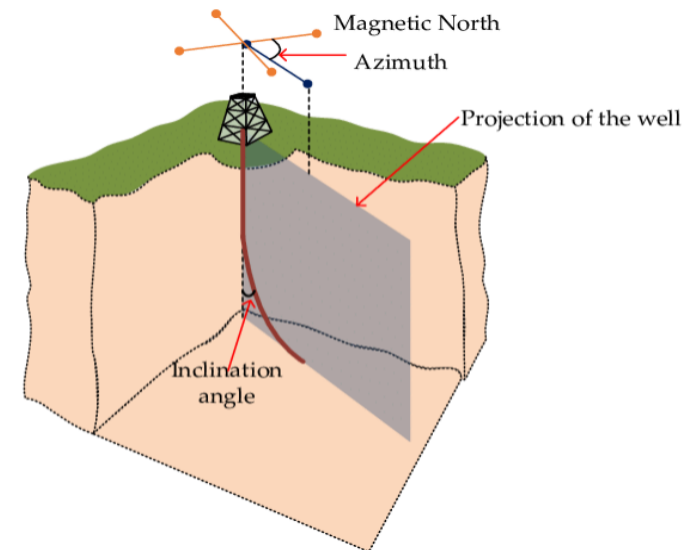
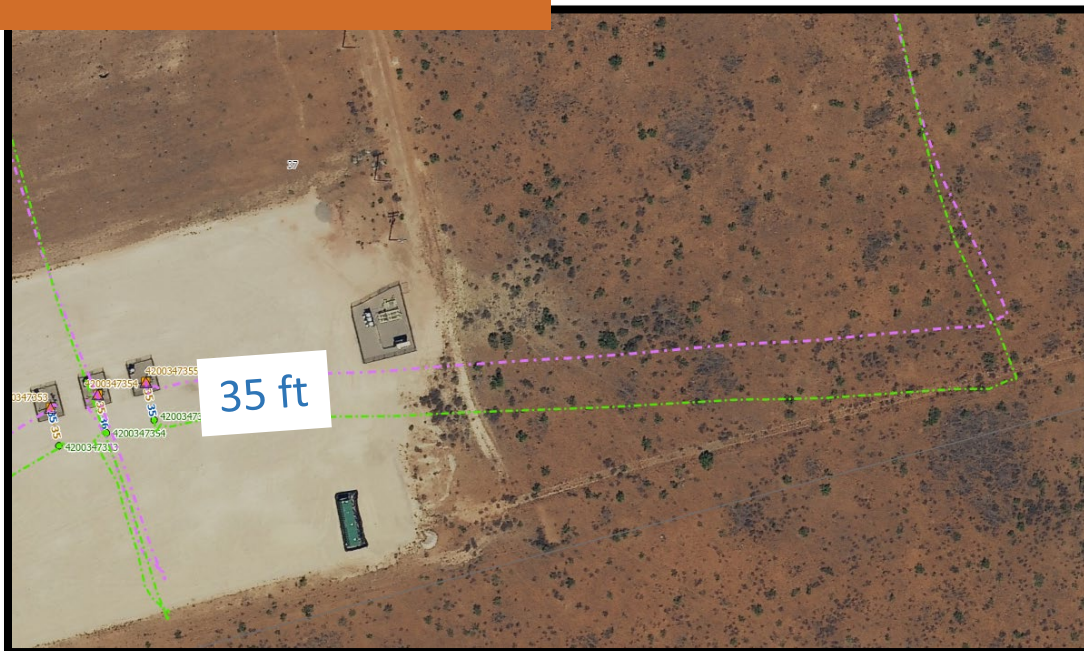
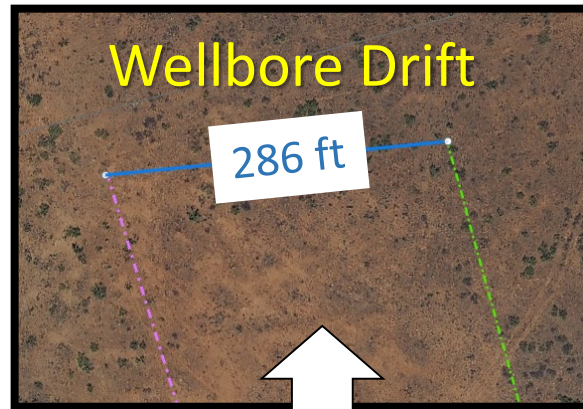
Distribution of Distance - UL to RRC



Challenges – Data Quality

Wellbore Build Process

Inconsistent in-house methods being used for building 3D wellbore features.



Orientation (Azimuth & Inclination)

- Magnetic north
- Geographic north (latitude and longitude)
- Grid north [projected coordinate system]

Measurement Methods

- Tangential
- Balanced Tangential
- Average Angle
- Curvature Radius
- Minimum Curvature

Challenges – Data Quality

Attributes

Missing, inaccurate, inconsistent...

Validation Exceptions

Ground elevation missing

Ground Elevation out of tolerance with DEM

SHL Lat/Lon out of tolerance w/wellbore start node

SHL out of tolerance with other sources

Total Measure Depth (TD) missing

Total Vertical Depth (TVD) missing

TVD > TD

Perf(s) missing

Last Take < First Take

Last Take > Total Depth

Hole Direction missing

Hole Direction inconsistent with Wellbore feature

Etc...

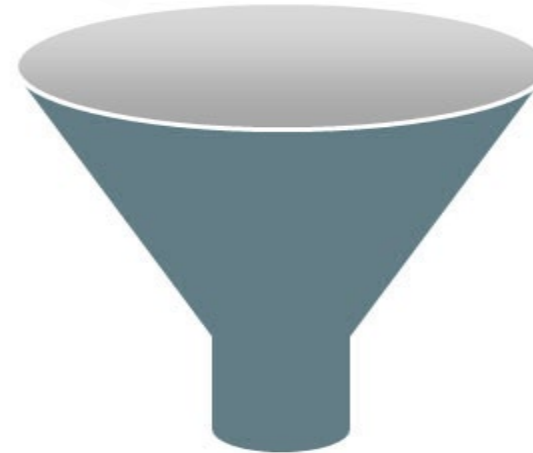
Responses - Data Quality

Master Data Management

Blends & masters wellbore attributes from multiple sources

+ Spatial validations using FME

- Supplements in-house data
- Framework for data cleanup



Authoritative Wellbore Records

Challenges - Development

API 4200347763 Horizontal - Location

Well Detail

Allocated Prod 0

Notes 5

Documents 1

Logs 0

Surface Location: **Surface Lease 110121**
Andrews, Block 13, Section 22
175 FSL & 1410 FEL
32.37465591 / -102.74721035 NAD83
Elevation 3272 feet GL

New Locations: **UL "13" DUBLIN SA #3H** →
LIME ROCK RESOURCES IV-A, L.P. - 3/8/2018
Reporting Lease: 110121
Permit 837109-8-O PD: 5000
Field: SHAFTER LAKE, N. (SAN ANDRES) (82572666)
Current Status: New Location - 3/8/2018

Replace embedded maps in existing Well & Lease search applications

Land Admin Home Wells Land

API or Lease # Search Jeff Kenney Tuesday, April 5, 2022

Production Sharing Agreement: 3027-9868 - UTL L.J. BELDIN 1211-17-6H

Detail

Tracts 4

Wells 4

Production 36

Notes

Number: 3027-9868
Name: UTL L.J. BELDIN 1211-17-6H
Type: PRODUCTION SHARING AGREEMENT (PSA)
Operator: PARSLEY ENERGY OPERATIONS, LLC

Parent: 3027 (PSA) - UTL L.J. BELDIN 1211-17-6H

Status: Active (1/5/2019) 3 Years 3 Months

Formation: Wolfcamp Formation
Contract Interval: From 11346 to 14470 Feet
Acreage: 640.700
Product: Both

Operators: JAGGED PEAK ENERGY LLC

- Limited screen real estate
- How much functionality?
- Mix of 2D & 3D data

Responses – Development

Screen Real Estate

Added toggles for different display types

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PRODUCTION SEARCH
LEASE SEARCH
PURCHASER LOOK UP
GIS DATA
SITES & INFO
FORMS, POLICIES & PROCEDURES

Back to Lease Search

University Lands Lease Detail: 111453

Lessee:	JAGGED PEAK ENERGY ET AL
Agreement Issued:	9/22/2010
Agreement Status:	Producing (12/22/2015)
Primary Term:	3 Years

Map Current Parcels (1) Documents (1)

3D Both

Map view toggle (highlighted by blue arrow)

Map showing lease area (yellow) and surrounding parcels (numbered 8-13, 29-31, 43-45). Includes Winkley Ward and 2702 ft boundary.

Bureau of Land Management, Texas Parks & Wildlife, Esri, HERE, Garmin, GeoTechnologies, Inc., USGS, METI/NASA, EPA, USDA
Powered by Esri

View Wells

Responses – Development

Screen Real Estate

Added toggles for different display types

The screenshot displays the University Lands website interface. At the top, the logo and navigation menu are visible. The main content area shows the 'University Lands Lease Detail: 111453' with a table of lease information. Below the table is a 3D map view showing the lease location. A blue arrow points from the text 'Added toggles for different display types' to the map's display type controls.

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Map Current Parcels (1) Documents (1)

2D 3D Both

Maxar | Source: USGS, NGA, NASA, CGIAR, GEBCO, N Robinson, NCEAS, NLS, OS, NMA, Geodatasystrelsen and the GIS User Community | Esri, HERE, G... Powered by Esri

View Wells

Responses – Development

Screen Real Estate

Added toggles for different display types

The screenshot displays the University Lands website interface. At the top, the logo and navigation menu are visible. The main content area shows the 'University Lands Lease Detail: 111453' with a table of lease information. Below this, there are two map views: 'Current Parcels (1)' and 'Documents (1)'. The 'Current Parcels' view is active, showing a 3D perspective of the lease area with green lines and a yellow highlighted parcel. A blue arrow points from the text 'Added toggles for different display types' to the 2D/3D toggle buttons in the map interface.

Lessee:	JAGGED PEAK ENERGY ET AL
Agreement Issued:	9/22/2010
Agreement Status:	Producing (12/22/2015)
Primary Term:	3 Years

Map | Current Parcels (1) | Documents (1)

2D 3D

Earthstar Geographics | Source: USGS, NGA, NASA, CGIAR, GE... Powered by Esri | Bureau of Land Management, Texas Parks & Wildlife, Esri, HERE... Powered by Esri

View Wells

Responses – Development

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University Lands Lease Detail: 111453

Lessee:	JAGGED PEAK ENERGY ET AL
Agreement Issued:	9/22/2010
Agreement Status:	Producing (12/22/2015)
Primary Term:	3 Years

Map Current Parcels (1) Documents (1)

2D 3D Both

Lease Number 111453

Lessee: JAGGED PEAK ENERGY ET AL
Status: Producing
County: Block: 17
Section: 11
Qtr/Qtr: E2,SW
Top Depth: 0
Bottom Depth: 99999
Mineral Acres:
Dat Search Map: [Map App](#)

Link to GIS webmap

Passes feature selection between embedded map and ArcGIS Enterprise webmap

Oil & Gas Lease: 111453

MapLesseeName	JAGGED PEAK ENERGY ET AL
LeaseStatus	Producing
DateBeginning	12/21/2015
BlockNbr	17
SectionNbr	11
QtrQuarter	E2,SW
DepthTop	0
DepthBottom	99,999
Availability	Leased
Zoom to	***

Earthstar Geographics | Source: USGS, NGA, NASA, CGIAR, GE... Powered by Esri

View Wells

Maxar | Esri, HERE, Garmin, GeoTechnologies, Inc. esri

Responses – Development

Mix of 2D & 3D data

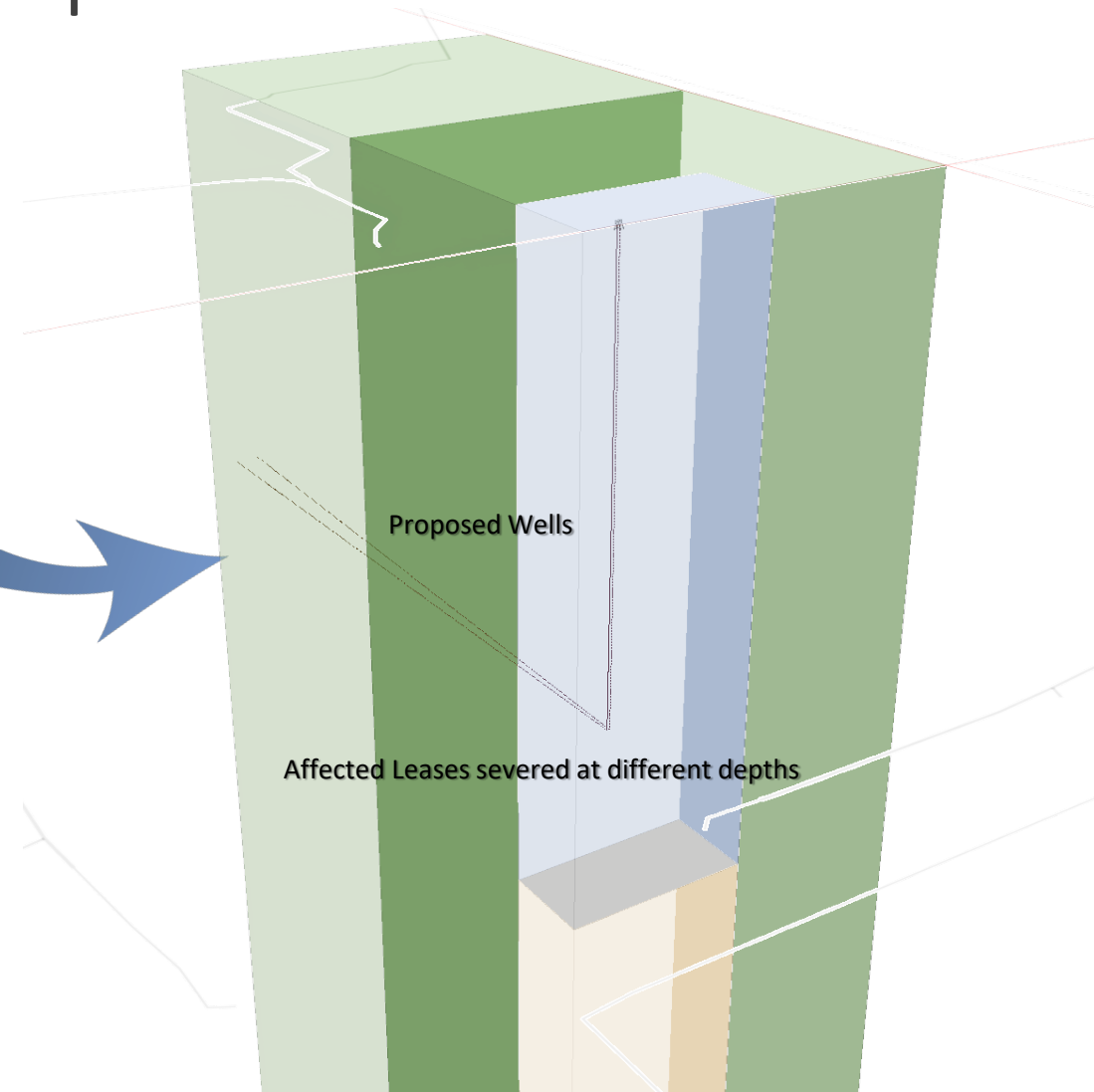
Needed to migrate all Well & Lease related features to accommodate 3D analysis

Available Leases

Not stored in our Land Admin

Permitted Wells

3D lines vs 2D draped on surface



Key Take-Aways

1. **Under estimated the data engineering effort**
 - FME critical component
2. **Pleasantly surprised with ArcGIS Enterprise**
 - 3D web visualization performance out of the box
3. **3D visualization provides business value**
 - if for no other reason than improved data quality

Going Forward

Validation

Automate spatial validation of data quality

Visualization

Incorporate data quality factors into display

Cleanup

Embedded tools for corrections

Parcel Fabric

Move all lease types into Parcel Fabric model

Land Admin

Embed OG lease editing into web interface



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[Back to Lease Search](#)

University Lands Lease Detail: 111674

Lessee:	RRP ACQUISITIONS 1 LLC ET AL
Agreement Issued:	9/22/2010
Agreement Status:	Producing (9/3/2013)
Primary Term:	3 Years

Map Current Parcels (1) Past Parcels (1) Documents (1)

Maxar | Source: USGS, NGA, NASA, CGIAR, GEBCO, N Robinson... Powered by Esri, Texas Parks & Wildlife, Esri, HERE, Garmin, GeoTechnologies, I... Powered by Esri

View Wells

End