Geometry Data Type

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Contents

Disclaimer

Revision History

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Summary

Geometry Data Type

Oracle Analytics natively supports the geometry data type which lets users visualize and work with geometry columns. Oracle Analytics now automatically recognizes geometry columns from Oracle databases and CSV files, so users can easily import and connect to spatial data. A geometry data type in Oracle Analytics can represent a wide range of spatial shapes, including points, polygons, and lines, enabling detailed and dynamic geographic visualizations. Geometry data types can be used for visualizing data on maps or as inputs for advanced spatial calculations, enabling detailed spatial analysis. This document provides information for content authors about using the geometry data type in their workbooks.

Business Value

Accelerate Map Design and Visualization

You can quickly visualize geographic information by dragging and dropping geometry columns onto a canvas where the shapes render automatically as a map visualization, without having to manually set up any map layers. Spatial data objects, whether sourced directly from an Oracle database or a CSV file, are effortlessly rendered in Oracle Analytics as maps, allowing you to quickly create dynamic spatial insights. This native feature boosts visual performance and ensures spatial data objects are rendered smoothly and responsively.

Optimize Map Layer Maintenance

In scenarios where geometry definitions frequently change—such as delivery routes, flood zones, or custom sales regions—using the geometry data type ensures that maps in Oracle Analytics are automatically updated with the latest shape information. There's no need to preconfigure or ensure a specific map layer exists in your Oracle Analytics environment, the geometry data automatically shows in a map visualization. There's also no need to manually update any data or map layers to reflect changes, as the maps dynamically adjust by querying the updated geometry data. This eliminates extra maintenance of data layers or map layers and ensures that maps always display the most current data.

Support Spatial Calculations

You can compute calculations to perform spatial measurements using the geometry data type. Spatial calculations enable you to calculate the area and length of geometry shapes, measure distances between two geographic data types (assuming proper joining is defined), determine spatial relationships, and perform condition-based calculations that return true or false. These calculations help you analyze geographic data more effectively, leading to powerful spatial data-driven decisions.

Visualize Geometry Columns in Oracle Analytics

About the Geometry Data Type

Geometry columns are special first-class objects in Oracle Analytics and can be used only for the following operations:

- To create map visualizations
- In custom calculations for spatial measurements and correlations (either on a canvas or in a data flow)
- As part of custom SQL sourcing (meaning that you can create a dataset using Spatial SQL defined through the Manual SQL query mode)

Consequently, note that many other operations are disabled or extremely limited when using a geometry column. Geometry columns cannot be used as filters in a workbook or as components (visualization definition grammar) to any visualizations other than maps. The geometry data type cannot be manually set by users on a data column, it must be recognized as a geometry data type when importing as a dataset.

Enable Geometry Data Type in System Settings

Your administrator must enable the geometry data type for your Oracle Analytics environment.

1. On the Home page, click the **Navigator**, and then click **Console.**
2. Click **System Settings**.
3. Click **Preview** and turn on **Enable Geometry Data Type**.

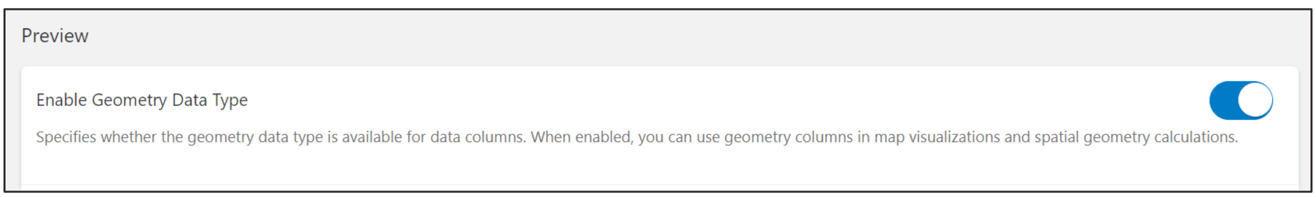


Figure 1 - Example shows how to enable Geometry Data Type in Preview in System Settings.

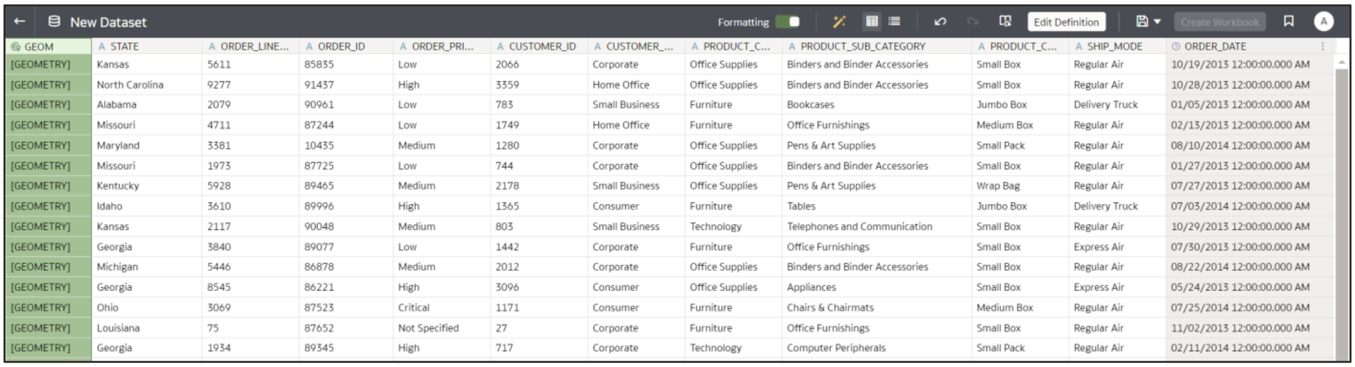
4. Click **Apply**.

Prepare Geometry Columns for Visualizing Maps

Once the geometry data type is enabled, you can prepare and connect to geometry data types in Oracle Analytics from either an Oracle database (using the Spatial Data Object Geometry data type (SDO.Geometry)) or a CSV file. The CSV source data must include geometry data in the Well-Known Text (WKT) format to be recognized by Oracle Analytics. For data sourcing from an Oracle database, this can be done via a direct connection or through a semantic model. The value stored in geometry columns appears as `[GEOMETRY]` and is useable only in map visualizations or custom calculations.

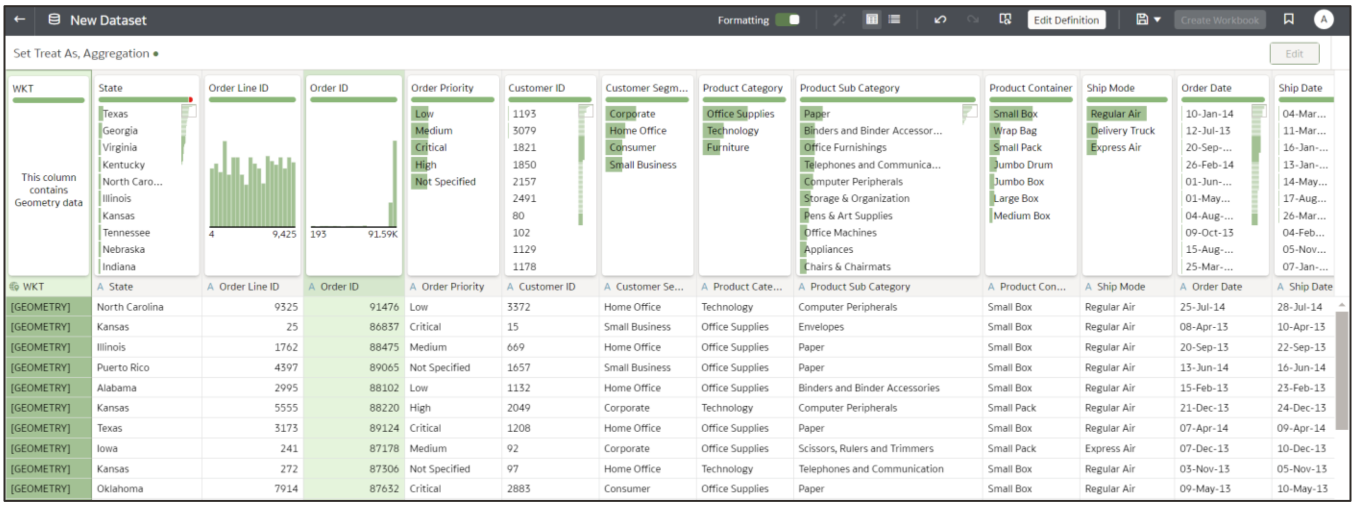
For direct connections, follow these steps:

1. On the Home page, click **Create** and then click **Dataset**.
2. In the Create Dataset dialog, select an already configured connection to an Oracle database which has the SDO.Geometry column or select a CSV file with a WKT column.



GEOM	STATE	ORDER_LINE...	ORDER_ID	ORDER_PRI...	CUSTOMER_ID	CUSTOMER_...	PRODUCT_C...	PRODUCT_SUB_CATEGORY	PRODUCT_C...	SHIP_MODE	ORDER_DATE
[GEOMETRY]	Kansas	5611	85835	Low	2066	Corporate	Office Supplies	Binders and Binder Accessories	Small Box	Regular Air	10/19/2013 12:00:00.000 AM
[GEOMETRY]	North Carolina	9277	91437	High	3359	Home Office	Office Supplies	Binders and Binder Accessories	Small Box	Regular Air	10/28/2013 12:00:00.000 AM
[GEOMETRY]	Alabama	2079	90961	Low	783	Small Business	Furniture	Bookcases	Jumbo Box	Delivery Truck	01/05/2013 12:00:00.000 AM
[GEOMETRY]	Missouri	4711	87244	Low	1749	Home Office	Furniture	Office Furnishings	Medium Box	Regular Air	02/13/2013 12:00:00.000 AM
[GEOMETRY]	Maryland	3381	10435	Medium	1280	Corporate	Office Supplies	Pens & Art Supplies	Small Pack	Regular Air	08/10/2014 12:00:00.000 AM
[GEOMETRY]	Missouri	1973	87725	Low	744	Corporate	Office Supplies	Binders and Binder Accessories	Small Box	Regular Air	01/27/2013 12:00:00.000 AM
[GEOMETRY]	Kentucky	5928	89465	Medium	2178	Small Business	Office Supplies	Pens & Art Supplies	Wrap Bag	Regular Air	07/27/2013 12:00:00.000 AM
[GEOMETRY]	Idaho	3610	89996	High	1365	Consumer	Furniture	Tables	Jumbo Box	Delivery Truck	07/03/2014 12:00:00.000 AM
[GEOMETRY]	Kansas	2117	90048	Medium	803	Small Business	Technology	Telephones and Communication	Small Box	Regular Air	10/29/2013 12:00:00.000 AM
[GEOMETRY]	Georgia	3840	89077	Low	1442	Corporate	Furniture	Office Furnishings	Small Box	Express Air	07/30/2013 12:00:00.000 AM
[GEOMETRY]	Michigan	5446	86878	Medium	2012	Corporate	Office Supplies	Binders and Binder Accessories	Small Box	Regular Air	08/22/2014 12:00:00.000 AM
[GEOMETRY]	Georgia	8545	86221	High	3096	Consumer	Office Supplies	Appliances	Small Box	Express Air	05/24/2013 12:00:00.000 AM
[GEOMETRY]	Ohio	3069	87523	Critical	1171	Consumer	Furniture	Chairs & Chairmats	Medium Box	Regular Air	07/25/2014 12:00:00.000 AM
[GEOMETRY]	Louisiana	75	87652	Not Specified	27	Corporate	Furniture	Office Furnishings	Small Box	Regular Air	11/02/2013 12:00:00.000 AM
[GEOMETRY]	Georgia	1934	89345	High	717	Corporate	Technology	Computer Peripherals	Small Pack	Regular Air	02/11/2014 12:00:00.000 AM

Figure 2 - Example shows the Sample Order Lines dataset with the geometry column GEOM. The data is coming from an Oracle database.



WKT	State	Order Line ID	Order ID	Order Priority	Customer ID	Customer Se...	Product Cate...	Product Sub Category	Product Con...	Ship Mode	Order Date	Ship Date
[GEOMETRY]	North Carolina	9325	91476	Low	3372	Home Office	Technology	Computer Peripherals	Small Box	Regular Air	25-Jul-14	28-Jul-14
[GEOMETRY]	Kansas	25	86837	Critical	15	Small Business	Office Supplies	Envelopes	Small Box	Regular Air	08-Apr-13	10-Apr-13
[GEOMETRY]	Illinois	1762	88475	Medium	669	Home Office	Office Supplies	Paper	Small Box	Regular Air	20-Sep-13	22-Sep-13
[GEOMETRY]	Puerto Rico	4397	89065	Not Specified	1657	Small Business	Office Supplies	Paper	Small Box	Regular Air	13-Jun-14	16-Jun-14
[GEOMETRY]	Alabama	2995	88102	Low	1132	Home Office	Office Supplies	Binders and Binder Accessories	Small Box	Regular Air	15-Feb-13	23-Feb-13
[GEOMETRY]	Kansas	5555	88220	High	2049	Corporate	Technology	Computer Peripherals	Small Pack	Regular Air	21-Dec-13	24-Dec-13
[GEOMETRY]	Texas	3173	89124	Critical	1208	Home Office	Office Supplies	Paper	Small Box	Regular Air	07-Apr-14	09-Apr-14
[GEOMETRY]	Iowa	241	87178	Medium	92	Corporate	Office Supplies	Scissors, Rulers and Trimmers	Small Pack	Express Air	07-Dec-13	10-Dec-13
[GEOMETRY]	Kansas	272	87306	Not Specified	97	Home Office	Technology	Telephones and Communication	Small Box	Regular Air	03-Nov-13	05-Nov-13
[GEOMETRY]	Oklahoma	7914	87632	Critical	2883	Consumer	Office Supplies	Paper	Small Box	Regular Air	09-May-13	10-May-13

Figure 3 - Example shows the Sample Order Lines dataset with the geometry column WKT. The data is coming from a CSV file.

Joins between geometry columns from two different datasets aren't supported. For use cases where you need to relate between the geometry columns, you must create and establish a distinct join using existing columns.

Add Geometry Columns to a Workbook

To start visualizing shapes from a geometry column, you need a dataset that holds geometry data, see **Prepare Geometry Columns for Visualizing Maps**. A geometry column can be consumed from a dataset created based on a SDO.Geometry data type from an Oracle database or a Well-Known Text (WKT) format from a CSV file.

1. On the Home page, click **Create** and click **Workbook**.
2. In the Add Data dialog, click a dataset with a geometry column, then click **Add to Workbook**.

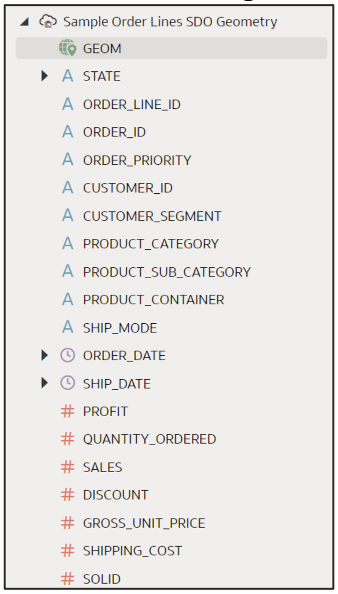


Figure 4 - Example of a geometry data type column with the name GEOM in the Sample Order Lines dataset created from an Oracle database.

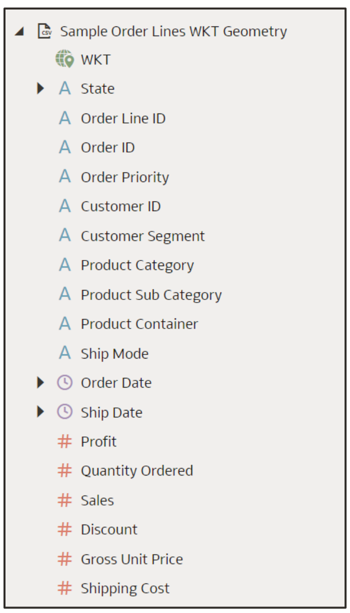


Figure 5 - Example of a geometry data type column with the name WKT in the Sample Order Lines dataset created from a CSV file.

3. Click **Save**.

Once the dataset is added to your workbook, you can simply drag and drop the geometry column onto the Visualize canvas to start creating visualizations, as described in the next section.

Visualize Geometry Column Data

In the Data panel, locate the geometry column and drag it to the Visualize canvas to start building a visualization.

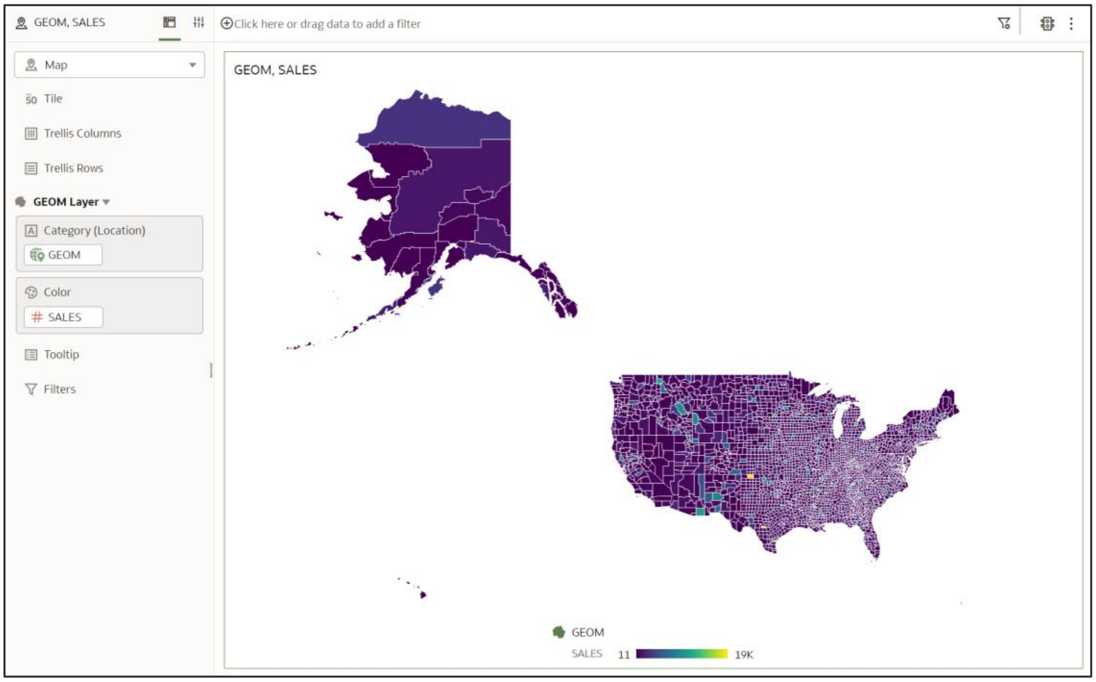


Figure 6 - Example of a geometry data type column from an Oracle database visualizing the shape of US Counties with the metric Sales for Color.

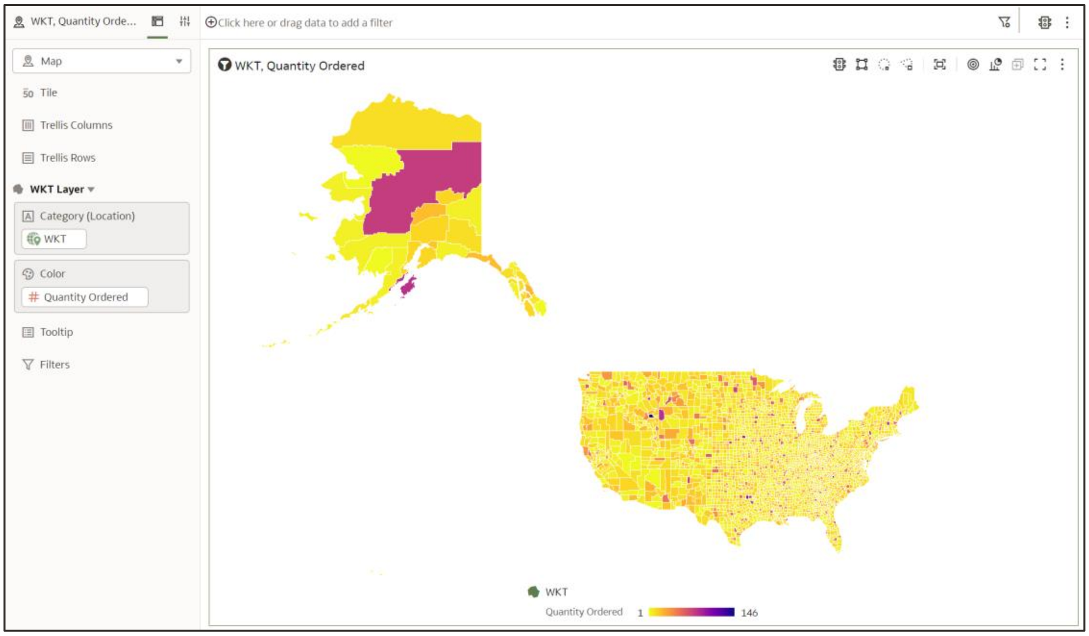


Figure 7 - Example of a geometry data type WKT column from a CSV file visualizing the shape of US Counties with the metric Quantity Ordered for Color.

By default, the map visualization renders without any background map layer. If required, you can overlay the map shape on a background map layer.

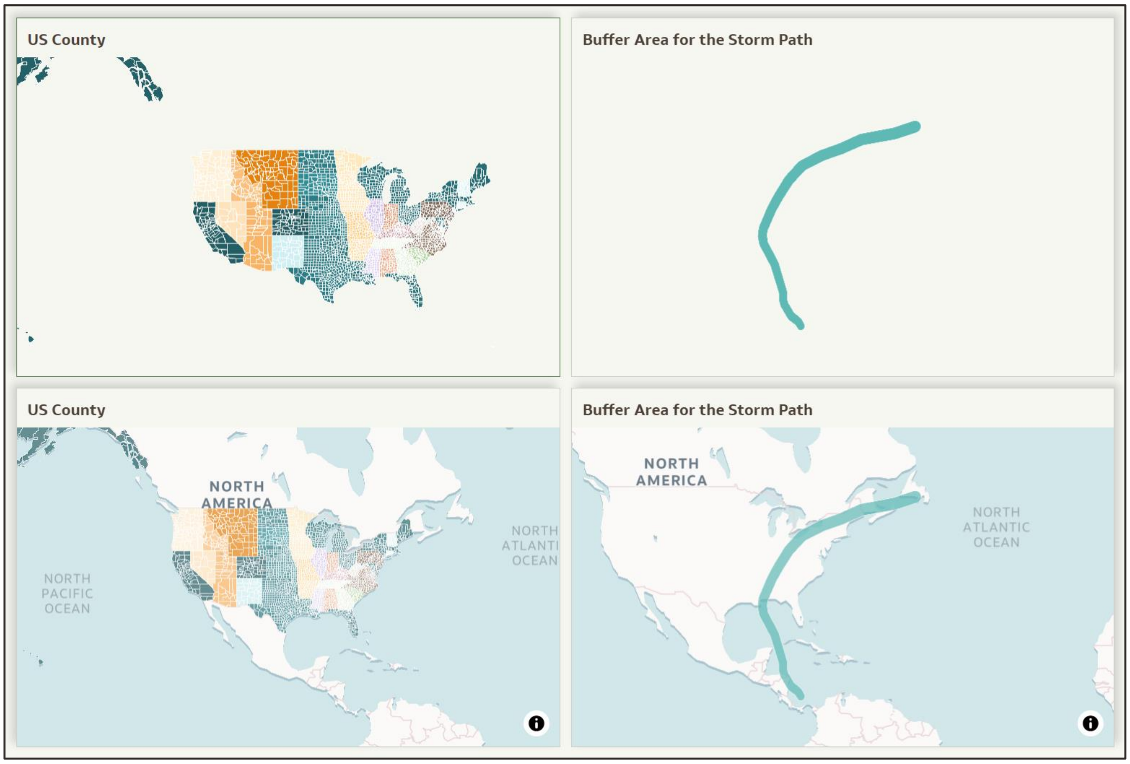


Figure 8 - Example of US Counties and the buffer area from a storm path visualized with no background layer in the top row of the figure, and with the Oracle DataViz map background layer in the bottom row of the figure.

Work with Data Layers and Layer Properties

You can overlay multiple data layers with geometry columns.

1. In the Grammar pane, click **Layer Options** for an existing layer, click **Add Layer**, and then select **Add Data Layer**.

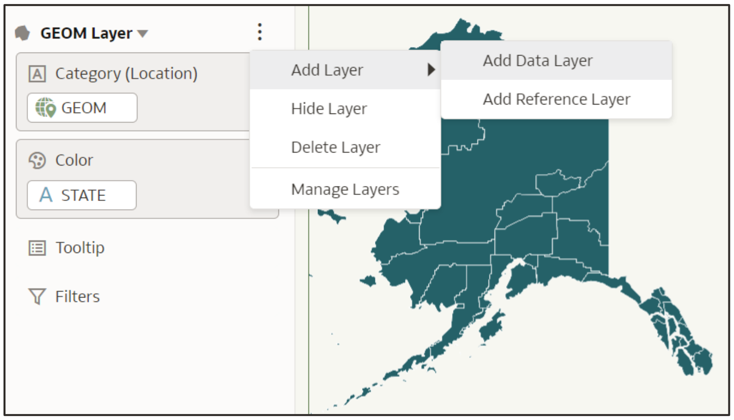


Figure 9 - Example of adding a new data layer for the map visualization.

Note that geometry columns can be used only in a data layer. If you need to use them in a reference layer, you must generate a GeoJSON file to support that reference layer.

2. In the Data pane, locate the dataset from which the new layer needs to be overlaid and drag the geometry column to the new data layer.

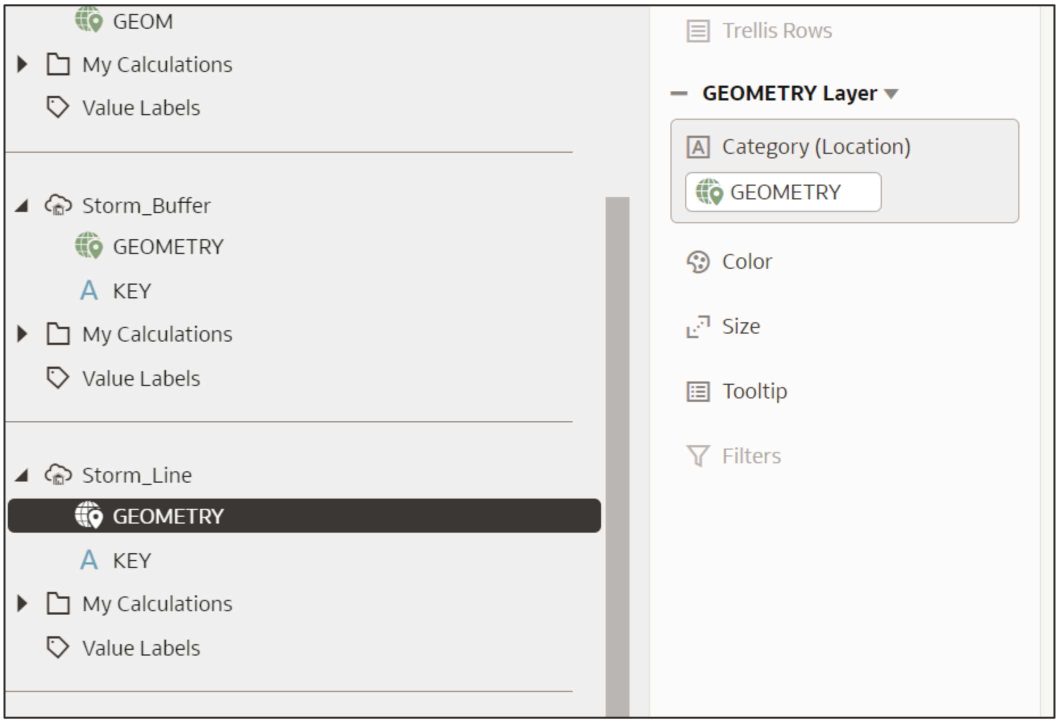


Figure 10 - Example of adding a new geometry column over an existing data layer. In this example, the geometry of a storm line is added on top of an existing layer which has the shapes of US Counties.

This visualizes the new data layer over the existing one.

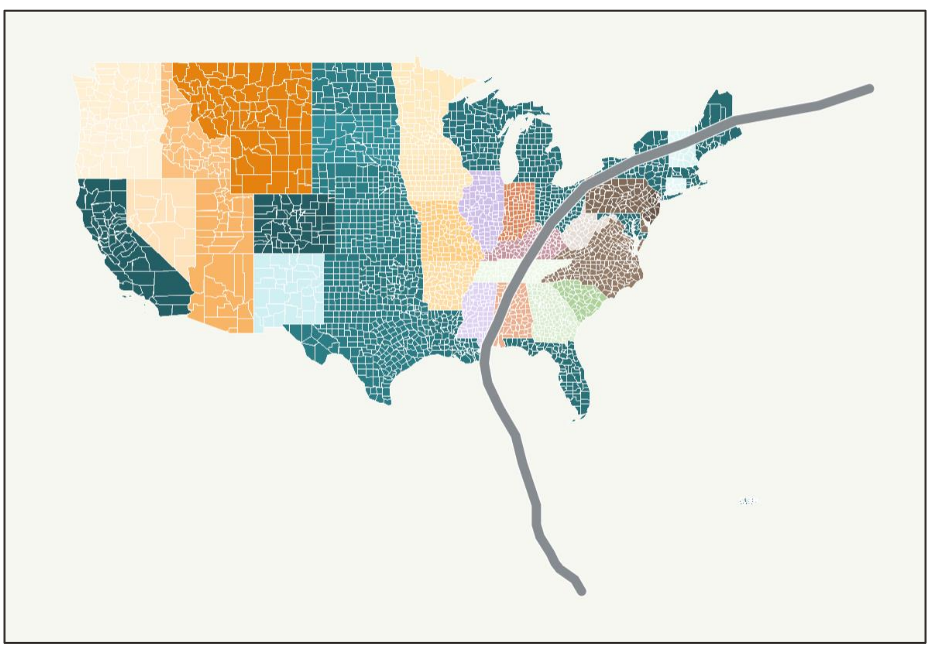


Figure 11 - Example shows how the Storm Line layer is added on top of US Counties.

The geometry data type supports existing data layer properties.

If your geometry is a line or a point, you can adjust the size of the geometry.

1. In the Properties pane, click **Layers**, and then locate and expand the layer you want to adjust the size for.
2. Click the **Size** field and use the slider to adjust the size.

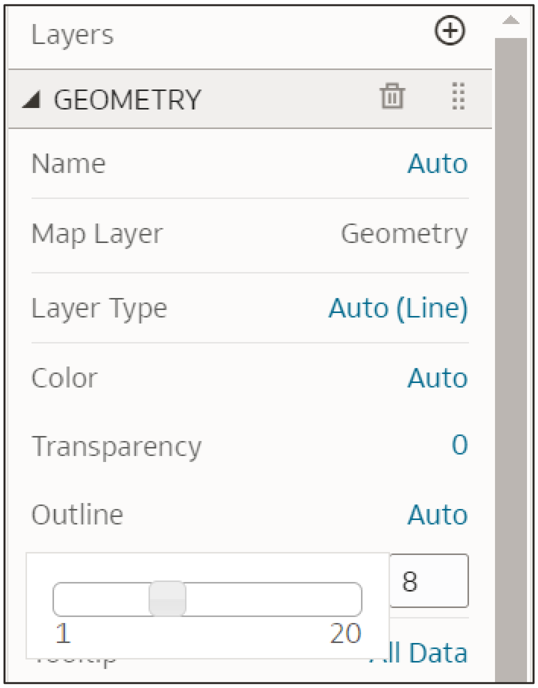


Figure 12 - Example shows how the Storm Line size can be adjusted.

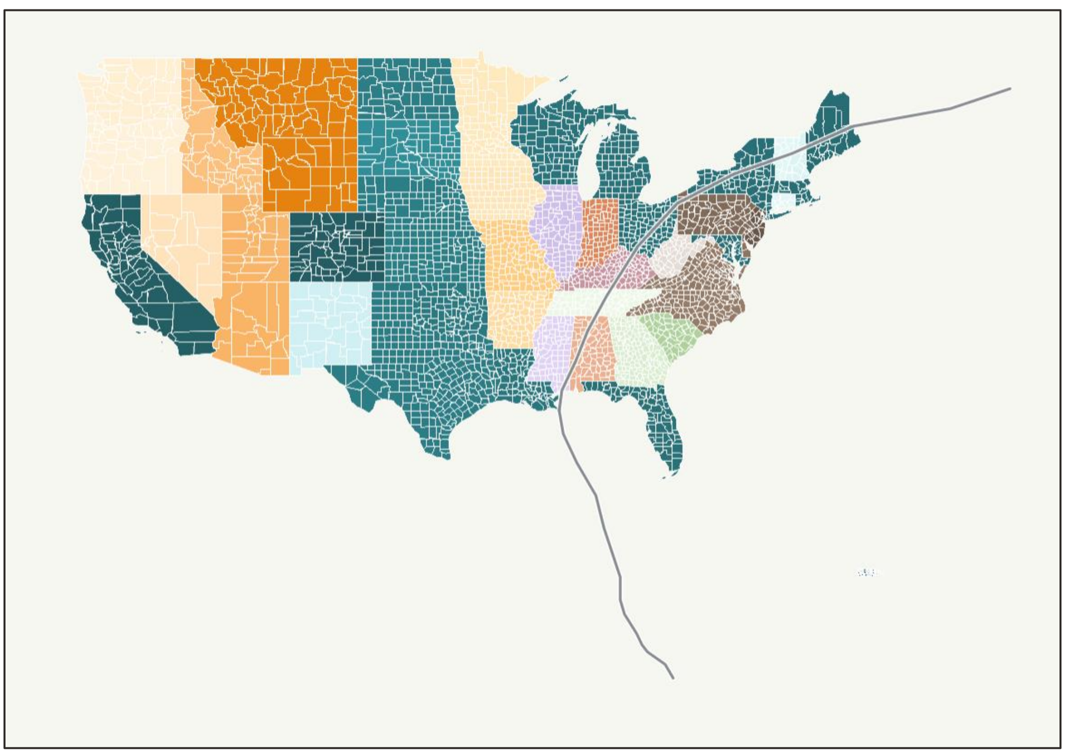


Figure 13 - Example shows how the Storm Line size is now adjusted in the visualization. The point size now has a numerical value of 2.

You can change the colors of the geometry shapes if no default colors are specified in the Grammar pane.

1. Right-click on the map visualization and select **Layer**.
2. Select a color, and then click **OK**.

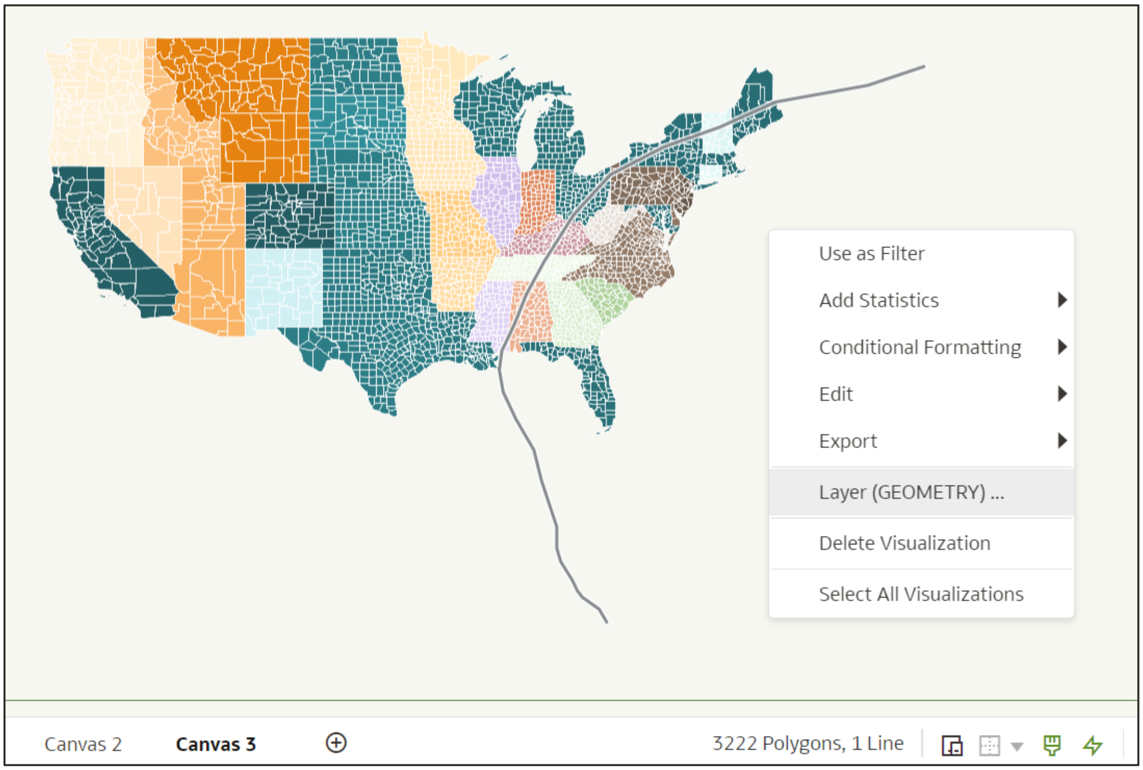


Figure 14 - Example shows how to adjust the color for the storm line overlaid on top of US Counties.

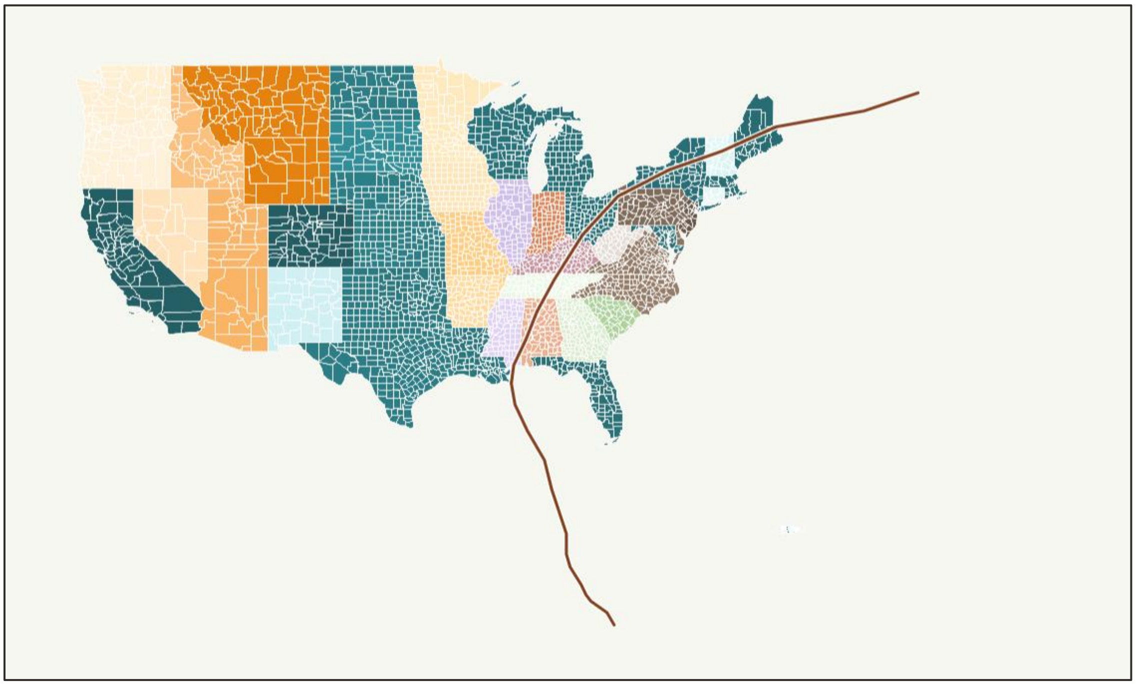


Figure 15 - Example shows the storm line is now red.

You can order the layers if there are more layers to be overlaid.

1. In the Grammar pane, click **Layer Options** for an existing layer, and then click **Order Layer**.
2. Click **Send Backward**. The new layer is sent backwards behind the previous layer, and the previous layer moves in front of the latest layer added.

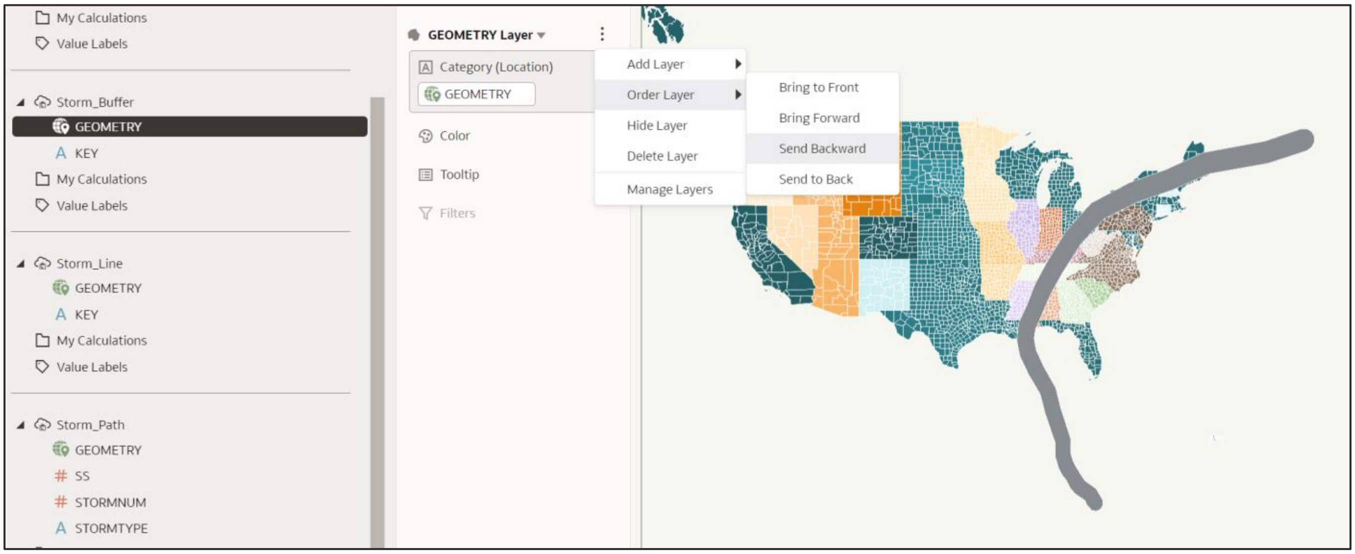


Figure 16 - Example shows how a new layer for Storm Buffer is added on top of an existing layer which has the geometry column from Storm Line. Since it's overlaid on top of an existing layer, the storm line is no longer visible.

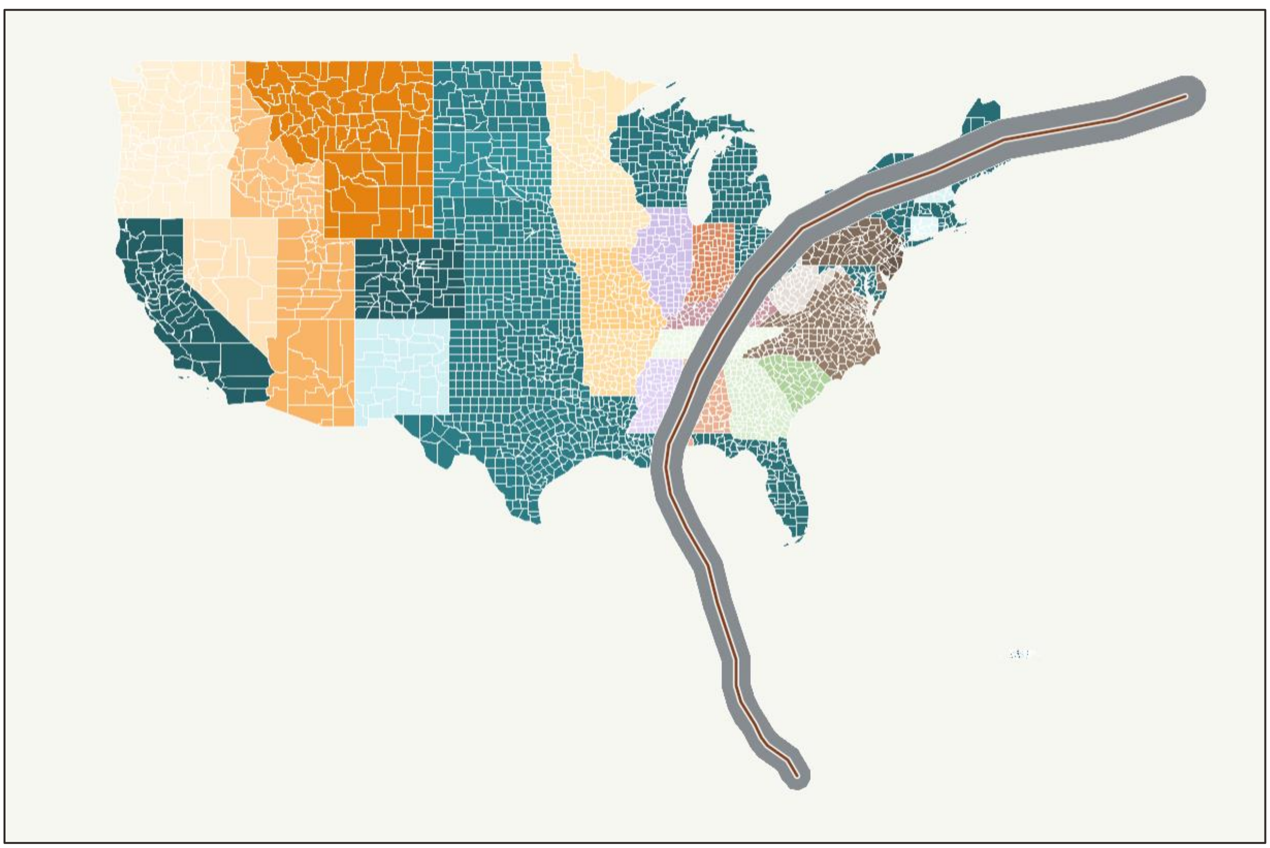


Figure 17 - Example shows the map layers for US Counties, Storm Line, and Storm Buffer in the right order.

Work with Background Map Layers and Layer Properties

You can apply a new background map layer for all the data layers.

1. In the Properties pane, click **Map.**
2. Click the **Background Map** field and select a layer.

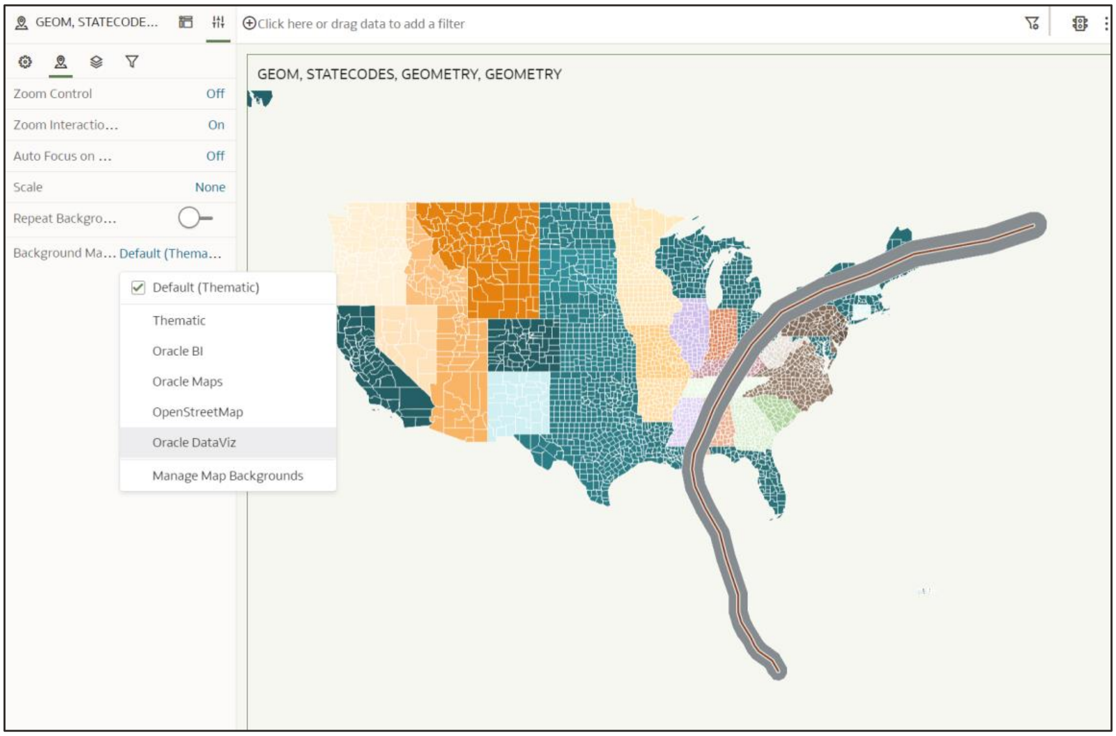


Figure 18 - Example shows how to apply a background map layer. In this example Oracle DataViz is selected.

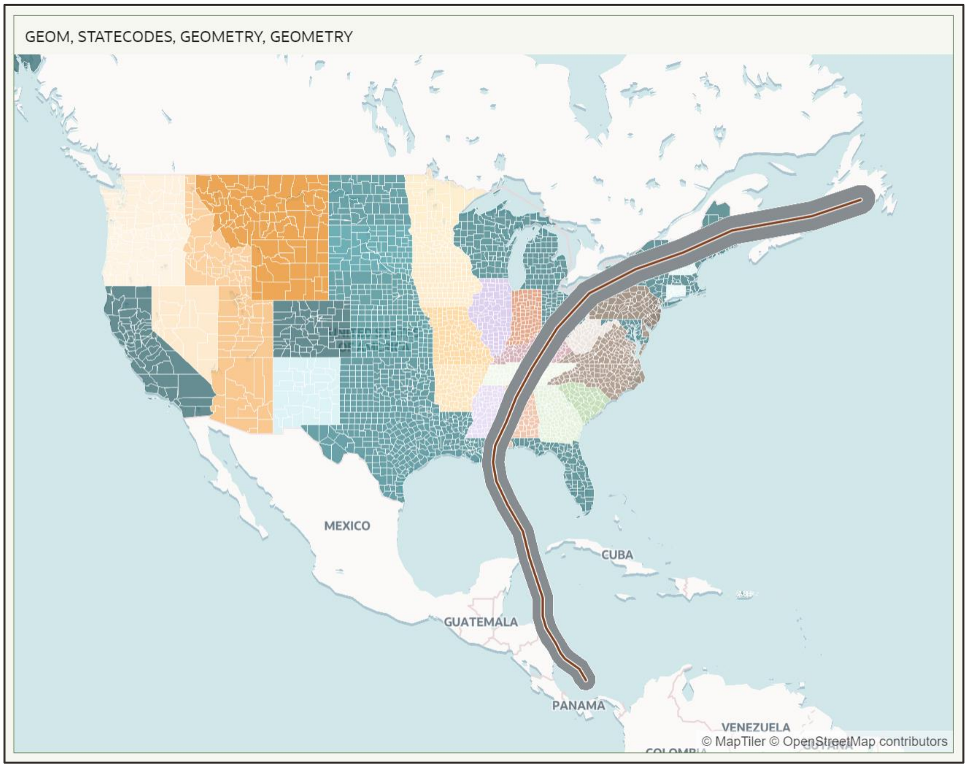


Figure 19 - Example shows the Oracle DataViz background map layer applied to the visualization.

You can still make changes to the layers by modifying the properties of each data layer.

1. In the Properties pane, click **Layers**, and expand the layer you want to modify.
2. Click the **Color** field and select **Custom**.
3. Click the **Fill Color** field and choose a color.

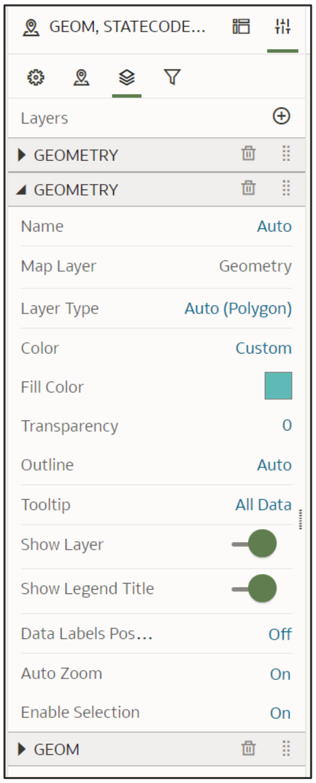


Figure 20 - Example shows how to apply a custom color to a data layer in the Properties pane for the map visualization.

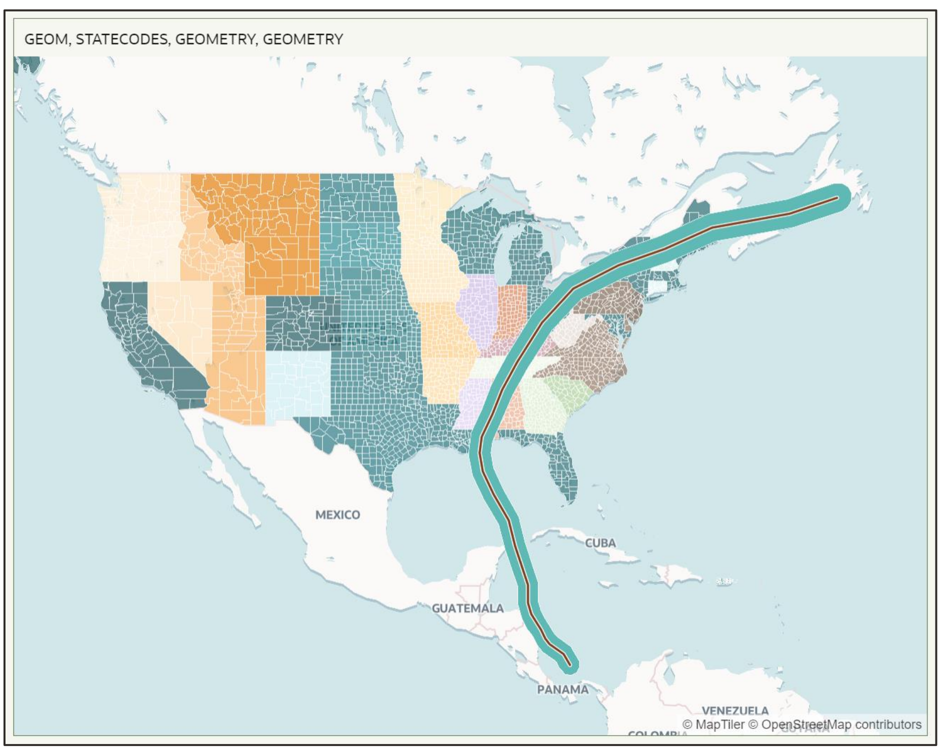


Figure 21 - Example shows the Storm Buffer layer with the new color.

You can see the statistics on how many shapes are used in the visualization at the bottom of the Visualize page.

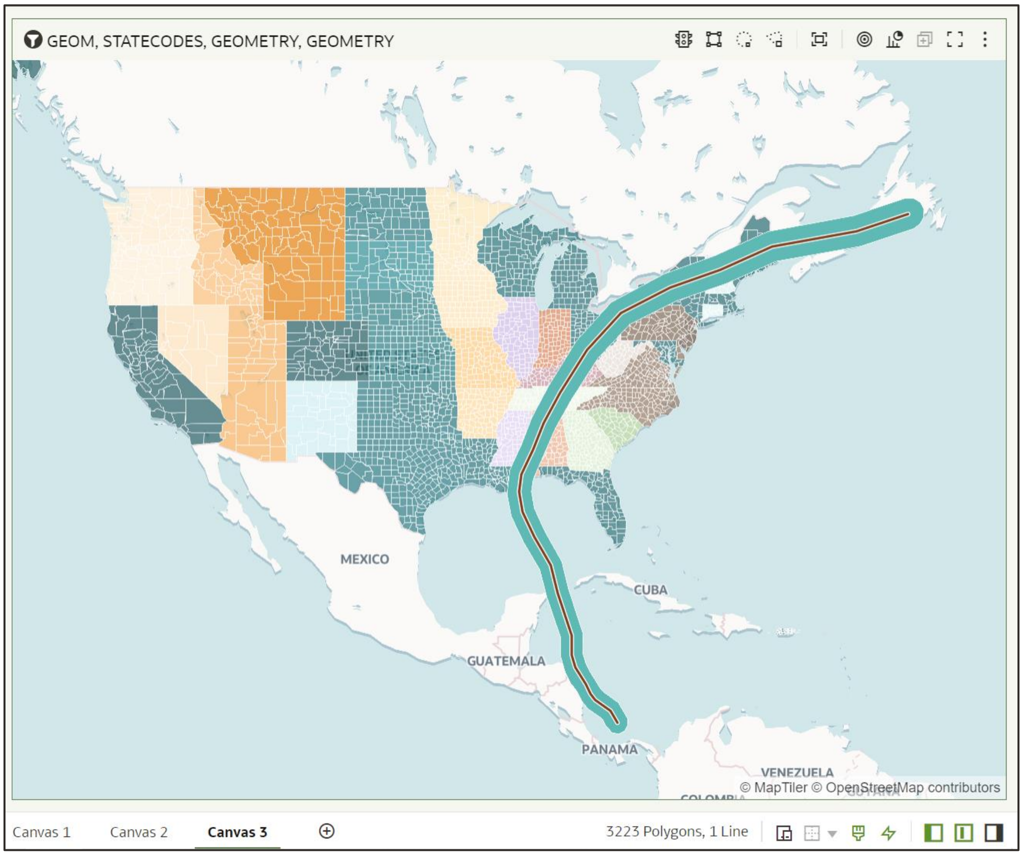


Figure 22 - Example shows that there are 3,223 Polygons and one Line used as part of all the data layers in the map.

As a best practice, name each data layer with a unique name.

1. In the Properties pane, click **Layers**.
2. Click the **Name** field, choose **Custom**, and provide a name for the layer.

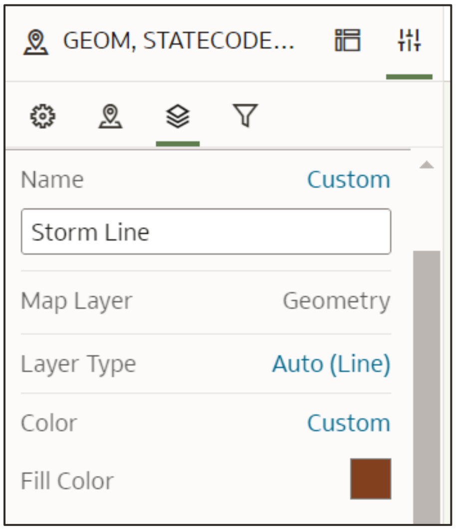


Figure 23 - Example shows the custom name Storm Line for the layer with the geometry column.

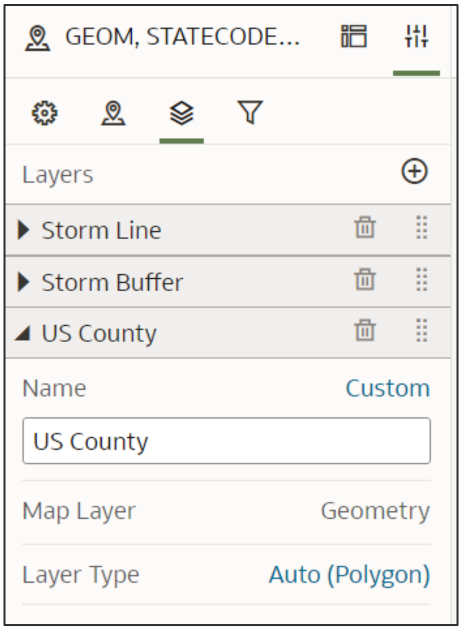


Figure 24 - Example shows the custom names given for all the data layers.

Work with Toggle Off, Toggle On, and Legends

You can toggle the data layers on and off when the map legend is enabled.

1. In the Properties pane, click **General**, and check the **Legend Position** field. The legend is displayed by default.

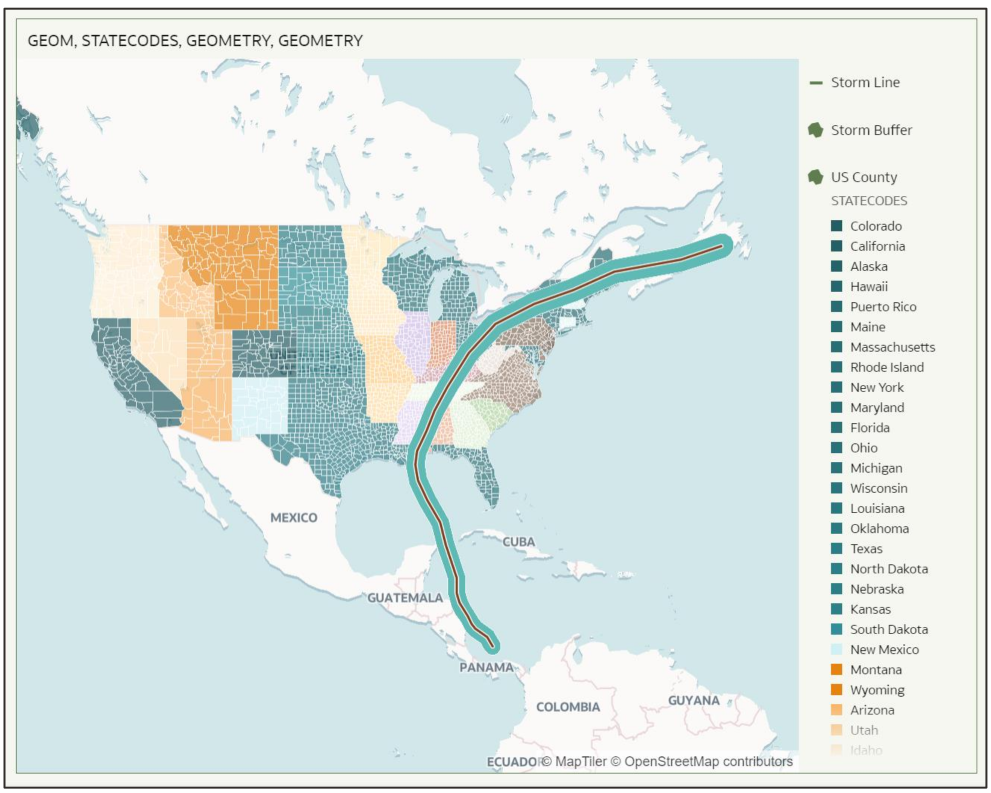


Figure 25 - Example shows the legend and layer names for the map visualization.

2. In the map legend, click a data layer to toggle it on or off.

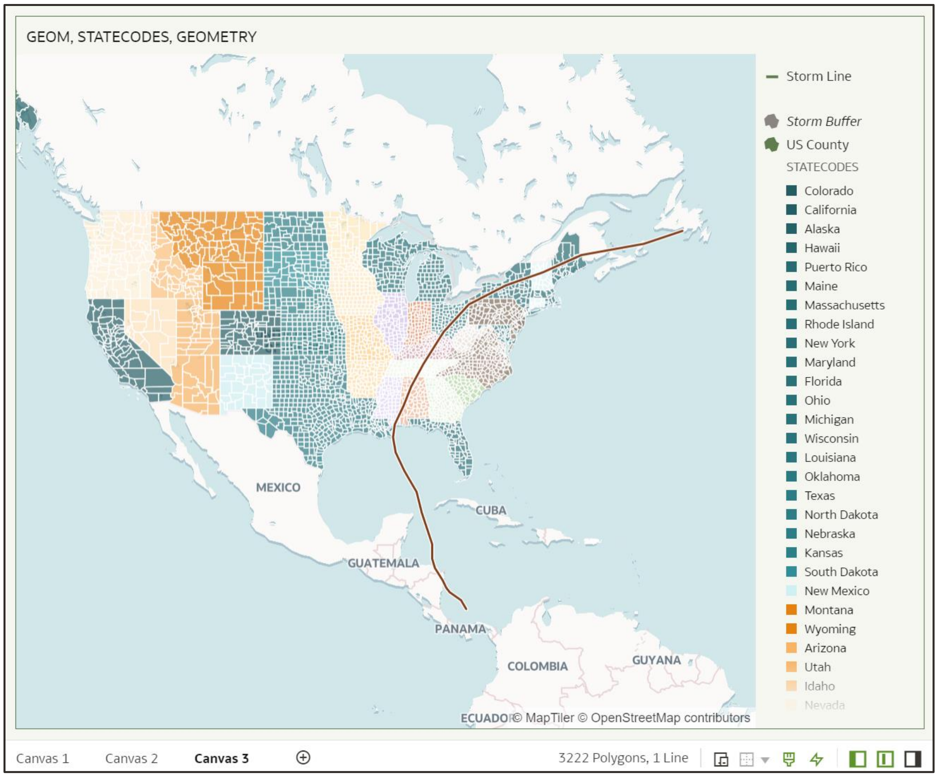


Figure 26 - Example shows the Storm Buffer data layer toggled off, and Storm Line with US County data layers toggled on. Statistics now shows 3,222 Polygons and one Line. One Polygon for the Storm Buffer is now excluded from the visualization.

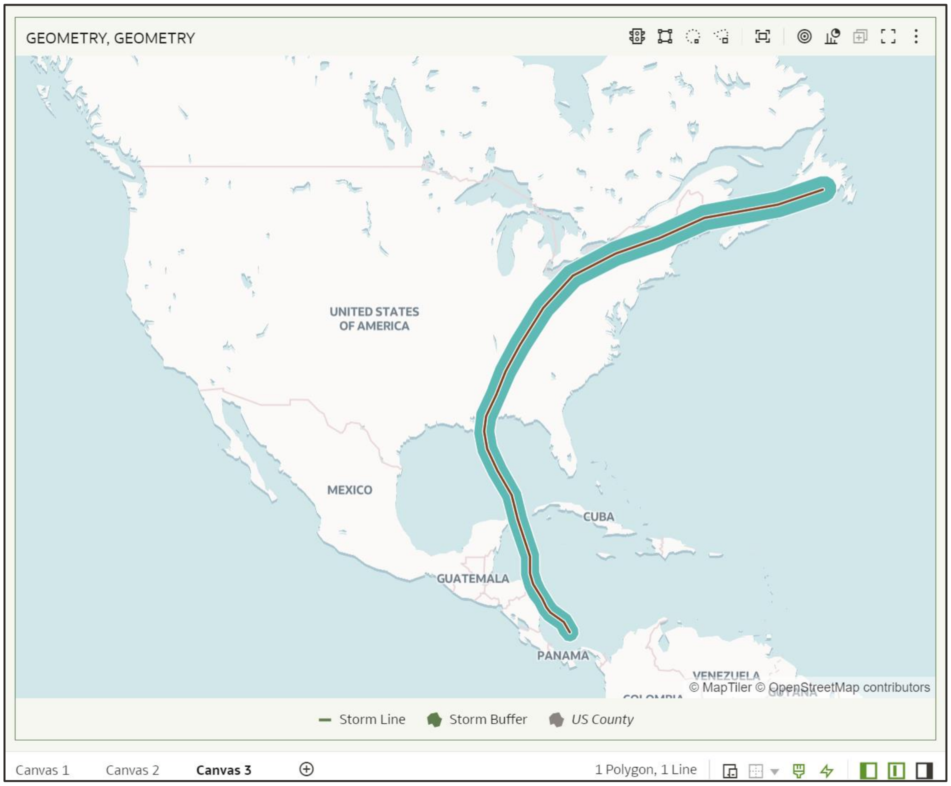


Figure 27 - Example shows the US County data layer toggled off, and Storm Line with Storm Buffer data layers toggled on. Statistics now shows one Polygon and one Line. 3,222 Polygons for the US County data layer are now excluded from the visualization.

Work with the Selection Tool

You can use the Selection tool to interact with the map layers. To select content based on geometry columns, you must have an attribute ID column (for example the name of the shape, or its ID) added to the map visualization. For example, only once an attribute is added as a Color, Tooltip, or Shape, are the Keep Selected and Remove Selected options available.

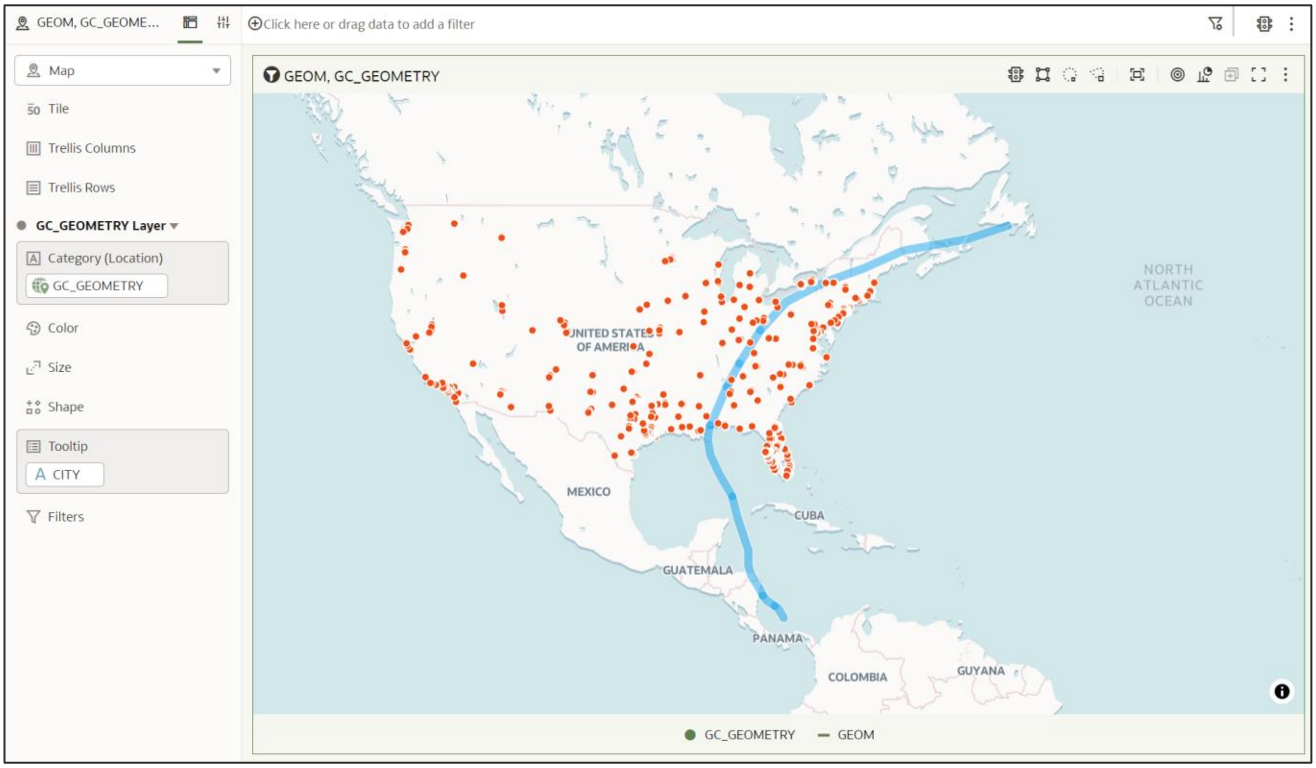


Figure 28 – Example shows the Storm Line layer and a layer with assets in different cities. City as an attribute column is used as a tooltip here to enable Keep Selected and Remove Selected.

1. To apply a selection to a new area, hover over the top right of the map visualization and locate the options for selection: Rectangle, Radial, and Polygon .
2. Click an option to select it, then drag and draw a custom selection area on top of the data layer.

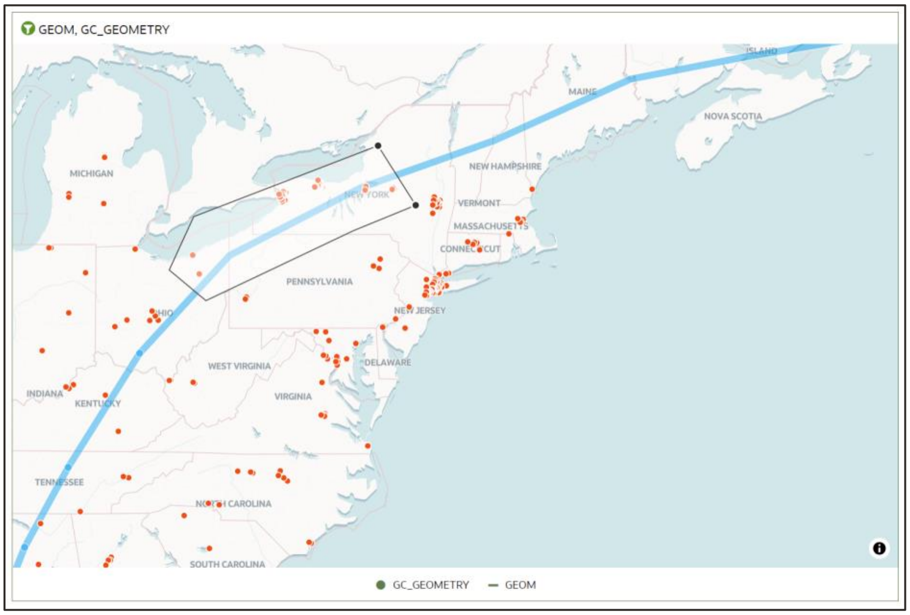


Figure 29 – Example shows how a Polygon selection is used and enables users to draw and select specific attributes.

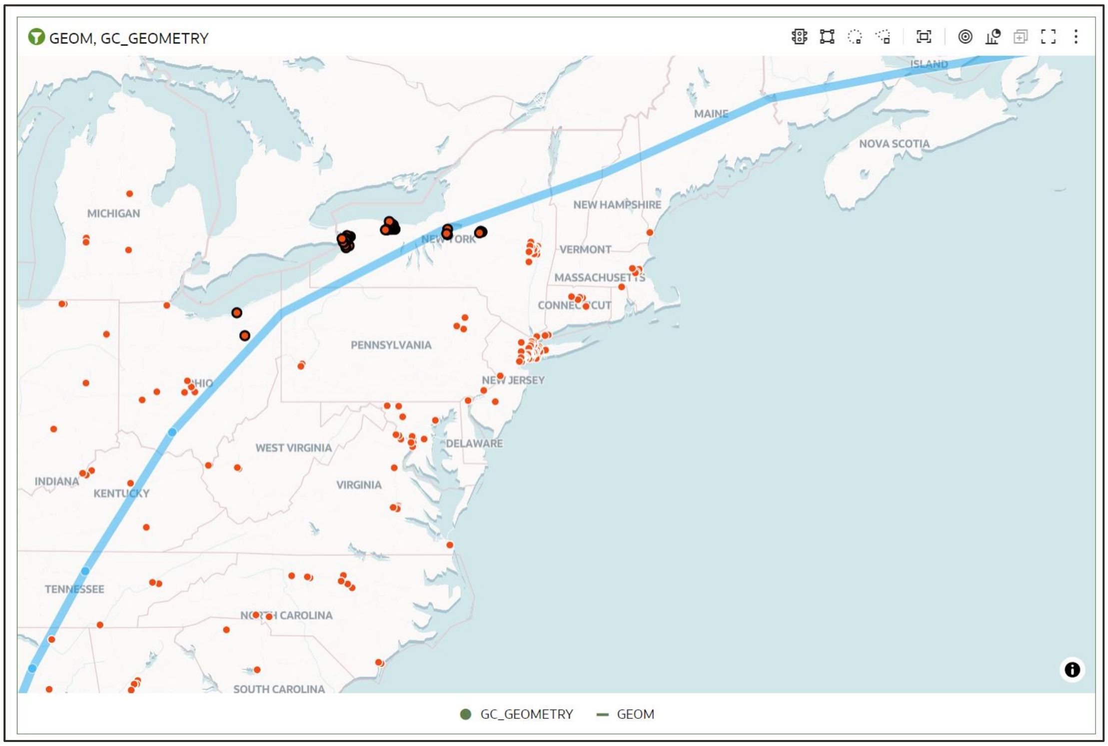


Figure 30 – Example shows how selected locations are highlighted once the polygon drawing is released.

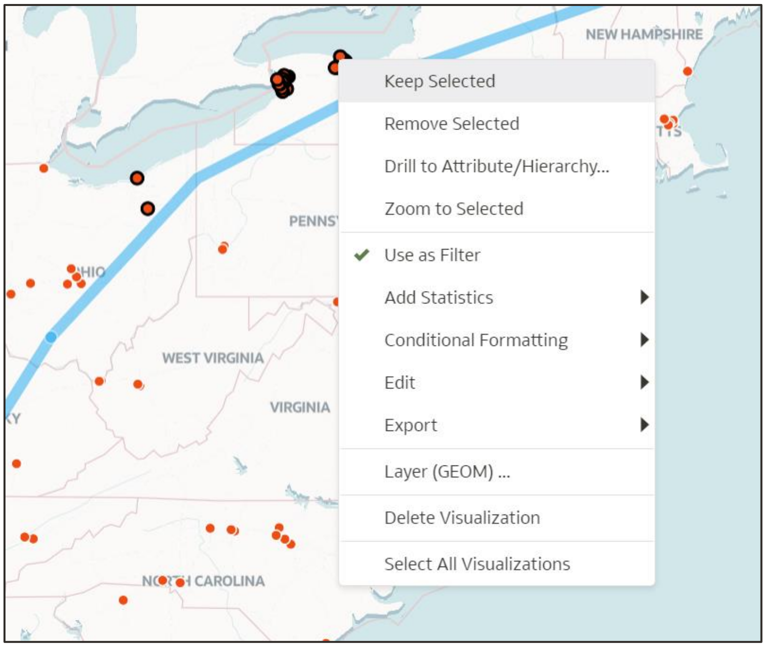


Figure 31 – Example shows how users can interact with the custom selection by either keeping the selection or removing the selection.

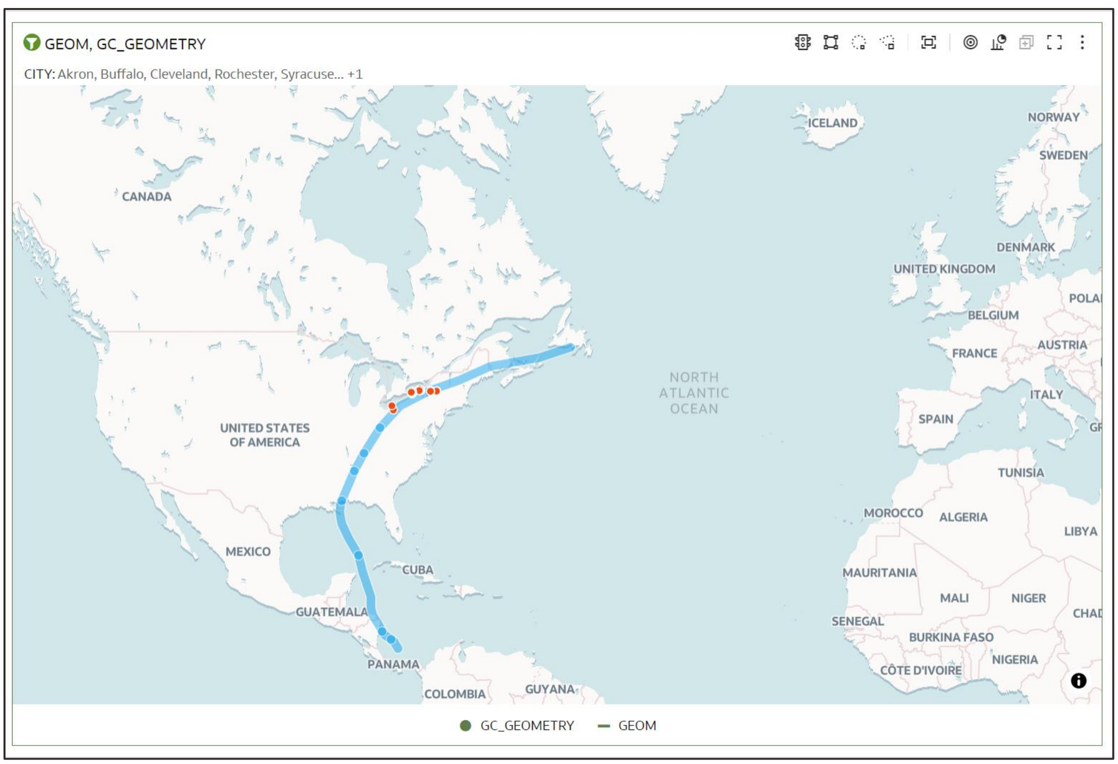


Figure 32 – Example shows how the option Keep Selected keeps only the filtered members.

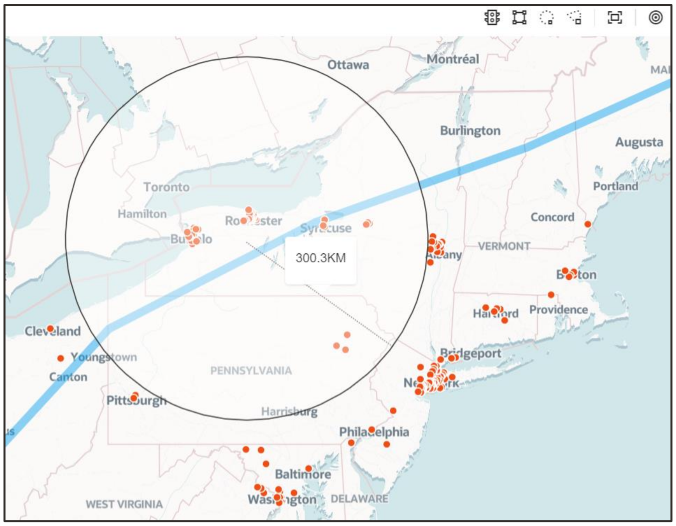


Figure 33 – Example shows the Radial selection.

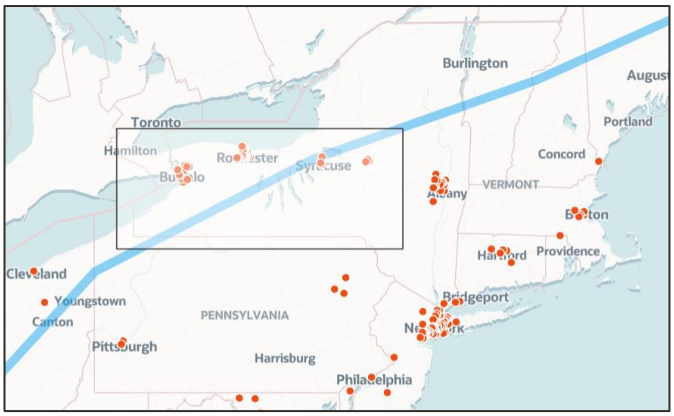


Figure 34 – Example shows the Rectangle selection.

Work with the Information Option

The Information option for a map visualization allows you to get information about geometry shapes that may not be displayed on the map. For example, shapes or polygons that have a disk size above 128 KB (per record) aren't displayed in the map visualization. In this case, the Information icon appears towards the bottom right of the map visualization. When you click the icon, it turns green and turns on the Information option near the map visualization title. Then, when you hover over this option, you can see which shapes didn't render as part of the layer. The information displayed is more detailed if the attribute ID column is part of the map visualization (as a tooltip, color, or shape).

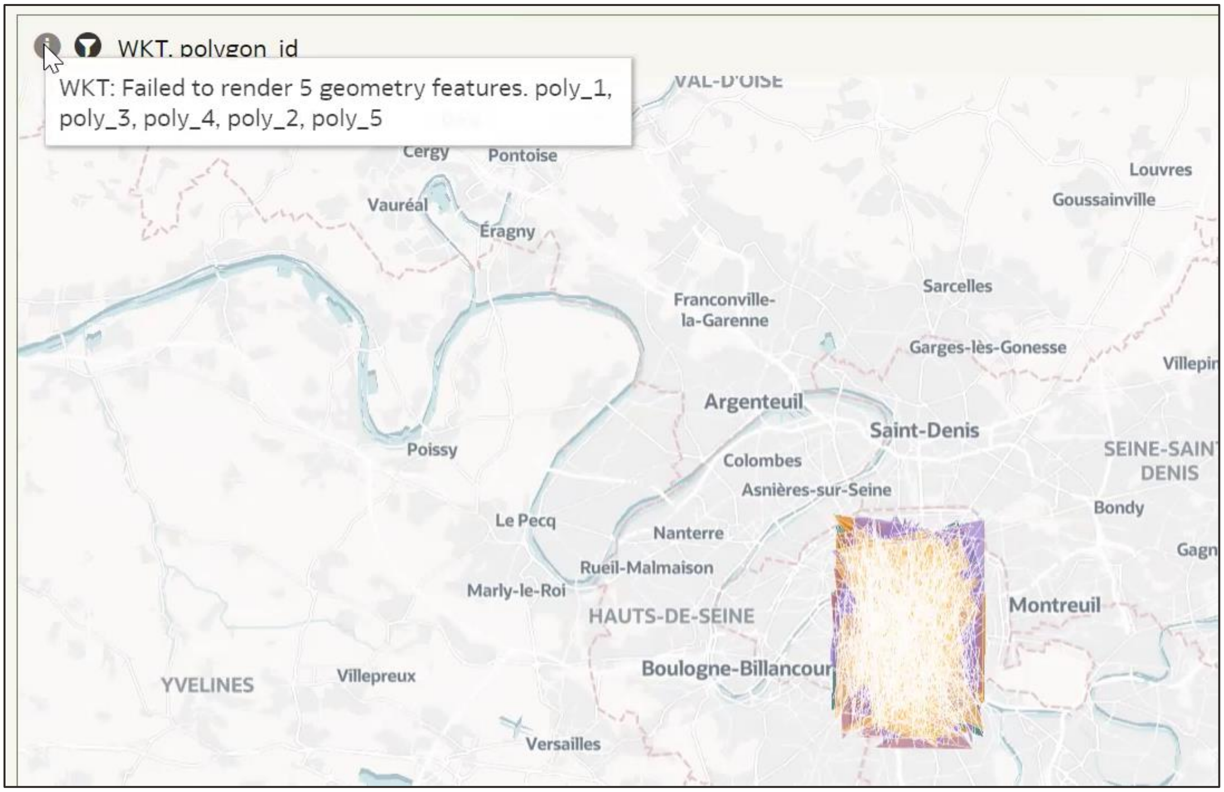


Figure 35 - Example shows how the Information option provides more information on shapes that have issues or that didn't render.

Figure 36, Example where the polygons are shown in Trellis Column, and polygons poly_4 and poly_5 aren't displayed due to shape size beyond 128 KB, whereas poly_6 and poly_7 are displayed since the shape size is within 128 KB.

Spatial Calculations in Oracle Analytics

You can create custom calculations to perform spatial measurements using geometry data types. Spatial calculations enable you to measure the area and length of geometry shapes, measure distances between two geographic data types, determine spatial relationships, and perform condition-based calculations that return true or false. These calculations help you analyze geographic data more effectively, leading to spatial data-driven decisions. Cartesian joins may be required for spatial calculations like `GeometryDistance`, `GeometryLength`, and `GeometryRelate`. The geometry calculations for area and length are computed in meters, ensuring accurate measurements for shapes based on their spatial coordinates.

1. In the Data pane, click **Create Calculation** ⊕.

   You can also right-click the My Calculations folder and click **Create Calculation**.

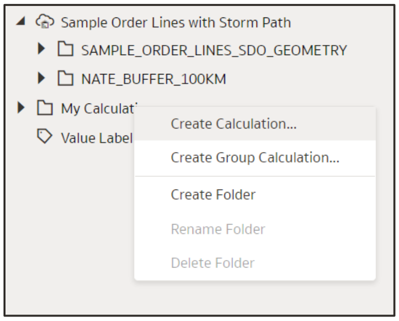


Figure 37 – Example showing the Create Calculation option from the My Calculations folder.

2. In the Create Calculation dialog, expand **Spatial** under the functions area and select the calculation you need.

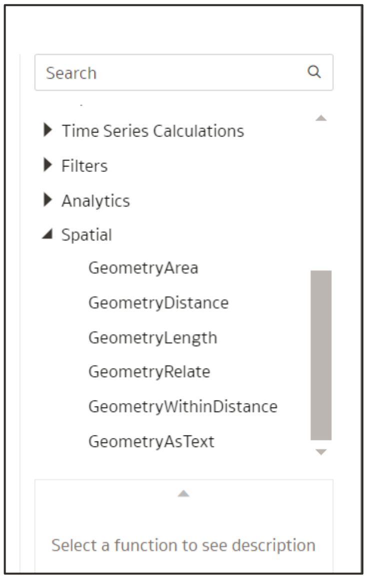


Figure 38 – Example showing the different spatial calculations available within Oracle Analytics.

Or you can type `geometry` in the calculation area and Oracle Analytics suggests calculations for you.

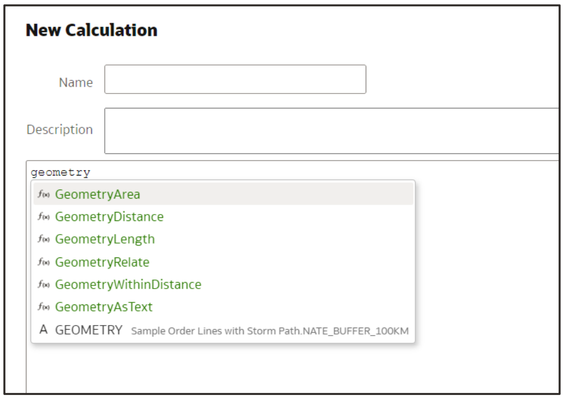


Figure 39 – Example showing how to select the desired calculation in the calculation area.

There are two types of spatial calculations available in Oracle Analytics:

- Calculations that require only one geometry column as an argument
- Calculations that require two geometry columns as arguments to compute the relationship

Calculations That Require Only One Geometry Column

How to Calculate the Area of a Geometry

The function `GeometryArea()` is used to calculate the area that a shape occupies.

Usage: `GeometryArea(geometry_column)`

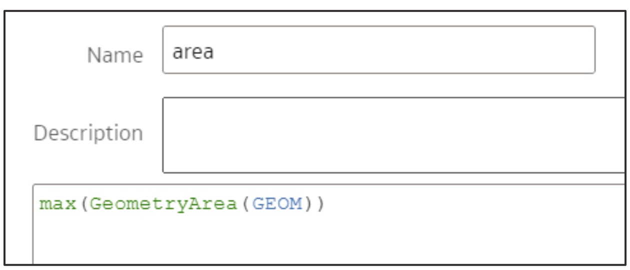


Figure 40 – Example showing an aggregate function max () applied on the GeometryArea () calculation.

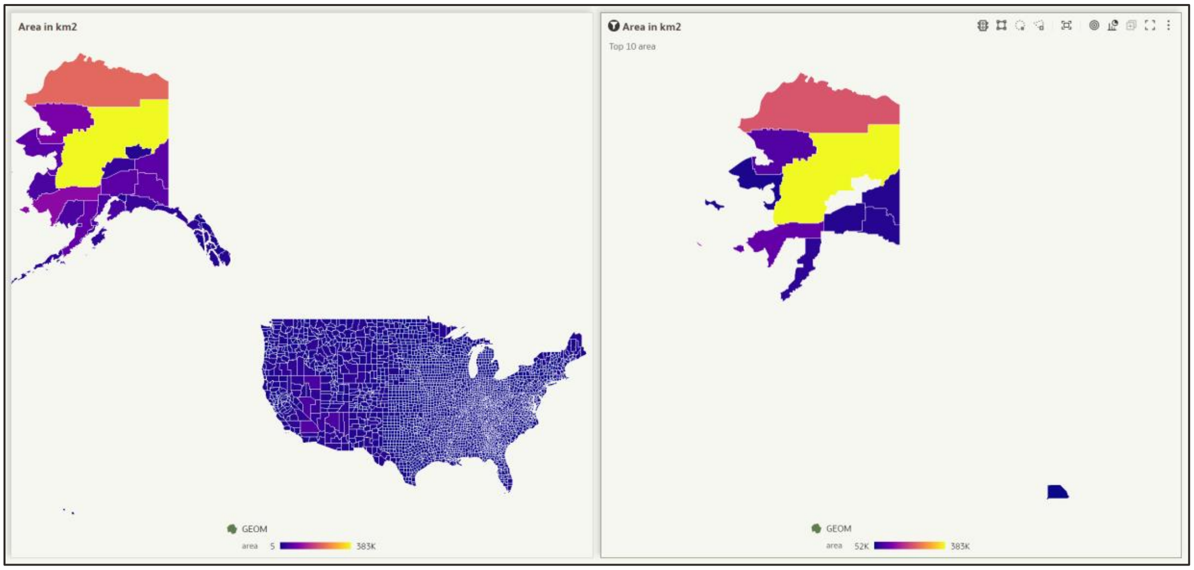


Figure 41 – Example showing how Top 10 counties in US based on area is visualized alongside all counties colored by the calculated area.

How to Calculate the Length of a Geometry

The function `GeometryLength()` is used to calculate the circumference of a shape.

Usage: `GeometryLength(geometry_column)`

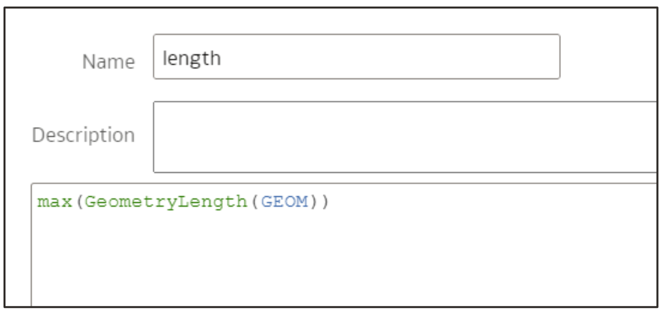


Figure 42 – Example showing an aggregate function max () applied on the GeometryLength () calculation.

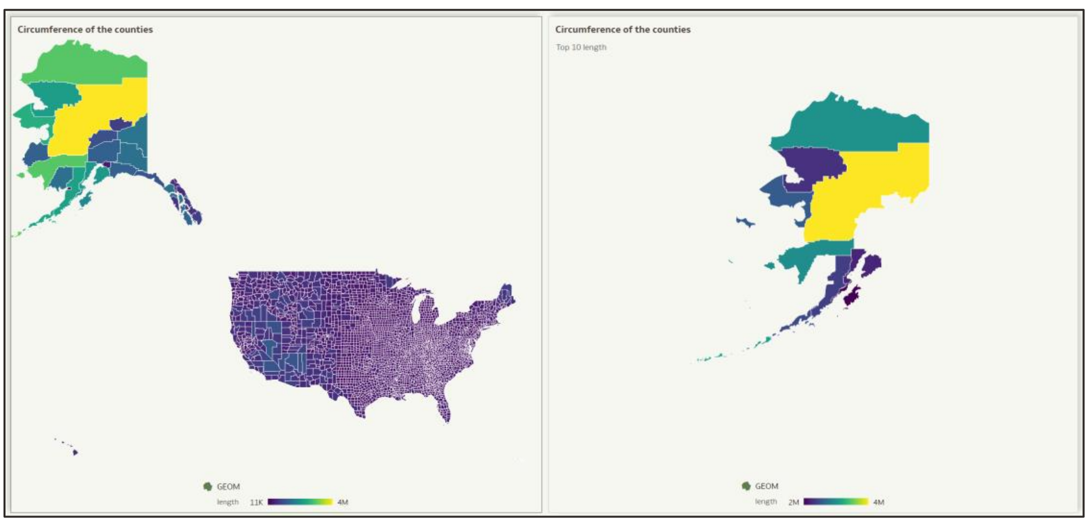


Figure 43 – Example showing the visual on the right selecting top 10 counties based on GeometryLength () alongside all counties colored by length of the shape.

How to Generate a Spatial Data Object Definition in Standard Text Format

The function `GeometryAsText()` is used to convert the longvarbinary values of the geometry column into Well-Known Text (WKT) format, a standard format for representing geometry objects. This function also is also useful to troubleshoot when a specific shape isn't being represented in the visualization.

Usage: `GeometryAsText(geometry_column)`

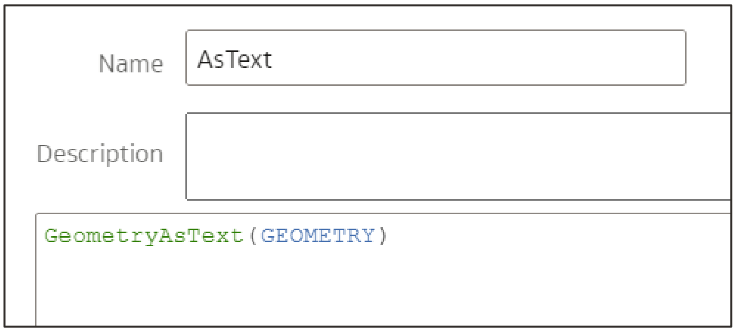


Figure 44 – Example showing usage of GeometryAsText ().

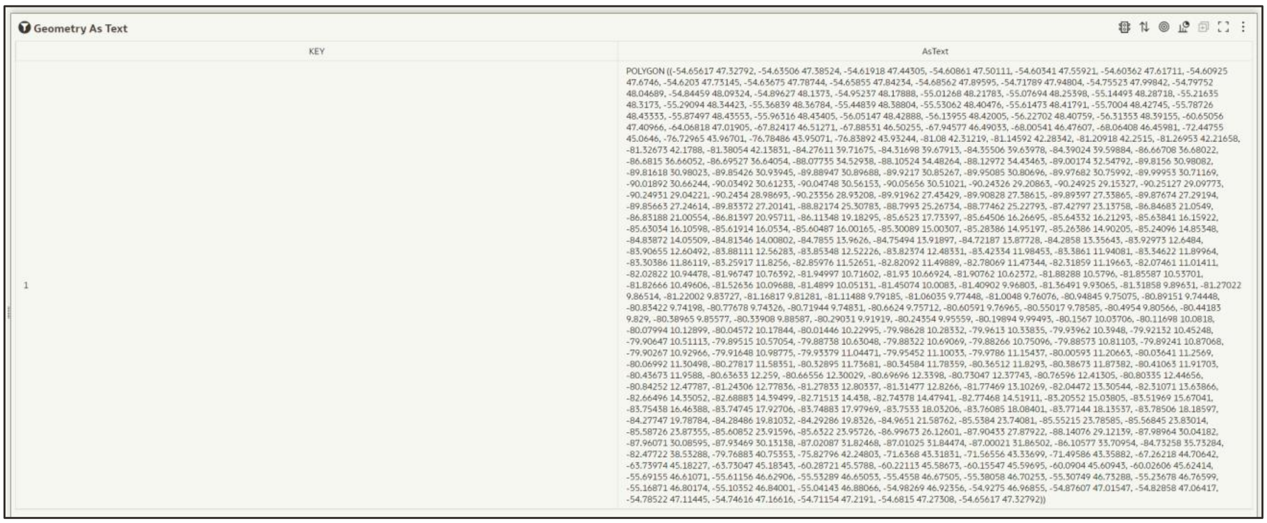


Figure 45 – Example showing the standard format of the Storm Buffer geometry column.

You can also use standard calculation functions along with the `GeometryAsText` calculation. For example, you can use the String function `length` to calculate the size of a shape, which is useful when identifying if a shape is beyond the acceptable limit of 128 KB.

Usage: `Length(GeometryAsText(Geometry_Coumn))` can return the size of the geometry shape in bytes.

Calculations That Require Two Geometry Columns

How to Calculate the Distance Between Two Geometry Data Types

The function `GeometryDistance()` is used to calculate the distance between two shapes. If your data holds two geometry columns in different datasets, then this function requires you to properly join the two datasets so that all geometry records inter-relate (mimicking a spatial join). It's advisable to establish the join while preparing and creating the dataset, and avoid blending the columns within the workbook canvas as an ad hoc mashup. It's critical that you always consume these joins with some filter value on one side of the join. Either design the dataset with an embedded filter value or design the canvas with an explicit filter value when using these in advanced geometry calculations. A good practice is to always filter the values while using calculations like `GeometryDistance`, `GeometryRelate`, and `GeometryWithinDistance`.

Usage: `GeometryDistance(geometry_column1,geometry_column2)`

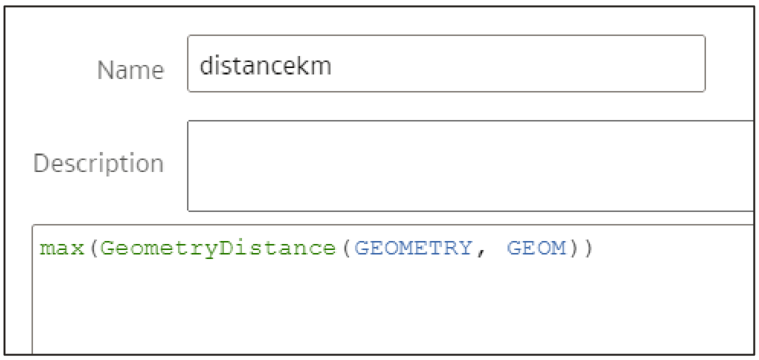


Figure 46 – Example showing an Aggregate function max () applied on the GeometryDistance () calculation.

Figure 47 - Example shows how a join is defined between two different database tables when creating the dataset.

How to Relate Two Geometry Data Types

The function `GeometryRelate()` is used to determine whether one shape is related to another shape.

A shape from one geometry column could be inside, outside, adjacent inside, adjacent outside, or touching another shape from a different geometry column. The shapes are categorized as Inside, Outside, or Touch. This function may require a Cartesian join.

Usage: `GeometryRelate(geometry_column1,geometry_column2)`

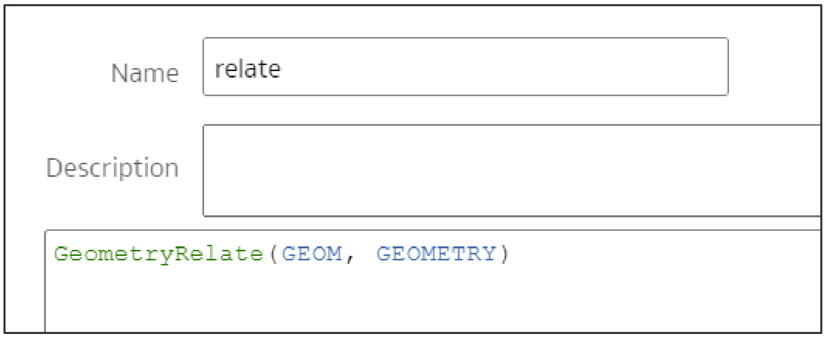


Figure 48 – Example showing usage of GeometryRelate ().

The sequence in which the geometry columns are selected within the `GeometryRelate` calculation has a direct impact on the result in which shapes are identified as relating to each other.

Figure 49 – Example showing the visual on the right relating all the counties that are touching the storm buffer or inside the storm buffer for potential impact.

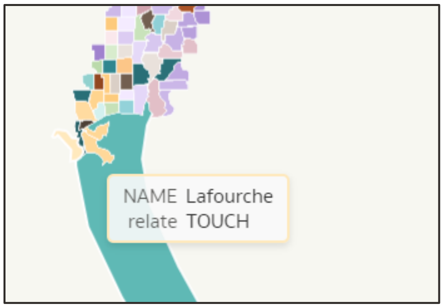


Figure 50 – Example showing shapes from US counties that are touching the storm buffer shape, calculated using GeometryRelate ().

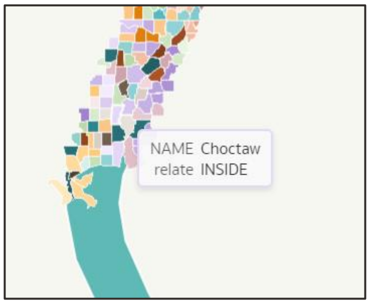


Figure 51 – Example showing shapes from US counties that are inside the storm buffer shape, calculated using GeometryRelate ().

How to Determine if Two Geometry Data Types Are Within a Specific Distance

The function `GeometryWithinDistance()` is used to determine whether two shapes are within a specified distance of each other. Based on the calculation, this function returns a True or a False as the result, and the visualizations can be designed based on the result. This function may require a Cartesian join. The sequence in which the geometry columns are selected within the calculation has a direct impact to the result.

Usage: `GeometryWithinDistance(geometry_column1,geometry_column2,distance_in_meter)`

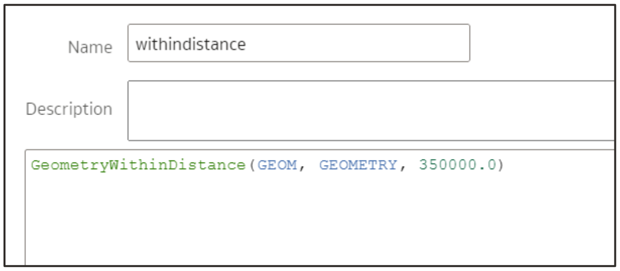


Figure 52 – Example showing usage of GeometryWithinDistance () with two geometry columns within aa numerical value of 350,000 meters or 350 km.

Figure 53 – Example shows the visual on the right with all US Counties within a 350 km range of the storm buffer. Only those counties that return the result as True are filtered and shown.

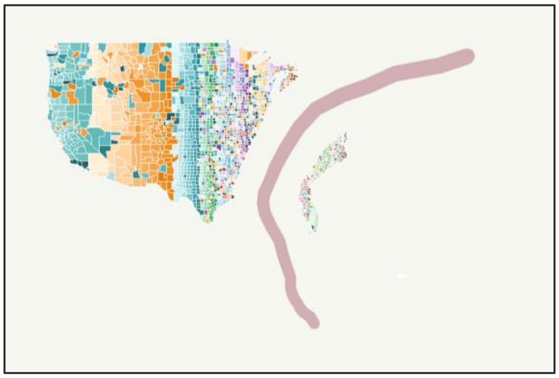


Figure 54 – Example shows all the US Counties that return False and hence don't have any direct impact from the storm.

Limitations

The geometry data type in Oracle Analytics offers exciting possibilities for map-based visualizations and advanced spatial analysis. While there are some limitations, understanding them helps you make the most of its capabilities.

- Geometry columns cannot be used as joins between database tables or as objects to drill on and cannot be visualized in a visualization other than a map.
- Geometry columns can be placed only in the Category grammar field for a map visualization. The content of a geometry column is like binary data to the human eye and is only valid when used in a map or as an argument for a spatial calculation.
- Geometry columns cannot be dragged into any Filter grammar field or used to pass as a context of a custom data action. The current version of the geometry data type doesn't natively support a use case requiring users to click on achieve filtering on a selection of shapes.
- Maps showing geometry columns aren't yet rendered on mobile devices.
- Geometry columns have limitations for use in data flows.
- Advanced analytics functions like Forecasting, Clustering, Outlier/Non-Outlier, Reference Line, and Trend Line aren't supported for geometry columns.
- Spatial joins or joins between geometry data types from different database tables or datasets aren't supported.
- Geometry data type records must be under 128 KB individually. If a record in a data source has a geometry expression that sizes above 128 KB, the projection for this record doesn't show on a map. For example, suppose a table contains data about US states (50 rows), each containing a geometry data type column with the polygon representing the state shape. Assume one of these states has a very high resolution for its border definition, and the size of the geometry object string for this state amounts to more than 128 KB. The dataset is created in Oracle Analytics and queries to the dataset honor every single column from the dataset, but if geometries are projected on a map, then only 49 states are shown on the map. The one larger than 128 KB isn't shown on the map, and a warning is displayed in the dialog for the Information icon on the map.

  If the size of a geometry shape is over 128 KB, then you can try the following alternatives as possible workarounds:

  - Simplify the definition of the polygon (reduce the number of points to delimit the polygon) and therefore reduce its technical storage.
  - Split the polygon into two or more distinct polygons to break down the size of each piece.
- Oracle Analytics supports 2-D map coordinate systems only. Any known coordinate system defined in the data source is projected to WGS 84 (EPSG 4326).
- File-based data sources containing geometry data must be Text/CSV files with the geometry field expressed as Well-Known Text (WKT) formats. WKT is a text markup language for representing vector geometry objects. It can represent distinct geometry objects such as Points, MultiPoints, LineString, Polygons, and MultiPolygons. WKT format syntaxes such as `GeometryCollection` or `FeatureCollection` aren't supported.
- Files with the GeoJSON format with geometry data aren't supported for importing as datasets with geometries in Oracle Analytics Cloud. In order to create a dataset with a geometry column, GeoJSON files must first be converted into CSV with WKT geometry formats or loaded into an Oracle database with the SDO.Geometry format.

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Performance Considerations

- Physical size of the data retrieved by the map
  - For large datasets with many distinct geometry records, the performance of the map visualization rendering is directly impacted by the size of the geometry data transiting over the network to the Oracle Analytics browser. The performance is a factor of how many distinct geometries are represented on the map and the average size (in KB) of each geometry. As it builds, the map visualization fetches the geometry definitions via the network for each distinct shape on the map, for each distinct layer. Very large lists of geometries take longer to render when geometries have a very fine definition (large average size).
  - **Mitigation:** Avoid representing very high numbers of geometries (>10,000) on a map, even if the system supports up to 125,000, the performance experience to render this is slow. If you do need to show many shapes at once, filter the map visualization with specific areas and enable consumer users to filter one area at a time.
- Spatial Cartesian joins
  - Spatial calculation functions such as `GeometryDistance`, `GeometryLength`, `GeometryRelate`, and `GeometryWithinDistance`, may require you to have two joined datasets. These functions require a proper data model to avoid ambiguity in execution, that is, a many-to-many distance calculation, which may lead to exceeding the query limit and poor performance.
  - **Mitigation**:
    1. Use a data model, and most importantly, data filtering on geometry records to avoid Cartesian joining effects.
    2. When using a database, spatial calculations ship down the function to the database and let Oracle Analytics retrieve the results of the calculation. Be cautious when optimizing performance and ensure this function-shipping is happening properly. There may be cases where other calculations are added (in data flows or workbooks) that prevent Oracle Analytics from pushing down the work to the database. In the context of troubleshooting performance, it's critical to check the context that allows function shipping.

Appendix 1 – Oracle Spatial Calculations

The following is a list of Spatial Functions from the Oracle Analytics Calculation Library.

Spatial Function	Syntax	Description
`GeometryArea`	`GeometryArea(shape_expr)`	Calculates the area that a shape occupies.
`GeometryLength`	`GeometryLength(shape_expr)`	Calculates the circumference of a shape.
`GeometryAsText`	`GeometryAsText(shape_expr)`	Converts the longvarbinary values of the geometry column into Well-Known Text (WKT) format, a standard format for representing geometry objects.
`GeometryDistance`	`GeometryDistance(shape_expr1,shape_expr2)`	Calculates the distance between two shapes.
`GeometryRelate`	`GeometryRelate(shape_expr1,shape_expr2)`	Determines whether one shape is inside another shape.
`GeometryWithinDistance`	`GeometryWithinDistance(shape_expr1, Shape_expr2,distance_expr)`	Determines whether two shapes are within a specified distance of each other.

`shape_expr` represents any valid geometry column or shape expression.

`shape_expr1,shape_expr2` represents any valid geometry column or shape expression.

`distance_expr` is any expression that evaluates to a numeric value in meters.