

Functionality and Compatibility Information

The TWDB Major Aquifer 3-D Viewer uses the ESRI CityEngine Web Viewer. Detailed browser and hardware requirements can be found on the ArcGIS Online Help page:

<https://doc.arcgis.com/en/arcgis-online/reference/about-cityengine-web-viewer.htm>

General Information

The Major Aquifer 3-D Viewer is an interactive map viewer designed for use by the general public. The viewer leverages industry standard GIS 3D modeling software and delivers a representation, in 3-D, of eight Texas major aquifers. Once in the model viewer, the user can navigate around the aquifer by controlling both zoom and rotation view perspectives. Basic information on aquifers such as average surface elevation and aquifer thickness can also be retrieved on a cell by cell basis. The data extracted and developed for this viewer is a subset of the TWDB agency Groundwater Availability Modeling Program, which incorporates scientific data into the U.S. Geological Survey numerical groundwater flow modeling MODFLOW code. Full aquifer model data can be acquired by contacting the TWDB GAM group at: gam@twdb.texas.gov

Note: Some of the Groundwater Availability Model source data required generalization for best usability over the web.

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Section 1. 3D Aquifer Viewer, General Information

Diagram illustrating the navigation and data sources for the 3D Aquifer Viewer interface.

Navigation Links:

- TWDB Data, Apps, & Maps homepage
- Landing Page Link
- TWDB Map Layers
- Aerial photography, USGS, Streets, and Google imagery
- User Guide & Contact email
- TWDB Home Page

Interface Elements:

- WATER DATA Interactive
- Major Aquifer 3D Viewer
- Layers
- Base Maps
- Help
- Disclaimer
- Texas Water Development Board

Map Details:

- Scale: 1 : 9244649
- Coordinates: Pointer - DMS: 23° 2' 6.97" N 90° 36' 28.13" W | DD: 23.035270 -90.607813
- Powered by Esri
- Source: Esri, DeLorme, FAO, NOAA, USGS, EPA, NPS
- Organization: TEXAS WATER DEVELOPMENT BOARD

Section 2. Aquifer / GAM Layer Detail

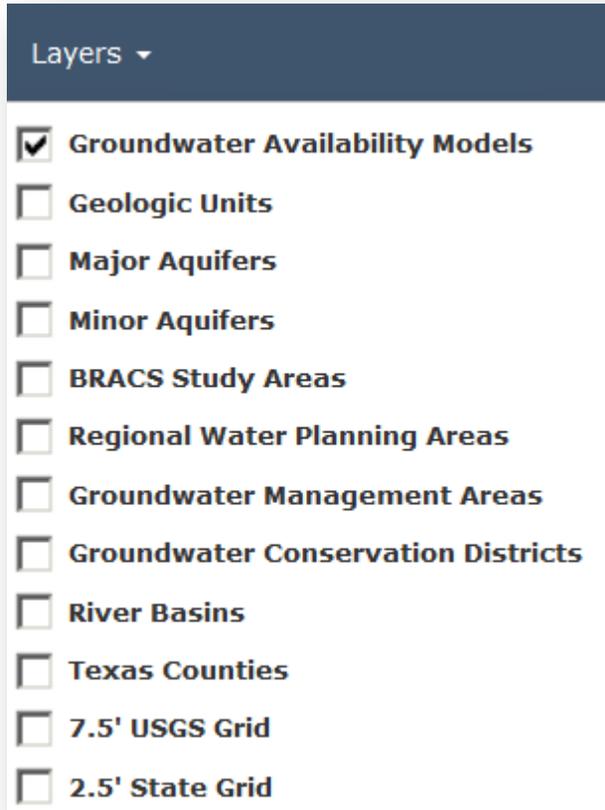
GAM Data:

Seymour Aquifer	GAM Lyr1-Seymour
High Plains Aquifer System	GAM Lyr 1-Ogallala
Edwards-Trinity (Plateau) Aquifer	GAM Lyr 1-Edwards Group, GAM Lyr 2-Trinity Group
Pecos Valley Aquifer	GAM Lyr 1-Pecos Valley
Southern Segment Edwards (Balcones Fault Zone) Aquifer	GAM Lyr 1-Edwards (BFZ)
Barton Springs Segment Edwards (Balcones Fault Zone) Aquifer	GAM Lyr 1-Edwards (BFZ)
Northern Segment Edwards (Balcones Fault Zone) Aquifer	GAM Lyr 1- Edwards (BFZ)
Northern portion of Trinity Aquifer System	GAM Lyr (3-7) -Trinity Aquifer
Hill Country portion of the Trinity Aquifer	GAM Lyr 1-Edwards Group , GAM Lyr 2-Upper Trinity, GAM Lyr 3-Middle Trinity, GAM Lyr 4-Lower Trinity
Northern portion of the Carrizo-Wilcox Aquifer	GAM Lyr 5-Carrizo, GAM Lyr (6-8) - Wilcox Group
Central portion of the Carrizo-Wilcox Aquifer	GAM Lyr 5-Carrizo, GAM Lyr (6-8) - Wilcox Group
Southern portion of the Carrizo-Wilcox Aquifer	GAM Lyr 5-Carrizo, GAM Lyr (6-8) - Wilcox Group

Northern portion of the Gulf Coast Aquifer System	GAM Lyr 1-Chicot, GAM Lyr 2-Evangeline, GAM Lyr 3-Burkeville, GAM Lyr 4-Jasper/Catahoula
Central portion of the Gulf Coast Aquifer System	GAM Lyr 1-Chicot, GAM Lyr 2-Evangeline, GAM Lyr 3-Burkeville, GAM Lyr 4-Jasper/Catahoula
Southern portion of the Gulf Coast Aquifer System	GAM Lyr 1-Chicot, GAM Lyr 2-Evangeline, GAM Lyr 3-Burkeville, GAM Lyr 4-Jasper/Catahoula

GAM Information	Description
CellColumn	Column number of the GAM grid
CellRow	Row number of the GAM grid
County	County of selected GAM grid cell
DEM	Average Land Surface Elevation
Layer# Top	Top elevation in feet of the aquifer
Layer# Bottom	Bottom elevation in feet of the aquifer
Layer# Thickness	Aquifer thickness in feet
Model Cell Id	Unique identifying number of the cell that is the combined row and column.

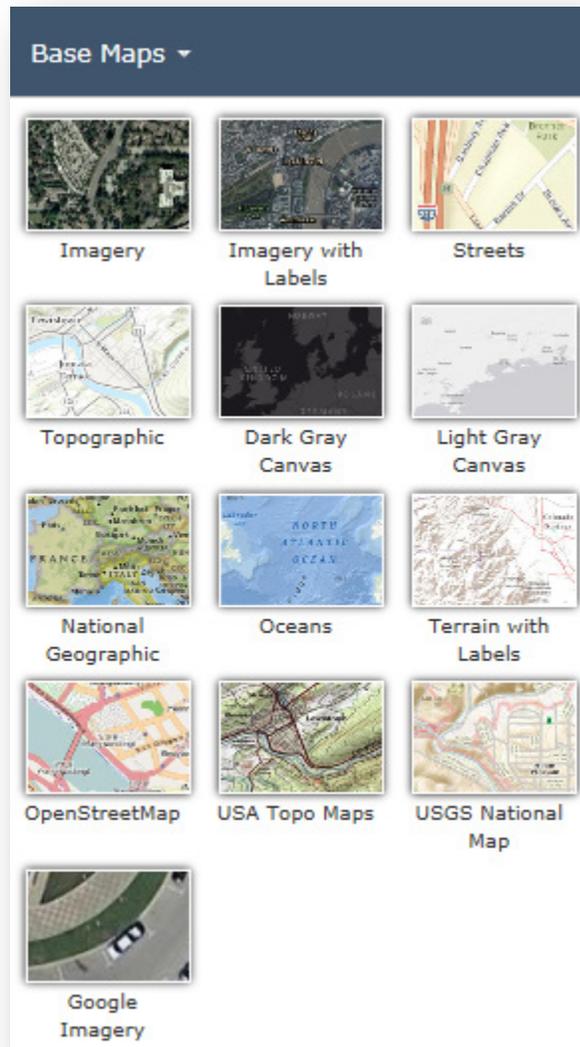
Section 3. Map Layers



Layers: *Coordinate system is WGS 1984 Web Mercator (auxiliary sphere)*

Groundwater Availability Model Boundaries	Groundwater Availability Model (GAM) boundaries of the Major Aquifers. The boundaries are an index to the 3D-Viewer where basic aquifer framework information, such as average surface elevation and aquifer thickness can be viewed for each 1-mile by 1-mile "cell". The data extracted and developed for this viewer is a subset of the TWDB agency scientific model data—Groundwater Availability Modeling Program.
Geologic Units	The Geologic Atlas of Texas (GAT). This data set was jointly created by U. S. Geological Survey, Texas Natural Resource Information System, and the Texas Bureau of Economic Geology. The data includes rock units, members, and structures (faults).
Major Aquifers	The nine major aquifers of Texas as defined by the TWDB, updated December 2006.
Minor Aquifers	The 21 minor aquifers of Texas as defined by the TWDB, updated December 2006.
BRACS Study Areas	TWDB's Brackish Resources Aquifer Characterization System (BRACS) designed to map and characterize the brackish aquifers of Texas in greater detail than previous studies.
Regional Water Planning Areas	The 16 Water Planning Regions in Texas, created by TWDB, updated November 2014.
Groundwater Management Areas	Groundwater Management Area Boundaries, created by TWDB
Groundwater Conservation Districts	Groundwater conservation districts in Texas. Original data is sourced from Texas Commission on Environmental Quality.
River Basins	The 23 major river basins of Texas, created by U.S. Geological Survey
Texas Counties	Texas county boundaries
7.5' USGS Grid	The USGS 7.5-minute map series grid index. The index grid covers the geographic extent of USGS 1:24,000 topographic maps (7.5- by 7.5-minute quadrangles) for Texas.
2.5' State Grid	TWDB well location grid. 2.5 minute grid that covers the state of Texas; meant to be used in conjunction with the USGS and other products that display data based upon this type of grid.

Section 4. Base Maps



Base Maps: *Coordinate system is WGS 1984 Web Mercator (auxiliary sphere)*

Imagery	The World Imagery map is a detailed imagery map layer that is designed to be used as a basemap for various maps and applications.
Imagery with Labels	The World Imagery map is a detailed imagery map layer and labels that is designed to be used as a basemap for various maps and applications.
Streets	The Streets basemap presents a multiscale street map for the world.
Topographic	The Topographic map includes boundaries, cities, water features, physiographic features, parks, landmarks, transportation, and buildings.
Dark-Gray Canvas	The Dark Gray Canvas basemap is designed to be used as a soothing background map for overlaying and focus attention on other map layers.
Light Gray Canvas	The Light Gray Canvas basemap is designed to be used as a neutral background map for overlaying and emphasizing other map layers.
National-Geographic	The National Geographic basemap is designed to be used as a general reference map for informational and educational purposes.
Oceans	The Ocean Basemap is designed to be used as a basemap by marine GIS professionals and as a reference map by anyone interested in ocean data.
Terrain with Labels	The Terrain with Labels basemap is designed to be used to overlay and emphasize other thematic map layers.
Open Street Map	The OpenStreetMap is a community map layer that is designed to be used as a basemap for various maps and applications.
USA Topo Maps	The USA topographic map presents land cover and detailed topographic maps of the United States. The maps are seamless, scanned images of the USGS paper topographic maps.
USGS National Map	This Web Map combines the various base map services (Boundaries, Names, Transportation, Elevation, Hydrography, Land Cover and others) that make up The National Map planimetric base map.
Google Imagery	The Texas Google imagery service is high resolution imagery showing the entire state of Texas. The service provides continuous 6-inch natural color imagery for the entire state.

Section 5. Browser General Navigation

The image displays the 'WATER DATA Interactive' web application interface. At the top, there is a navigation bar with the following elements: 'WATER DATA Interactive' logo, 'Major Aquifer 3D Viewer', 'Layers' dropdown, 'Base Maps' dropdown, 'Help' dropdown, 'Disclaimer', and the 'Texas Water Development Board' logo.

On the left side, there are four navigation controls in a vertical stack, each with a blue arrow pointing to a specific map control:

- Zoom In/Out:** Points to the '+' and '-' zoom buttons.
- Default Extent:** Points to the home icon.
- Find my location:** Points to the location icon.
- Previous extent:** Points to the left arrow icon.

The main map area shows a topographic view of Texas and surrounding regions. Several aquifer basins are highlighted with different colors and patterns:

- Blue hatched:** ESCABADO (STAKED PLAIN)
- Green:** EDWARDS PLATEAU
- Red:** SAbine
- Yellow hatched:** A basin in the southeast.
- Red hatched:** A basin in the south-central region.
- Blue hatched:** A basin in the southwest.

At the bottom left, there are three callout boxes:

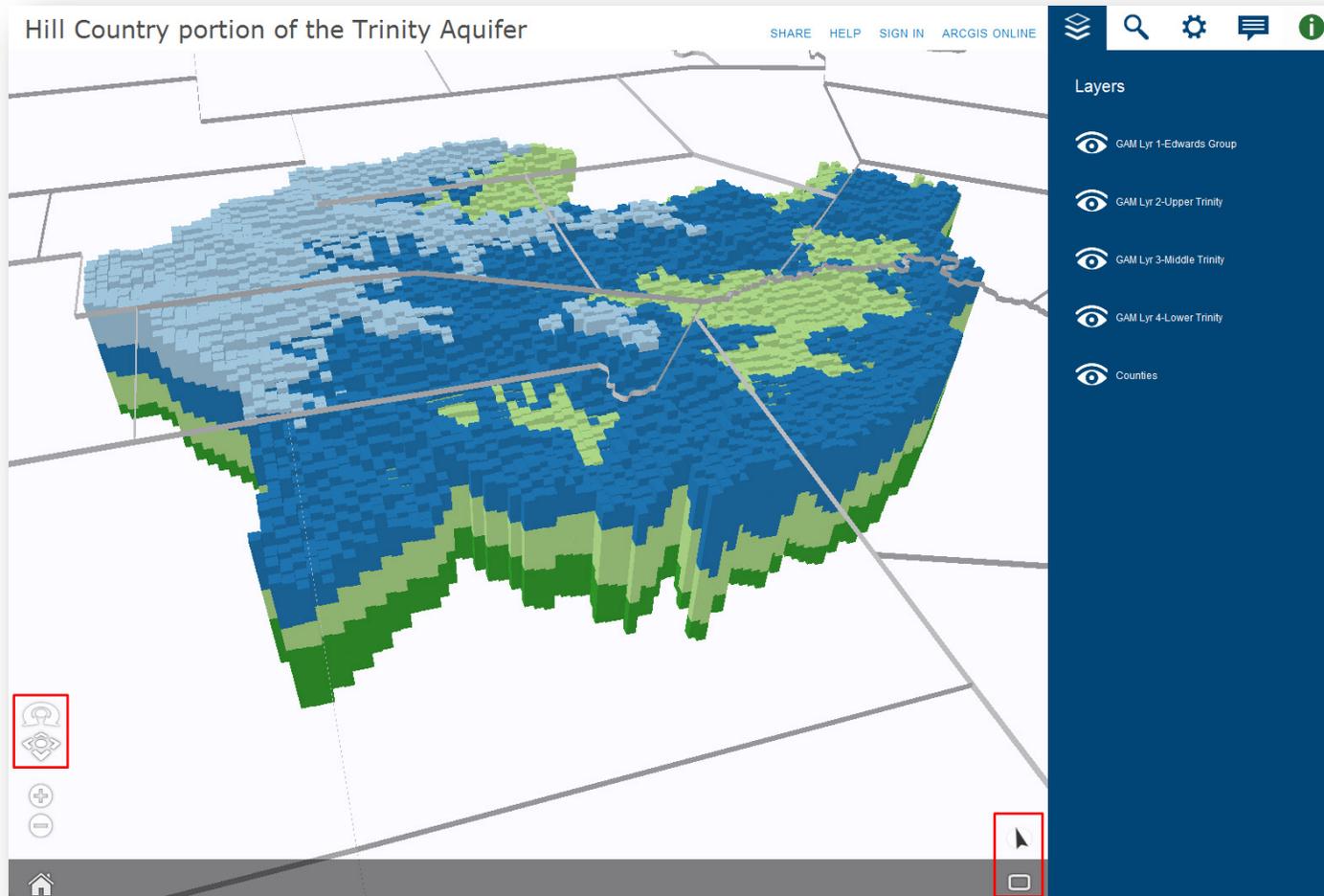
- Longitude, Latitude (cursor location):** Points to the coordinate display: 'Pointer - DMS: 26° 52' 44.32" N 94° 7' 24.37" W || DD: 26.878977 -94.123437'.
- Map scale bar:** Points to a scale bar showing 0, 100, and 200 km.
- Ratio map scale:** Points to the text '1 : 9244649'.

The bottom right corner features the 'esri' logo and the text 'POWERED BY esri'. The footer of the page reads 'TEXAS WATER DEVELOPMENT BOARD'.

Section 6. Navigate in the 3-D Web Viewer

(3-D Web Viewer software source: Web Scene, CityEngine © Copyright 2015 Environmental Systems Research Institute, Inc.)

- To pan, click the Pan button , click and hold the left mouse button, then drag the map in the direction you want to move it.
- To rotate, click the Rotate button , click and hold the left mouse button, then drag the map in the direction you want to rotate it.
- Either Pan or Rotate is active and your primary navigation within the scene. If you have a two-button mouse, you can use the left mouse button for the primary navigation and the right mouse button for the secondary navigation. For example, if you activate the Rotate button, you can use the left mouse button to rotate and the right mouse button to pan.
- The Compass  points to North. Click the compass to reorient the view to North.
- The Full Screen button  switches the view port to full screen.



Section 7. Layer Pane

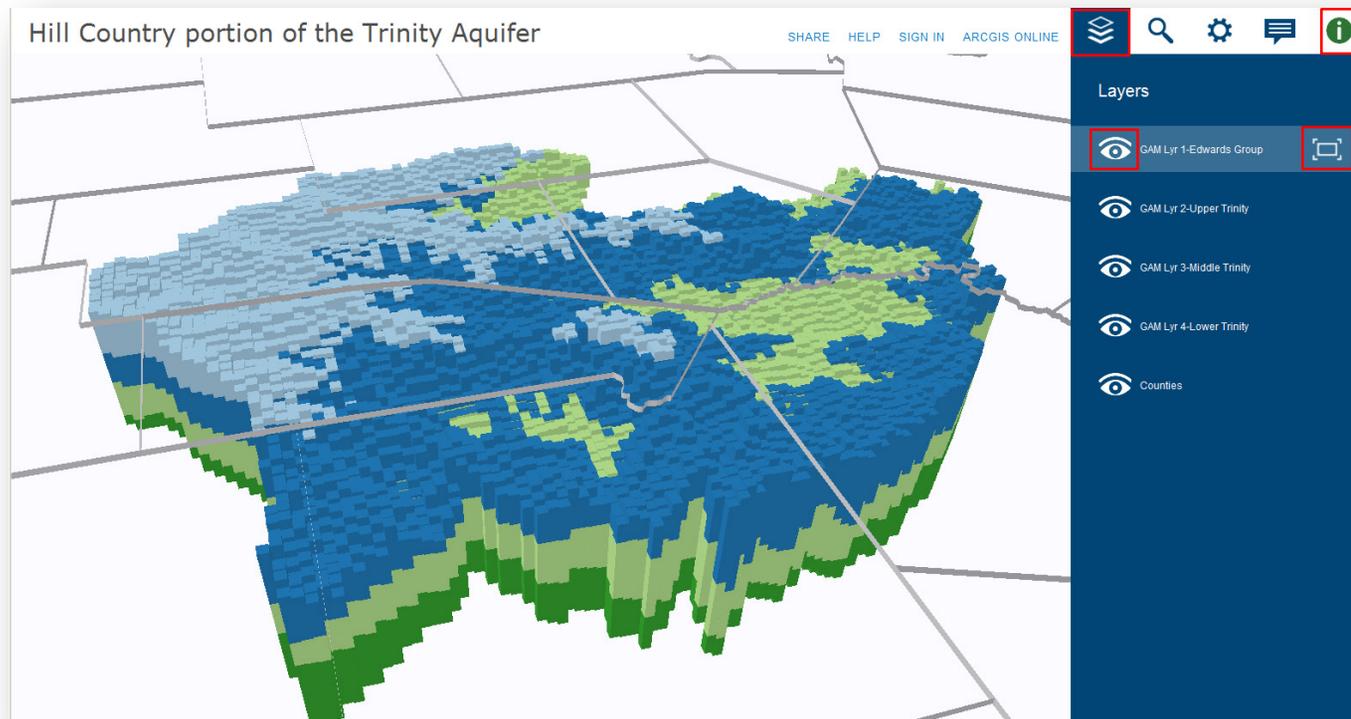


The Web Viewer panes include Layer, Search, Settings, Comments, and Information.

The CityEngine Web Viewer panes give you additional tools for interacting with the Web Scene. They are located in the top right header area. Click one of the pane buttons to show that pane and hide the others. The Information pane  is shown automatically when you select an object.

The Layers pane  allows you to work with layers within a Web Scene. You can show and hide layers and split the view to compare two sublayers side by side. For example, a redevelopment layer might be a sublayer of redevelopment data and a sublayer of built data which allows you to see the differences side by side.

- To hide a layer, click the Visibility button .
- To show a layer, click the disabled Visibility button .
- To zoom the Web Scene to the full extent of the layer, click the Frame button .



Section 8. Search Pane

Open the Search pane  to find specific objects and attributes within the Web Scene. CityEngine Web Viewer returns results based on object name, attribute values and keys, report values and keys, and layer name. Objects in layers that are hidden do not appear in the search results.

To find an object or attribute, enter one or more keywords into the search box. A list of results with summary information appears within the pane, and the resulting objects are isolated in the 3D view. You can then perform the following operations with the results:

- To highlight an object in the Web Scene, hover over the object name. If you don't see the highlighted object, it may be outside the visible area of the 3D viewport.
- To frame an object in the 3D viewport, hover over the object name and click the Frame button  that appears.
- To frame an object and open the Information pane , click the underlined object name.

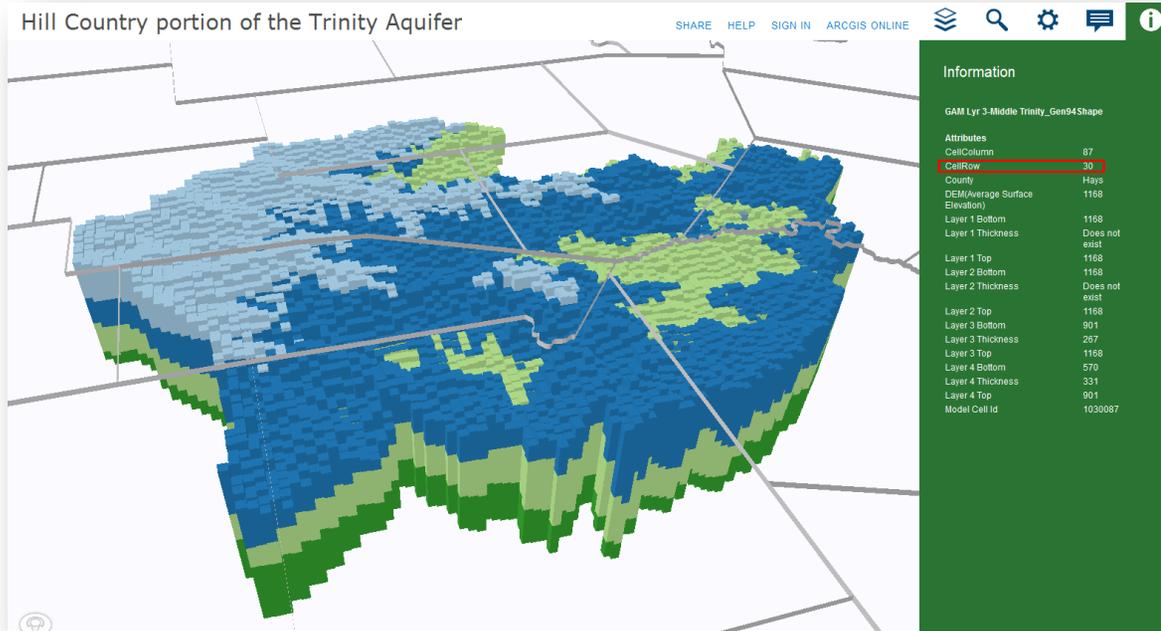
Search tokens can be used to define more specific search expressions:

- layer:<layername> finds only objects in layer <layername>
- name:<name> finds only objects where <name> is found in object's name
- <attributename>:<attribute value> finds only objects where <attribute value> is found in attribute <attributename>

An asterisk (*) serves as a wildcard character and matches zero or more characters. Quote a search term using double quotation marks ("term") to search for the exact term or if the search term includes white space. A minus sign preceding a token inverts the token condition. Search terms with no tokens match strings in all available fields (name, layer, attributes, and reports).

Section 9. View a Cross-section

- Open the Information pane , click on a cell object. You can use CellColumn or CellRow. In the example below it is CellRow Number (30).



- Open the Search pane  to select a row
 - Note the search syntax:

CellRow:30

