

ArcGIS Pipeline Referencing Tutorial



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Requirements

Data

The data for the individual exercises is located in their respective folder locations.

Software environment

- ArcGIS Desktop 10.5—Standard or Advanced
- ArcGIS Pipeline Referencing 10.5 for Desktop
- ArcGIS Server 10.5 —Standard or Advanced
- ArcGIS Pipeline Referencing 10.5 for Server
- Portal for ArcGIS 10.5
- ArcGIS Web Adaptor 10.5 for IIS
- ArcGIS Pro 1.4—Standard or Advanced
- ArcGIS Pro 1.4 for Pipeline Referencing

For more information on obtaining an evaluation, go to goo.gl/AVBP7A

Create Route

ArcGIS Pro

Routes are created in a network by using the centerline features that define the location and geometry of the new route.

The centerline features used to create routes in this exercise exist in the centerline feature class.

Create a new route on a Continuous Network

Objective

- Create a new route on the P_Continuous network

Data

- Data\Exercise 1-Route Editing\Create

ArcGIS Pro Project Name

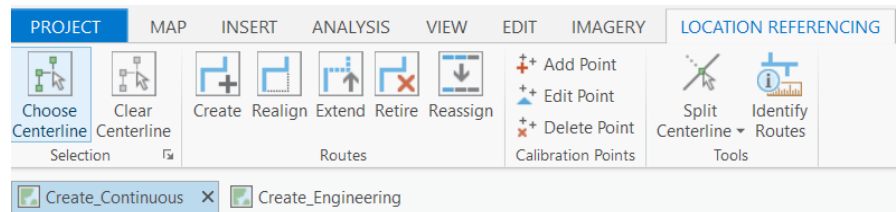
- CreateRoute

Layers Needed

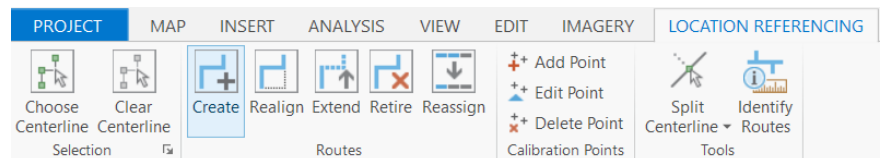
- Network
- Centerline

Methodology

1. Open the *CreateRoute* project and verify the *Create_Continuous* map is active.



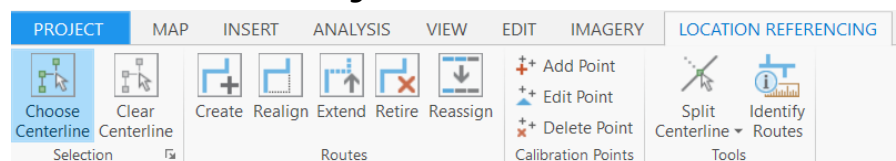
2. Go to **Map>Bookmarks**, and under Create_Continuous Bookmarks, choose **Create**.
3. Click the **Location Referencing** ribbon and in the Routes section, click **Create**.



The **Create Route** pane appears.

You will now select several centerline features to be used to create the new route.

4. Click the **Location Referencing** ribbon and click **Choose Centerline**.



*Centerline features can be created at any time using the **Create** tool on the **Edit** ribbon tab or by copying features from other sources.*

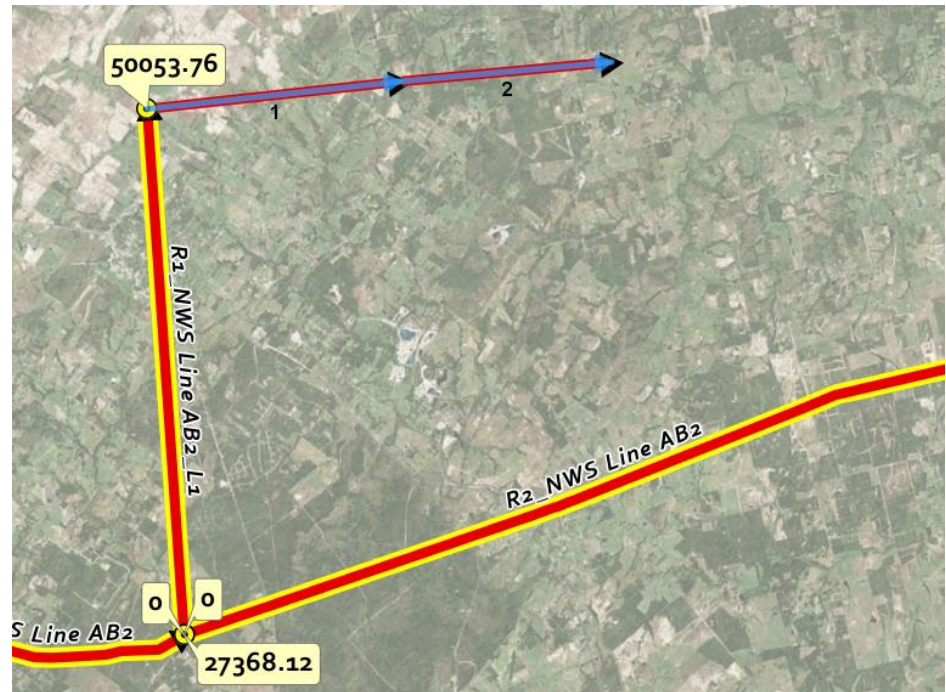
Pressing the Shift key and then selecting the centerline features allows you to define the order of the centerlines. The order in which the centerlines are selected determines the increasing direction of measure calibration.

Notice the blue arrows that appear when a centerline is selected. These show the direction of digitization.

The from measure and to measure values are automatically populated with the geometric length of the chosen centerline(s). Alternatively, you can type a value of your choice.

Centerlines that are selected with this tool will automatically be input into the active **Create Route** pane. You can use the **Clear Centerline** tool if you need to change your selection.

5. Press the Shift key and choose both existing centerlines in the map at the location of the new route (shown in blue selection). Be sure to select the centerlines in the correct order as shown by the numbers in black.



6. Ensure that *P_ContinuousNetwork* is chosen in the **Network** parameter.
7. Type *R1_NWS_Create_CN* in the **Route Name** text box.
A route within a LRS network must have a unique name.
8. Click the **Start Date** calendar button and choose *08/15/2016*.
The start date is the "born on" date of the route, and defines the date at which this route first exists in the LRS Network.
9. Accept the default value for the **From Measure** parameter.
Alternatively, you could type a value. The from measure value will be the start measure of the new route.
10. Accept the default value for the **To Measure** parameter.
Alternatively, you could type a value. The to measure value will be the end measure of the new route. The default value shown here is the from measure plus the geometric length of the centerline features
11. Prior to clicking **Run**, your tool input should look like the following image:

Location Referencing

Create Route

Network
P_ContinuousNetwork

Route Name
R1_NWS_Create_CN

Start Date
8/15/2016

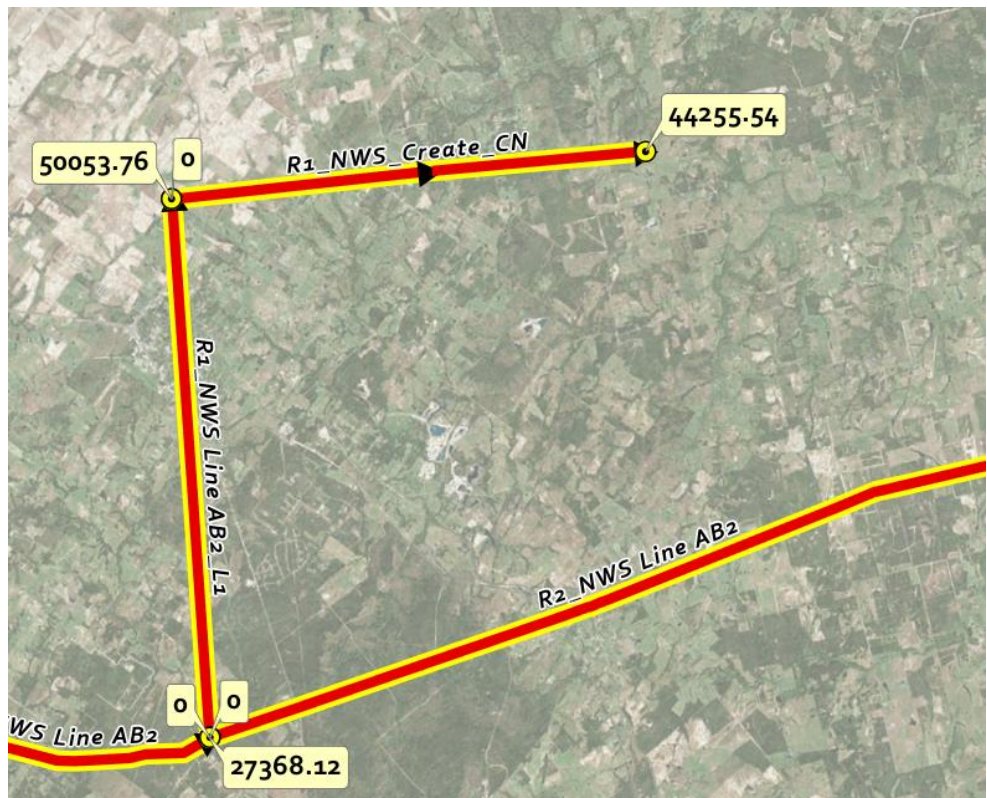
From Measure (in feet)
0.000

To Measure (in feet)
44255.542

Run ►

12. Click **Run**.

A new route called *R1_NWS_Create_CN* is created.

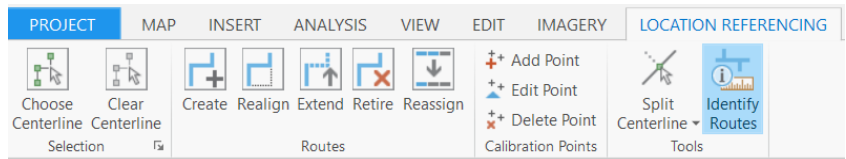


To learn more about time, see [Time Awareness in Pipeline Referencing](#).

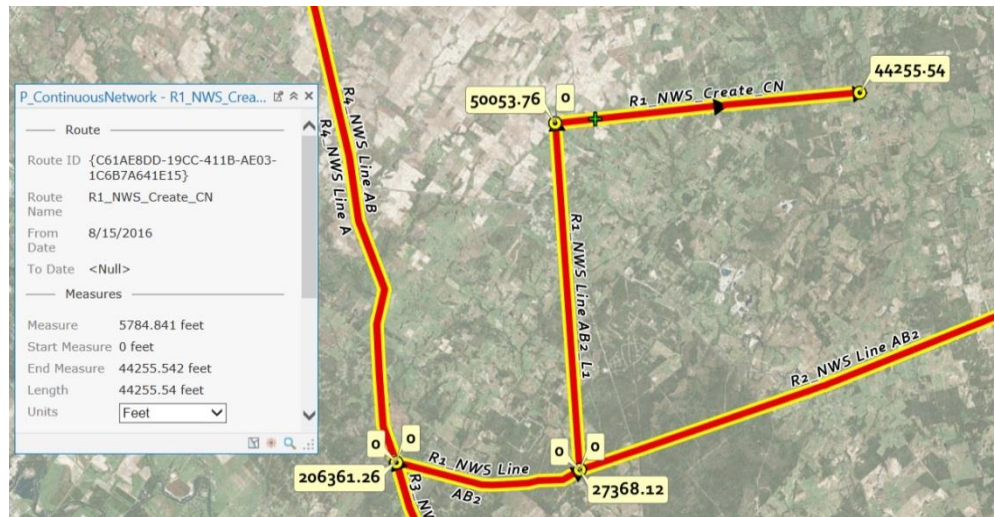
13. Use the ArcGIS Pro **Time Slider** experience to navigate through time. If you slide to a date prior to the route creation date of 8/15/2016, you will not be able to see the newly created route.

To enable time in this map, hover over the time slider and click the clock icon on the left of the bar that has a red x over it.

14. To see the route properties, click the **Identify Routes** tool on the **Location Referencing** ribbon.



15. Clicking anywhere along the route, your new route will appear like this:



16. Close ArcGIS Pro without saving your edits or changes to the project, or continue to create a route on an Engineering Network in the next exercise.

Create Route

ArcGIS Pro

The centerline features used to create routes in this exercise exist in the centerline feature class.

Create a new route on a network that supports lines

In ArcGIS Pipeline Referencing, a logical grouping of more than one non-branching route is called a line. See [What is a line?](#) to learn more about this concept.

Objective

- Create a new route on the P_Engineering network using the same centerlines used in the previous exercise. In the process, you will also create a new line.

Data

Data\Exercise 1-Route Editing\Extend

ArcGIS Pro Project Name

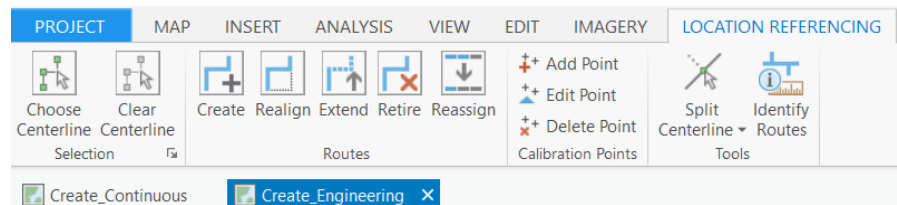
- CreateRoute

Layers Needed

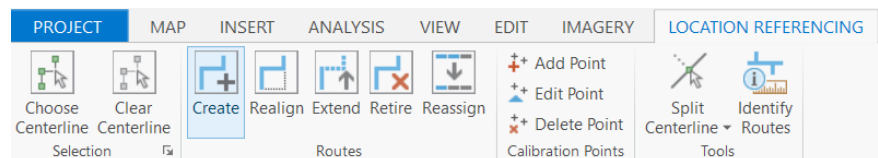
- Network
- Centerline

Methodology

1. Open the *CreateRoute* project and verify the *Create_Engineering* map is active.



2. Click **Map>Bookmarks**, and under *Create_Engineering* Bookmarks, choose **Create**.
3. Go to the **Location Referencing** ribbon and in the Routes section, click **Create**.

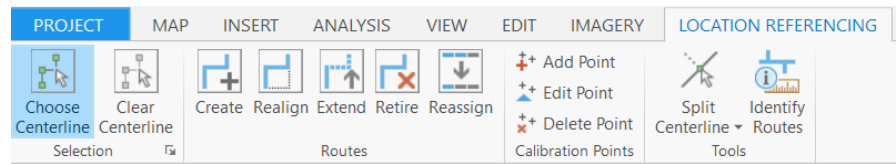


The **Create Route** pane appears.

You will now select several centerline features to be used to create the new route.

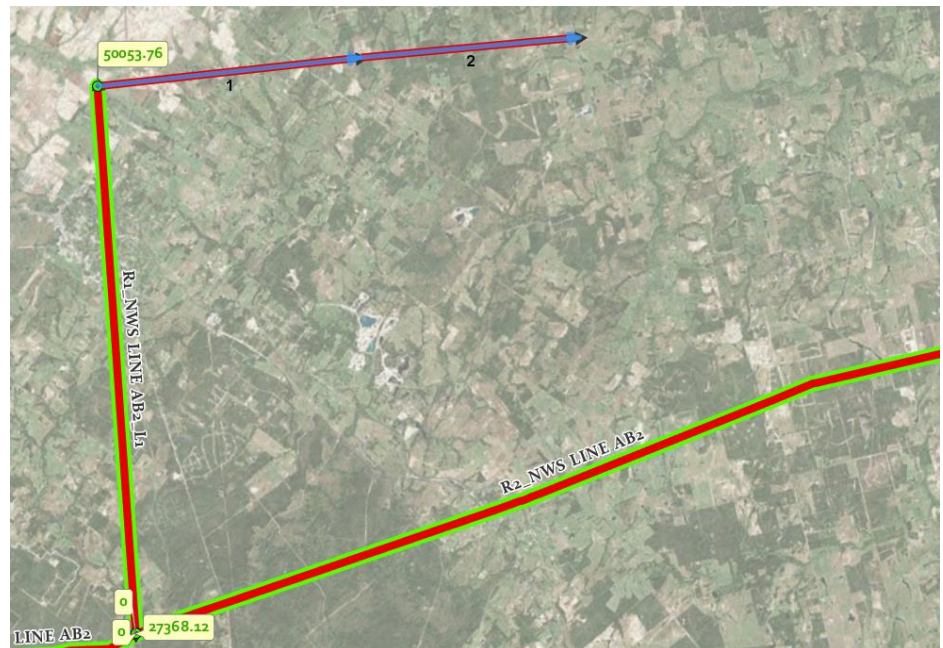
The Continuous LRS Network and the Engineering LRS Network both belong to the same LRS and reside in the same geodatabase. The LRS Networks within the same LRS share a centerline feature class.

- Go to the **Location Referencing** ribbon and click **Choose Centerline**.



Centerline(s) that are selected with this tool will automatically be input into the active **Create Route** pane. You can use the **Clear Centerline** tool if you need to change your selection.

- Press the Shift key and choose the existing centerlines in the map at the location of the new route (shown in blue selection). Be sure to select the centerlines in the correct order as shown by the numbers in black.



- Ensure that *P_EngineeringNetwork* is chosen in the **Network** parameter.

- Type *R1_NWS_Create_EN* in the **Route Name** text box.

A route within a LRS network must have a unique name.

- Type *NWS Line A20* in the **Line Name** text box.

A line within a LRS network must have a unique name.

- Click the **Start Date** calendar button and choose *08/15/2016*.

The start date is the "born on" date of the route, and defines the date at which this route first exists in the LRS Network.

- Accept the default value for the **From Measure** parameter.

Alternatively, you could type a value. The from measure value will be the start measure of the new route..

- Accept the default value for the **To Measure** parameter.

Alternatively, you could type a value. The to measure will be the end measure of the new route. The default value shown here is the from measure plus the geometric length of the centerline features.

12. Prior to clicking **Run**, your tool input should look like the following image:

Location Referencing

Create Route

Network
P_EngineeringNetwork

Route Name
R1_NWS_Create_EN

Line Name
NWS Line A20

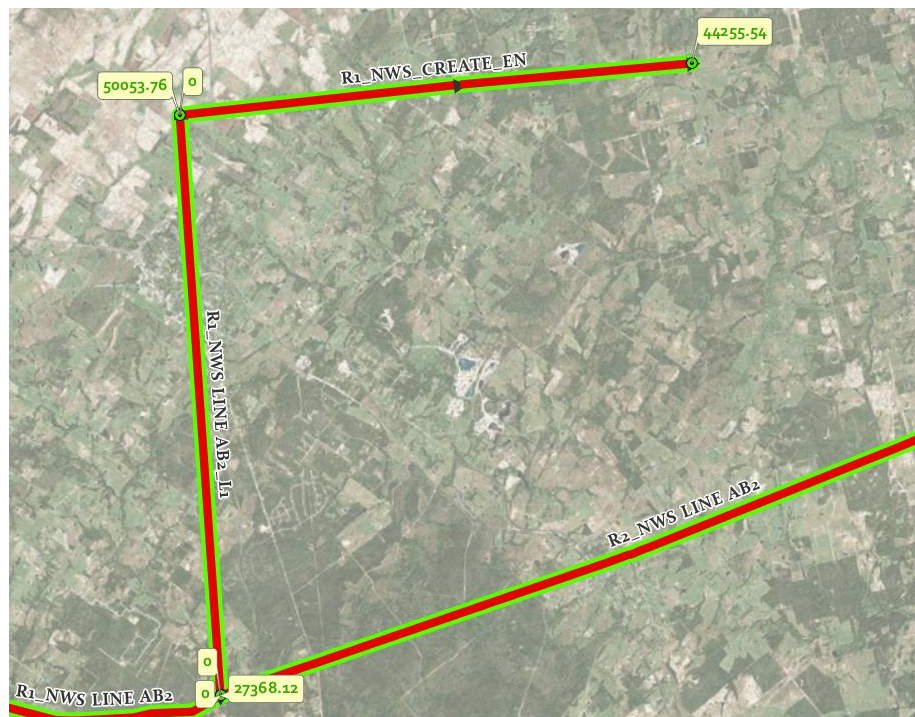
Start Date
8/15/2016

From Measure (in feet)
0.000

To Measure (in feet)
44255.542

Run ►

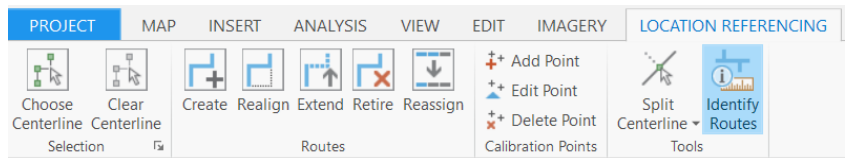
13. Click **Run**. A new route called *R1_NWS_Create_EN* that belongs to new line *NWS Line A20* is created.



14. Use the ArcGIS Pro **Time Slider** experience to navigate through time. If you slide to a date prior to the route creation date of 8/15/2016, you will not be able to see the newly created route.

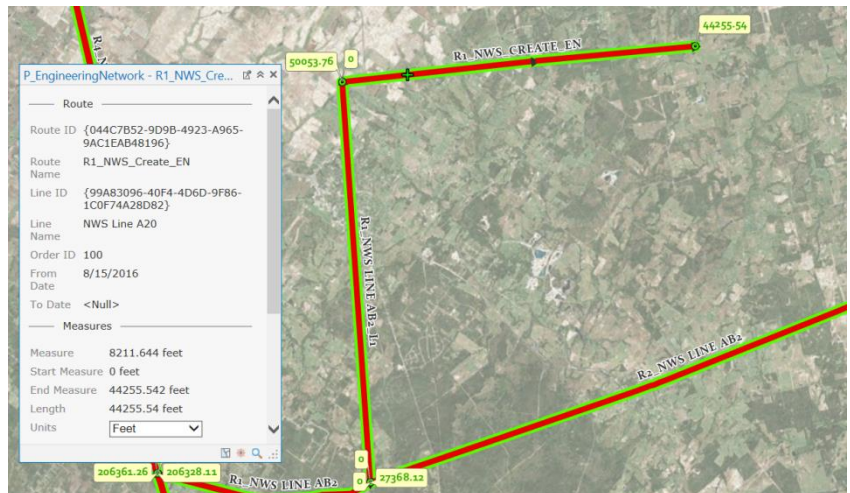
To enable time in this map, hover over the time slider and click the clock icon on the left of the bar that has a red x over it.

15. To see the line name and other attributes of the new route, click the **Identify Routes** tool on the **Location Referencing** ribbon.



16. Click anywhere along the route.

Your new route will appear like this:



Notice that unlike the route created on the continuous network, the properties for a route on an engineering network contain a line name, line ID, and line order (Order ID).

17. Close ArcGIS Pro without saving your edits or changes to the project
- In the next exercise, you will perform an extension on the routes you just created on the Continuous and Engineering Networks.

Extend Route

ArcGIS Pro

Routes are extended in a network by using the centerline features that define the location and geometry of the extended portion.

The centerline features used to extend routes in this exercise exist in the centerline feature class.

A route can be extended either at the beginning or at the end of the route.

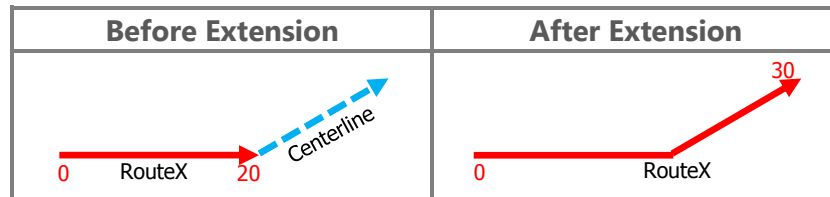
You may notice that time is enabled in this map, and it is set to 8/25/2016

Centerline features can be created at any time using the **Create** tool on the **Edit** ribbon tab or by copying features from other sources.

Extend a route on a Continuous Network

Objective

- Extend a route on the P_Continuous network



In this diagram, RouteX is extended from the end of the route onto an adjacent centerline feature.

Data

Data\Exercise 1-Route Editing\Exrend

ArcGIS Pro Project Name

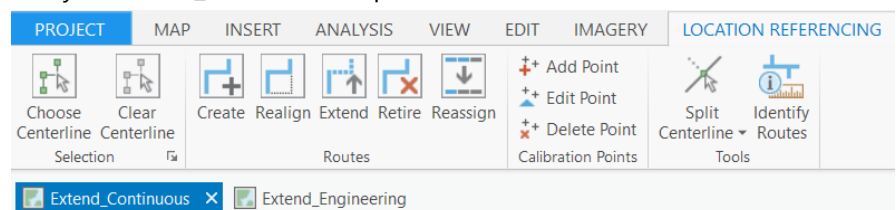
- ExtendRoute

Layers Needed

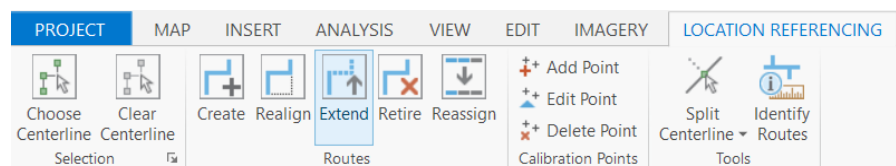
- Network
- Centerline

Methodology

- Open the *ExtendRoute* Project.
- Verify the *Extend_Continuous* map is active.



- Click **Map>Bookmarks**, and under *Extend_Continuous* Bookmarks, choose **Extend**.
- Click the **Location Referencing** ribbon and in the **Routes** section, click **Extend**.



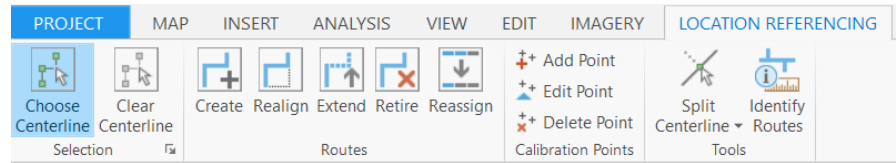
The **Extend Route** pane appears.

Notice the arrow that appears when a centerline is selected. These show the direction of digitization.

The from measure and to measure values are automatically populated with the geometric length of the chosen centerline(s). Alternatively, you can type a value of your choice.

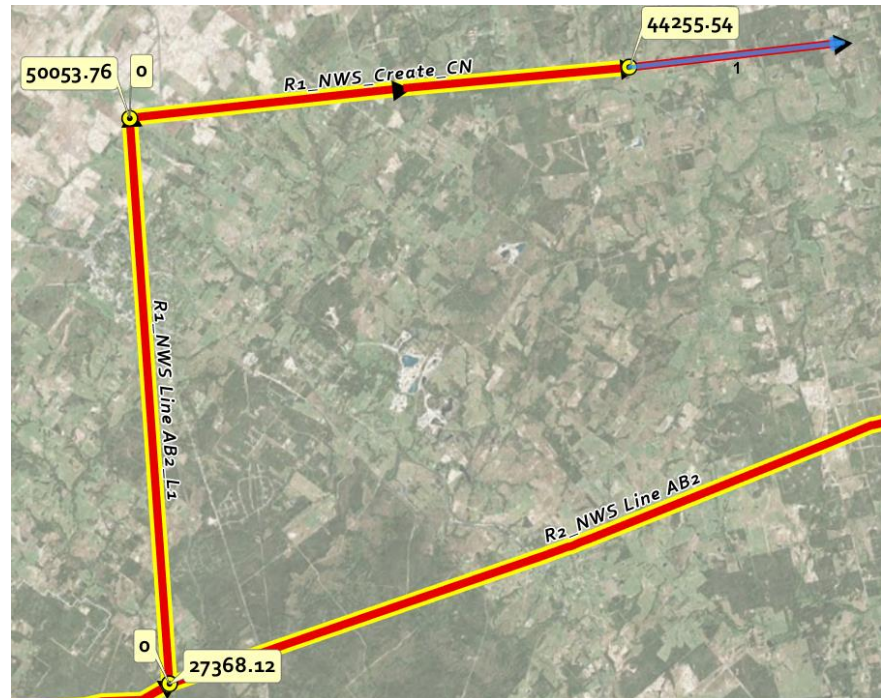
You will now select several centerline features to be used to extend a route.

- Click the **Location Referencing** ribbon and click **Choose Centerline**.

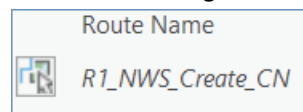


A centerline that is selected with this tool will automatically be input into the active **Extend Route** pane. You can use the **Clear Centerline** tool if you need to change your selection.

- Choose the existing centerline in the map (shown in blue selection).



- Ensure that P_ContinuousNetwork is chosen in the **Network** parameter.
- Use the route picker tool from within the **Extend Route** pane to choose the route *R1_NWS_Create_CN* from the map. Here, you are extending from the end of the existing route.



The route that is chosen at this step will be extended onto the currently selected centerline features.

- Click the **Effective Date** calendar button and choose 8/25/2016.
The effective date will be the date which this edit operation takes place within the LRS Network. Prior to this date, the route extension will not exist as it has not occurred yet.
- Accept the default value for the **From Measure** parameter.
Alternatively, you could type a value. The from measure is the measure of the

selected route at which the extension will begin. In this case, it is the end measure of the selected route.

11. Accept the default value for the **To Measure** parameter.

Alternatively, you could type a value. The to measure will be the end measure of the extended route. The default value shown here is the from measure plus the geometric length of the centerline features.

12. Prior to clicking **Run**, your tool input should look like the following image:

Location Referencing

Extend Route

Network
P_ContinuousNetwork

Route Name
R1_NWS_Create_CN

Effective Date
8/25/2016

Extended Section

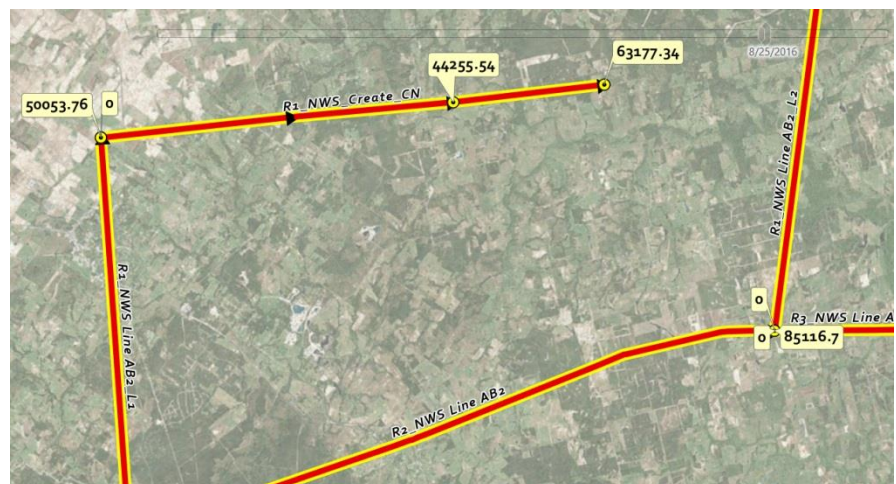
From Measure (in feet)
44255.542

To Measure (in feet)
63177.345

Run

13. Click **Run**.

Route *R1_NWS_Create_CN* is extended, with a new length of 63177.34 feet as of 8/25/2016.



For more information about time and some temporal editing scenarios, see [Time awareness in Pipeline Referencing](#).

In ArcGIS Pipeline Referencing, as edits are made the calibration points are time sliced along with the routes

Route *R1_NWS_Create_CN* has now been time sliced, as shown in the attribute table below. The representation of the route prior to the extension now has a **To Date** populated with the **Effective Date** of the edit operation. The representation of the route after the extension has a **From Date** equal to the **Effective Date**. The **To Date** is recorded as <NULL> until this route is edited again at a future date.

P_ContinuousNetwork

Field:

Add

Delete

Calculate

Selection:

Zoom To

Switch

Clear

Delete

Route Name	From Date	To Date	SHAPE_Length
R1_NWS_Create_CN	8/25/2016	<Null>	63177.344834
R1_NWS_Create_CN	8/15/2016	8/25/2016	44255.542039
Click to add new row.			

- Use the ArcGIS Pro **Time Slider** experience to navigate through time. If you slide to a date prior to the route extension effective date of 8/25/2016, you will not be able to see the newly created route or see the new time slice in the attribute table
- Close ArcGIS Pro without saving your edits or changes to the project, or continue to extend a route on an Engineering Network in the next exercise.

Extend Route

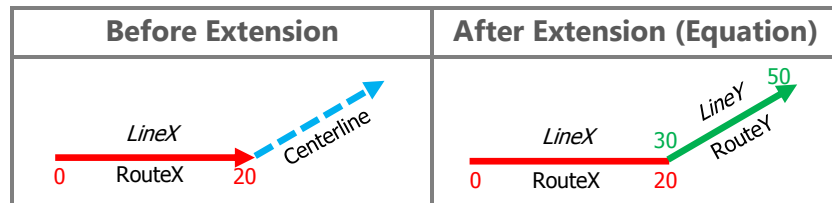
ArcGIS Pro

For a network that supports lines, extending a route is only allowed at the beginning of the first route on the line or from the end of the last route on the line

Extend a route on a network that supports lines

Objective

- Extend a route on the P_Engineering network by introducing an equation



In this diagram, RouteX is extended from the end of the route onto an adjacent centerline feature. Since an equation is introduced, the result will be a new route belonging to a new line.

Data

- Data\Exercise 1-Route Editing\Exrend

ArcGIS Pro Project Name

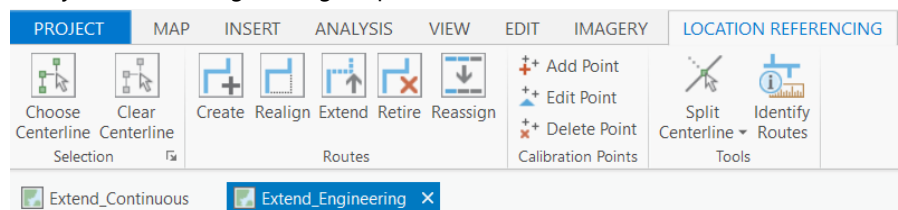
- ExtendRoute

Layers Needed

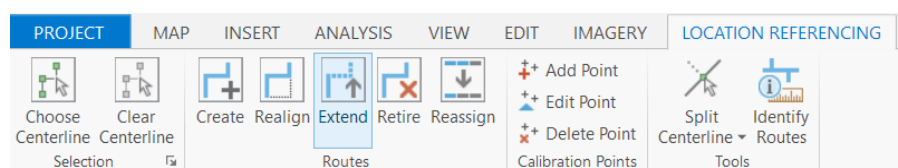
- Network
- Centerline

Methodology

- Open the *ExtendRoute* Project.
- Verify the *Extend_Engineering* map is active.



- Click **Map>Bookmarks**, and under *Extend_Engineering* Bookmarks, choose **Extend**.
- Click the **Location Referencing** ribbon and in the Routes section, click **Extend**.

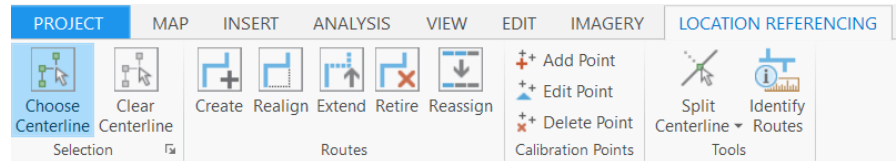


You may notice that time is enabled in this map, and it is set to 8/25/2016.

The **Extend Route** pane appears.

You will now select several centerline features to be used to extend a route.

- Click the **Location Referencing** ribbon and click **Choose Centerline**.



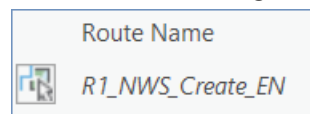
A centerline that is selected with this tool will automatically be input into the active **Extend Route** pane. You can use the **Clear Centerline** tool if you need to change your selection.

- Choose the existing centerline in the map (shown in blue selection).



- Ensure the P_EngineeringNetwork is chosen in the **Network** parameter.
- Use the route picker tool from within the **Extend Route** pane to choose the route *R1_NWS_Create_EN* from the map.

Here, we are extending from the end of the existing route.



The route that is chosen at this step will be extended onto the currently selected centerline features.

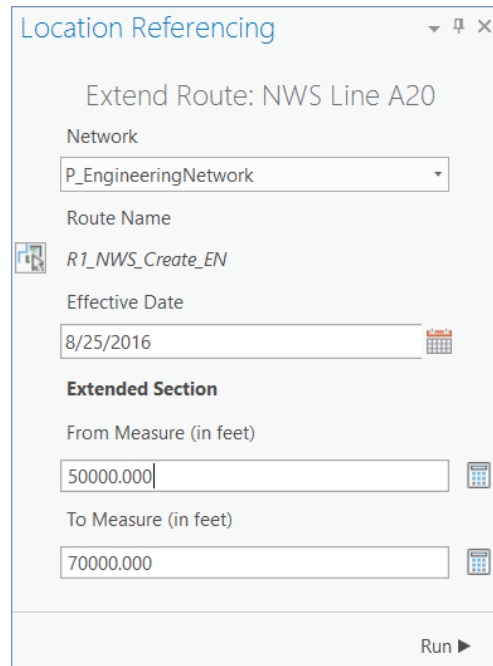
- Click the **Effective Date** calendar button and choose 8/25/2016.
The effective date will be the date which this edit operation takes place within the LRS Network. Prior to this date, the route extension will not exist as it has not occurred yet.
- Type a value of 50000 for the **From Measure** parameter.
The default from measure of 44255.54 populated into the tool is the end

For a network that supports lines, if the from or to measures of the extended section of the route result in an equation point, a new route is created for the extended section.

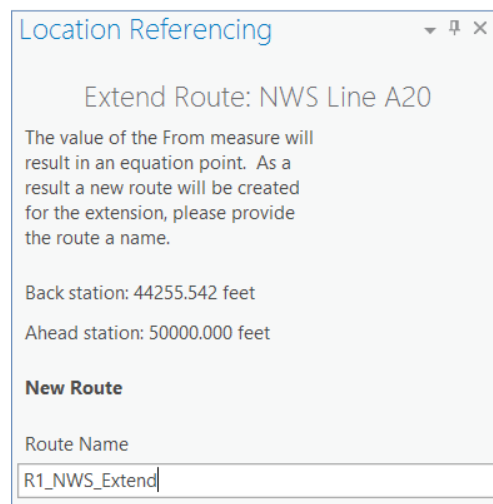
An equation is a point of discontinuity in measures between two routes. This may be due to a gap or overlap in measures.

measure of the selected route. However, for this exercise the start measure of the extension needs to be 50000. This will create an equation to preserve the strictly increasing nature of the route measures.

11. Type a value of *70000* for the **To Measure** parameter.
The to measure will be the end measure of the extended route.
12. Prior to clicking **Run**, your tool input should look like the following image:



13. Click **Run**.
Since we introduced an equation, a new route will be created.
14. Name the new route *R1_NWS_Extend*.
This new route will be on the same line as route R1_NWS_Create_EN and have a from date equal to the effective date of the edit operation, and a to date equal to <NULL> until the route is edited at a future date.



15. Click **Run** again.

NWS Line A20 is now extended by adding new route R1_NWS_Extend. Route R1_NWS_Create_EN is not extended; instead a new route is created because an equation was introduced. If you had not introduced an equation, route R1_NWS_Create_EN would have been extended to a length of 70000 feet and the route would have been time sliced. Follow Part 1 of this tutorial to see a time slice example.

16. The next image shows the new route created by the extend operation as of 8/25/2016:



Note that if you create a derived network and use the ArcGIS Pipeline Referencing tools to keep it up to date with your network that supports lines, performing edits manually across multiple networks is not necessary.

17. Use the ArcGIS Pro **Time Slider** experience to navigate through time. If you slide to a date prior to the route extension effective date of 8/25/2016, you will not be able to see the newly created route or see the new time slice in the attribute table.
18. Close ArcGIS Pro without saving your edits or changes to the project.

Retire Route

ArcGIS Pro

Retirement of a route can occur when a pipe is no longer needed or decommissioned or permanently abandoned. A portion of a route or an entire route can be retired

A route is retired as of a specific date, after which the route is no longer active in the network. This is done by populating the **To Date** field for the retired route in the network table.

For a Continuous Network, a retirement can occur across an entire route, or across a portion of a route between two measures.

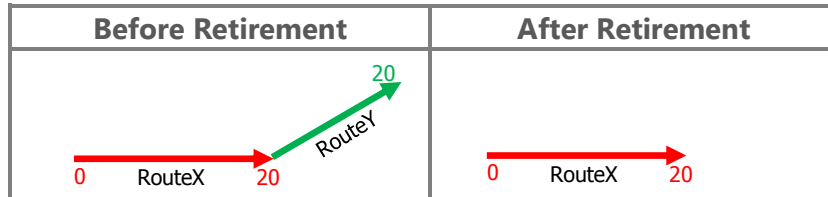
You may notice that time is enabled in this map, and it is set to 8/15/2016.

The retirement date specified in the **Retire Route** pane must fall within the current time range set in the map. It must also be a valid date on the route, meaning the route must exist as of the date value entered.

Retire a route on a Continuous Network

Objective

- Retire an entire route on the P_Continuous Network



Data

- Data\Exercise 1-Route Editing\Retire

ArcGIS Pro Project Name

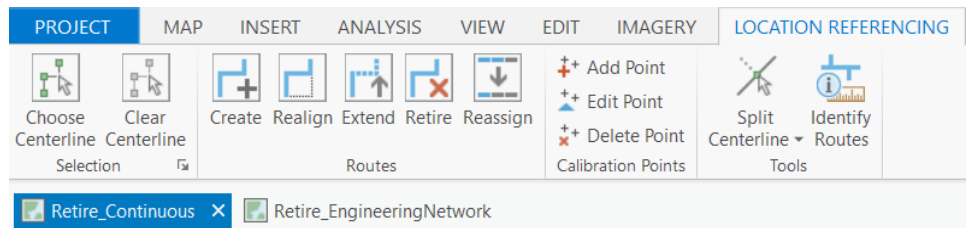
- RetireRoute

Layers Needed

- Network

Methodology

- Open the *RetireRoute* project.
- Verify the *Retire_Continuous* map is active.

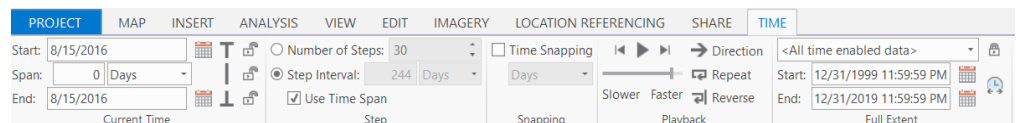


- Click **Map>Bookmarks**, and under Retire_Continuous Bookmarks, choose **Retire**.
- Check that the time slider near the top of the map is set to a current time of 8/15/2016.

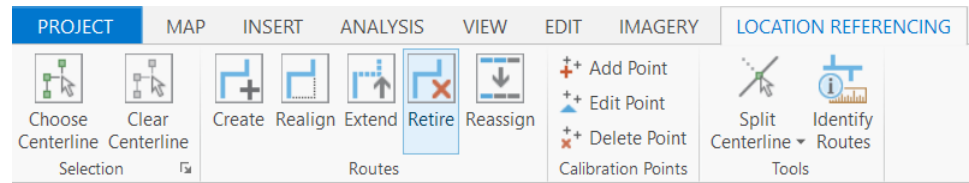


ArcGIS Pro bookmarks store time settings as well as the map location.

- Click the **Time** ribbon tab and verify that in the Current Time section, the start and end date are set to 8/15/2016.



6. Click the **Location Referencing** ribbon and in the Routes section, click **Retire**.



The **Retire Route** pane appears.

7. Ensure that *P_ContinuousNetwork* is set in the **Network** parameter.
You will retire a route that belongs to this network.
8. Click the **Retire Date** calendar button and choose 8/15/2016 as the date for retirement.
The **Retire Date** will be the date which this retire edit operation takes place within the LRS Network. Prior to this date, the route retirement has not yet occurred. The To Date field of the route and the calibration points get populated with this date
9. Use the route picker tool to choose *Route1Y* on the map, which is shown highlighted in light blue in the following image:



The From Measure and To Measure values for a retirement can be set in the following ways:

- The check box to use the start and/or end measures of the route
- Chosen from the map using the measure picker tool

- Typed in manually

For the purpose of this exercise, you will retire this entire route. The route name *Route1Y* has now been added to the **Retire Route** pane.

10. Check the **Use route start measure** check box to set a From Measure value.
The retirement will begin from this measure, with the location shown on the map by a green circle indicator. The measure of 0 will be populated, since the selected route has a start measure of 0 feet.

You can turn on the centerline layer and observe that the centerline features did not change due to the retirement.

Centerlines are not retired along with the route, although if only a portion of a route is retired, the underlying centerline will be split at the retirement measure.

To learn more about time, see [Time Awareness in Pipeline Referencing](#).

11. Check the **Use route end measure** check box to set a To Measure value.

The retirement will be effective up to this measure, with the location shown on the map by a red circle indicator. The measure of *12001.302* will be populated, since the selected route has an end measure of 12001.302 feet.

12. Leave the **Recalibrate route downstream** check box unchecked. Since you are retiring the entire route, there is no remaining downstream portion to recalibrate in this scenario.

13. Prior to clicking the **Run** button, your tool input should look like the following image:

The screenshot shows the 'Retire Route' dialog box within the 'Location Referencing' application. The dialog has a title bar with standard window controls. The main content area is titled 'Retire Route' and contains the following fields and controls:

- Network:** A dropdown menu showing 'P_ContinuousNetwork'.
- Retire Date:** A date field showing '8/15/2016' with a calendar icon to its right.
- Route Name:** A field showing 'Route1Y' with a small icon to its left.
- From Measure (in feet):** A field showing '0.000' with a small icon to its left.
- Use route start measure:** A checked checkbox.
- To Measure (in feet):** A field showing '12001.302' with a small icon to its left.
- Use route end measure:** A checked checkbox.
- Recalibrate route downstream:** An unchecked checkbox.
- Run:** A button with a right-pointing arrow.

14. Click **Run**.

The route will get retired. In the next image, *Route1Y* is no longer present as of 8/15/2016.



15. Use the ArcGIS Pro **Time Slider** experience to navigate through time. If you slide to a date prior to the route retirement date of *8/15/2016*, you will be able to see *Route1Y*.
16. Close ArcGIS Pro without saving your edits or changes to the project.

Retire Route

ArcGIS Pro

For a network that supports lines, such as an Engineering Network, a retirement can occur across an entire route, across multiple routes, or across a portion of one or more routes between two measures.

You may notice that time is enabled in this map, and it is set to 8/15/2016.

Retire routes on a network that supports lines

Objective

- Retire a portion of a line (a retirement that spans multiple routes)

Data

- Data\Exercise 1-Route Editing\Retire

ArcGIS Pro Project Name

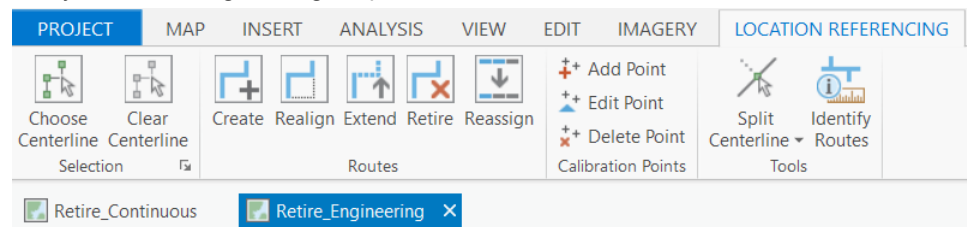
- RetireRoute

Layers Needed

- Network

Methodology

- Open the *RetireRoute* project.
- Verify the *Retire_Engineering* map is active.

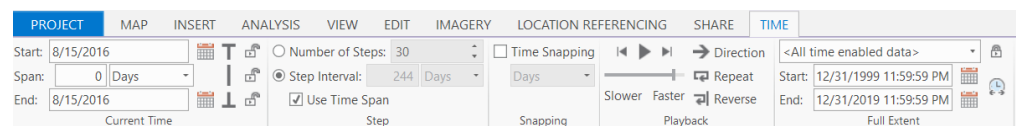


- Click **Map > Bookmarks** and under *Retire_Engineering* Bookmarks, choose **Retire**.
- Check that the time slider near the top of the map is set to a current time of **8/15/2016**.



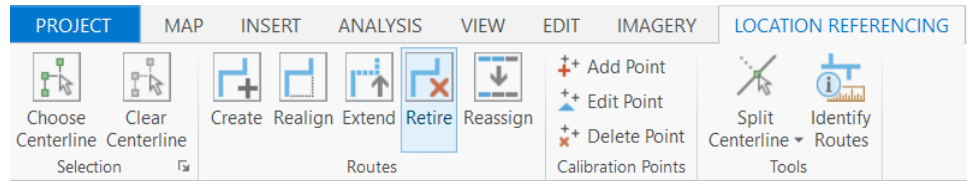
ArcGIS Pro bookmarks store time settings as well as the map location.

- Click the **Time** ribbon tab and verify that in the Current Time section, the start and end date are set to **8/15/2016**.



- Click the **Location Referencing** ribbon and in the Routes Section, click on **Retire**.

Notice that the line name *Line02* is populated at the top of the **Retire Route** pane. You may retire multiple routes that belong to the same line, but not across multiple lines in the same edit operation.



The **Retire Route** pane appears.

7. Ensure that *P_EngineeringNetwork* is set in the **Network** parameter.
You will retire a route that belongs to this network.
8. Click the **Retire Date** calendar and choose 8/15/2016 as the date for retirement.

The **Retire Date** will be the date in which this retire edit operation takes place within the LRS Network. Prior to this date, the route retirement has not yet occurred. The To Date field of the route and the calibration points get populated with this date.

9. Use the **From Route Name** picker tool  to choose *RouteB1* on the map, which is shown highlighted in light blue in the next image:



Routes *RouteB1*, *RouteB2* and *RouteB3* belong to the same line *Line02*. In this exercise, you will start the retirement from the starting location of *RouteB1* and end the retirement in the middle of *RouteB3*.

The route name *RouteB1* has now been added to the **Retire Route** pane.

10. Check the **Use route start measure** check box to set a From Measure value.
The retirement will begin from this measure, with the location shown on the map by a green circle indicator. The measure of 0 will be populated, because the selected route has a start measure of 0 feet.
11. Use the **To Route Name** picker tool  to choose *RouteB3* on the map, which is shown highlighted in light blue in the next image:



12. Use the **To Measure** picker tool  to choose a measure in the middle of *RouteB3*. If you have snapping enabled, you will be given an option to select the midpoint of the route.

The retirement will be effective up to this measure, with the location shown on the map by a red circle indicator. The measure of *1181.807* will be populated if you selected the midpoint, although for this exercise, you do not need to select this exact measure.

13. Check the **Recalibrate route downstream** check box to remove the length of the retired route from the measures of the remaining portion of *RouteB3*.

	Before Retirement	After Retirement
Do Not Recalibrate Downstream		
Recalibrate Downstream		

Your edit will follow the bottom row in the diagram, which means the new time slice of *RouteB3* will begin with a measure of 0 feet.

If the **Recalibrate route downstream** check box is unchecked, then the modified route derives a From Measure from the To Measure of the retired portion. The To Measure of the modified route remains unchanged.

Complete the Extend Route tutorial to understand time slicing.

Pipeline Referencing uses a line order sequence to maintain the order of the three routes belonging to Line02. This line order is updated based on edit activities that occur. Line order can be seen in the attribute table of the network feature class.

This retire operation will impact the line order since multiple routes will not exist on Line02 as of 8/15/2016, and RouteB3 will be the first and only route on the line.

Prior to the retirement, the routes had a line order of:

- RouteB1 = 100
- RouteB2 = 200
- RouteB3 = 300

After the retirement, the routes had a line order of:

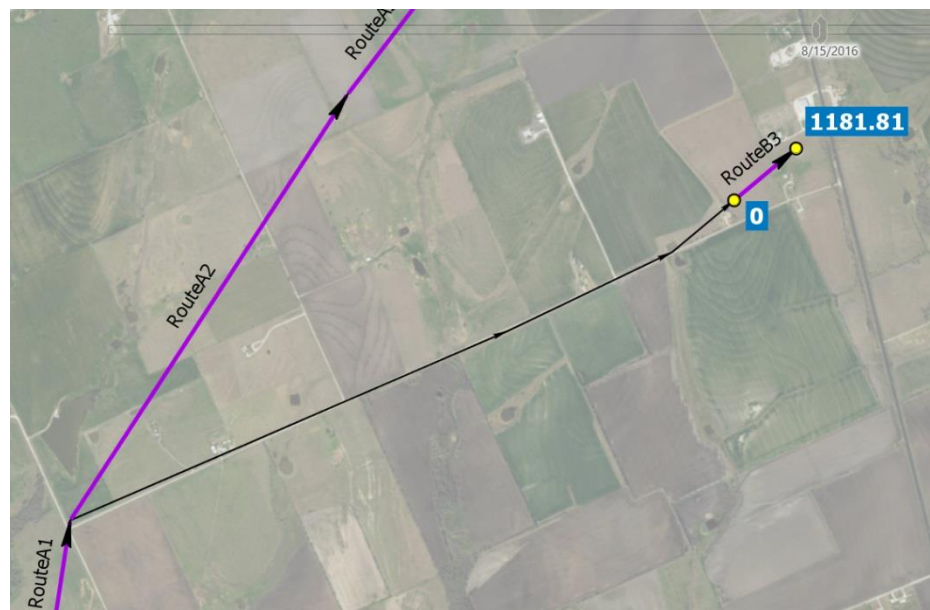
- RouteB3 = 100

Since the centerline layer is turned on, observe that the underlying centerline features did not change, except for the centerline for RouteB3. Only a portion of this route was retired, so the centerline feature was split to accommodate the new, shorter shape of the route.

14. Prior to clicking the **Run** button, your tool input should look like the following image:

17. Click **Run**.

The route will get retired. In the next image, *RouteB1* and *RouteB2* are no longer present as of 8/15/2016, and *RouteB3* is much shorter and begins with a measure of 0 as of 8/15/2016.



18. Use the ArcGIS Pro **Time Slider** experience to navigate through time. If you slide to a date prior to the route retirement date of 8/15/2016, you will be able to see the

routes in this exercise that belong to *Line02* prior to the retirement.

19. Close ArcGIS Pro without saving your edits or changes to the project.

Realign Route

ArcGIS Pro

More Information:

<https://goo.gl/KYwGTg>



Realignment edit activity can be used for re-routing of routes.

1: The Location Referencing tab is context based, i.e. it is visible only when you have Pipeline Referencing features (routes, calibration points or centerlines) added to your map.

2: If centerlines touch the routes, then the From Measure and To Measure values are automatically populated with the geometric length of the chosen centerline. If the centerlines do not touch the routes, then you can use the pickers to populate the From Route and To Route parameters.

3: The centerline provides the location and geometry for the realignment. You can use multiple centerlines to realign a route.

9: The centerline features used to create routes can preexist in the centerline feature class, be digitized

Objective

- Realign routes in an Engineering Network



Route R1, R2 and R3 realignment

Data

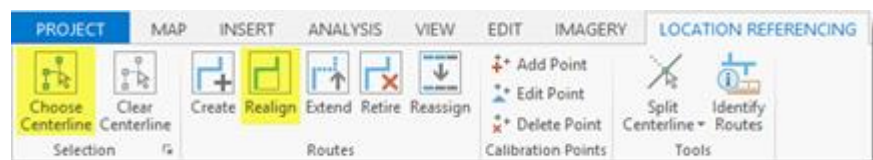
- Data\Exercise 1-Route Editing\Realign

Layers Needed

- Network
- Centerline

Methodology

- Start ArcGIS Pro.
- Open the *RealignRoute* project.
- Click **Map** > **Bookmarks** and choose the *Realign Route* bookmark.
- Click the **Location Referencing** tab¹ and in the Routes section, click **Realign** and then **Choose Centerlines**.



The location referencing ribbon

Exercise: Note down the Order ID of these routes:

Route Name	Order ID
R11_NWS_LineAB1	
R22_NWSLineAB1	
R33_NWSLineAB1	
R44_NWSLineAB1	

- Click the existing centerline on the map along the location of realignment. The selected *centerline*⁹ is highlighted in blue and the arrow shows the direction of digitization.

into the centerline feature class (using aerial photography or other basemaps for guidance), copied and pasted from other feature classes, or imported from CAD files or other ArcGIS-supported data sources.

4: Alternatively, type the date in the **Effective Date** text box.

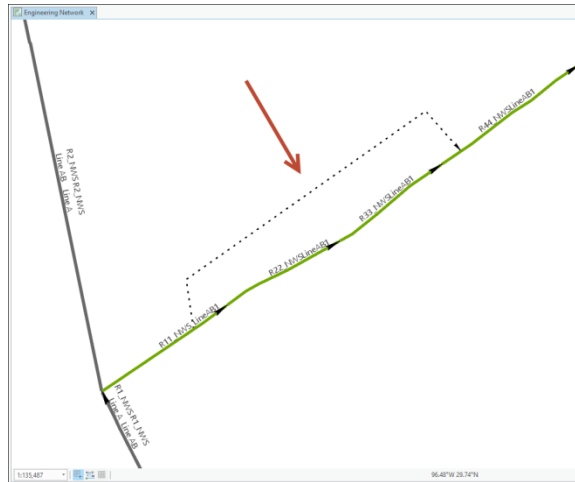
Double-clicking the empty **Effective Date** text box populates today's date.

5: The source route is the route/routes on which the realignment takes place.

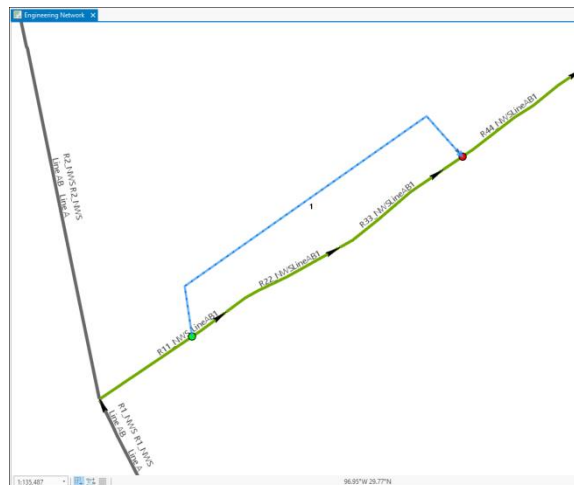
6: The suggested From Measure value is the measure at the location where the start of the centerline touches the source route.

7: The suggested To Measure value is the measure at the location where the end of the centerline touches the To route.

The **Realign Route** dialog box gets populated.



Choose the centerline on the map



The centerline is chosen

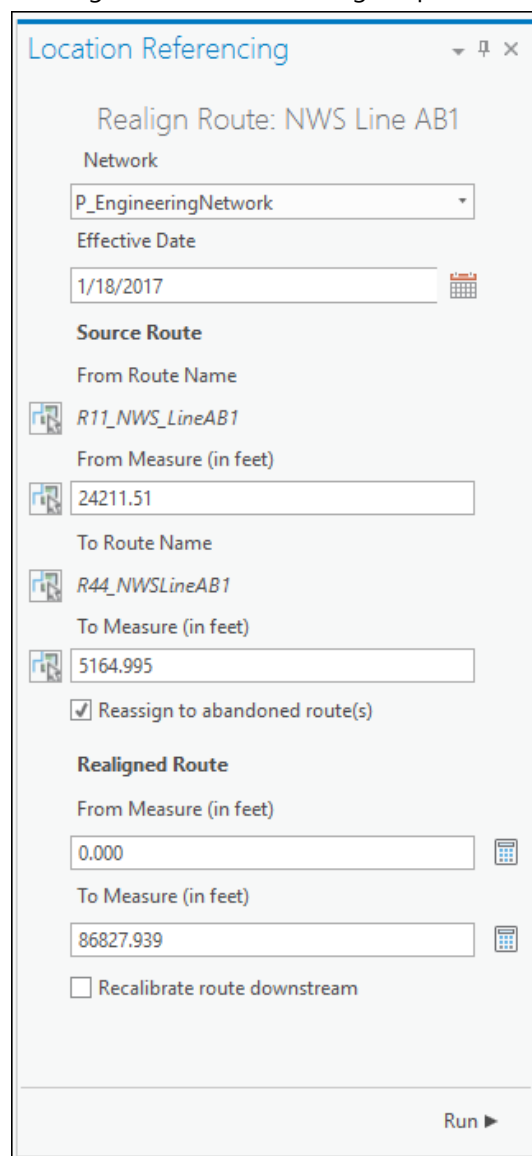
6. In the **Realign Route** dialog box, ensure the Network is set to P_EngineeringNetwork.
7. Set 1/18/2017 as the **Effective Date**⁴ for the route.
The realignment of the route takes place on this date.
8. Accept the default **From Route**⁵ in the **Source Route** section.
The realignment starts from this route.

You can use the route picker button  to choose the route from the map. However, since the centerline touches a route, the route has already been chosen.

9. Accept the default **From Measure**⁶.
Alternatively, you can type OR use the route picker to get the **From Measure**² value from the map.
A Green point graphic denotes the start of realignment.

8: The realigned route section provides the From and To measures of the realigned section.

10. Accept the default for **To Route**.
The realignment ends at this route.
11. Accept the default for **To Measure**⁷.
Alternatively, you can type OR use the route picker to get the *To Measure* value from the map.
A Red point graphic denotes the end of realignment.
12. Check the **Reassign to abandoned route(s)** check box.
13. In the *Realigned Route*⁸ section, type 0 as *From Measure*² value.
The source measure of the realigned portion will start at 0.
14. Click on the **Recalculate To Measure** button  to get the *To Measure*⁷ value.
The target measure of the realigned portion will be 86827.939.



The screenshot shows a software dialog box titled "Location Referencing". It contains several sections for configuring a route realignment:

- Realign Route:** NWS Line AB1
- Network:** A dropdown menu showing "P_EngineeringNetwork".
- Effective Date:** A date field set to "1/18/2017" with a calendar icon.
- Source Route:**
 - From Route Name:** A field with a route picker icon showing "R11_NWS_LineAB1".
 - From Measure (in feet):** A field with a route picker icon showing "24211.51".
 - To Route Name:** A field with a route picker icon showing "R44_NWSLineAB1".
 - To Measure (in feet):** A field with a route picker icon showing "5164.995".
- Reassign to abandoned route(s):** A checked checkbox.
- Realigned Route:**
 - From Measure (in feet):** A field showing "0.000" with a calculator icon.
 - To Measure (in feet):** A field showing "86827.939" with a calculator icon.
 - Recalibrate route downstream:** An unchecked checkbox.
- Run:** A button with a right-pointing arrow.

The realign route dialog

15. Ensure the **Recalibrate route downstream** check box is unchecked.

16. Click **Run**.

The tool transitions to the next page that shows the list of routes that are going to be retired due to the realignment.

Location Referencing

Realign Route: NWS Line AB1

A new route will be created in the realigned portion. The following route(s) will be abandoned due to the realignment.

Route Name	From Measure	To Measure
R11_NWS_LineAB1	24211.510	33187.250
R22_NWSLineAB1	0.000	28346.156
R33_NWSLineAB1	0.000	28138.960
R44_NWSLineAB1	0.000	5164.995

◀ Back

Next ▶

List of routes to be retired

The routes to be abandoned are highlighted in red on the map.

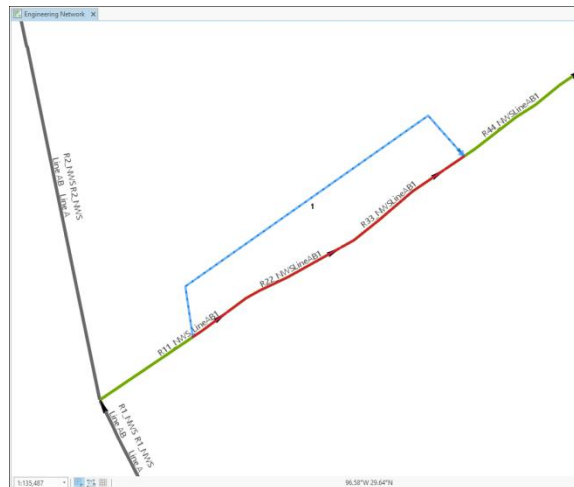


Figure 1. The routes to be retired are highlighted in red

17. Click **Next**.

In step 13, you changed the suggested From Measure to 0 and chose not to recalibrate downstream (step 15). Hence, equation points got introduced at the From and To measures of the realigned route.

Consequently, a new route will be created at the realign portion (refer case H in figure 13).

18. Click **Next**.

19. Provide the name for the new route as shown in Figure 8.

Location Referencing

Realign Route: NWS Line AB1

Please provide the route a name.

New Route

Route Name

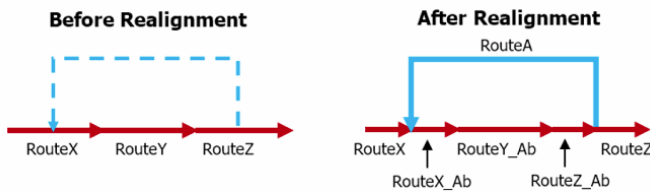
R112_NWSLineAB1

◀ Back Next ▶

Provide a name to the new route

20. Click **Next**.

We chose to reassign to abandoned routes (step 12).



. Reassigning to abandoned routes

Instead of retiring the existing routes as of the effective date of the edit, abandoned routes (new routes in the network) are created to represent assets that are still present, but not in use.

21. Provide the line name and route names for the abandoned routes as shown in Figure 9.



The abandoned routes are highlighted in red

Location Referencing

Realign Route: NWS Line AB1

Please provide the route names and attributes for abandoned routes.

Abandoned Routes

Line Name

NWS Line AB1_Ab

Source Route Name	Abandoned Route Name
R11_NWS_LineAB1	R11_AB1
R22_NWSLineAB1	R22_AB1
R33_NWSLineAB1	R33_AB1
R44_NWSLineAB1	R44_AB1

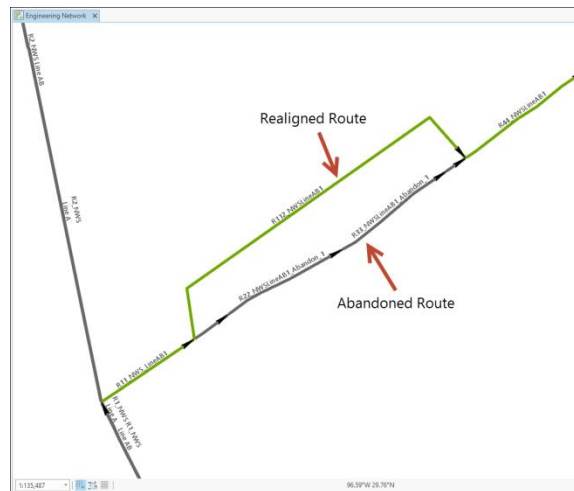
◀ Back

Run ▶

Attributes for the abandoned routes

22. Click **Run**.

The routes are realigned



The result of realign tool

Exercise: Note down the Order ID of these routes:

Route Name	Old Order ID	New Order ID
R11_NWS_LineAB1		
R44_NWSLineAB1		

--	--	--

23. Use ArcGIS Pro Time Slider experience to navigate through time. For example, go to a date prior to the date of extension, say 7/15/2016, to view the status of the route before the realignment.
24. Optional: After editing a line network, if a derived network has been configured you can update the derived network by following the steps within the tutorial for ***Derived Network Workflow***.

Note: The configuration of a derived network is optional. At this point in the edit workflow, if you had configured a derived network, the edit(s) to the line network should now be applied to the derived network. To apply the edit(s) to the derived network first you apply event behaviors, then generate routes and finally update derived measures. The steps to update the derived network are outlined within the tutorial for ***Derived Network Workflow***.

25. Close ArcGIS Pro without saving edits or project changes.

Appendix:

Some of the realignment scenarios are shown in the next image:

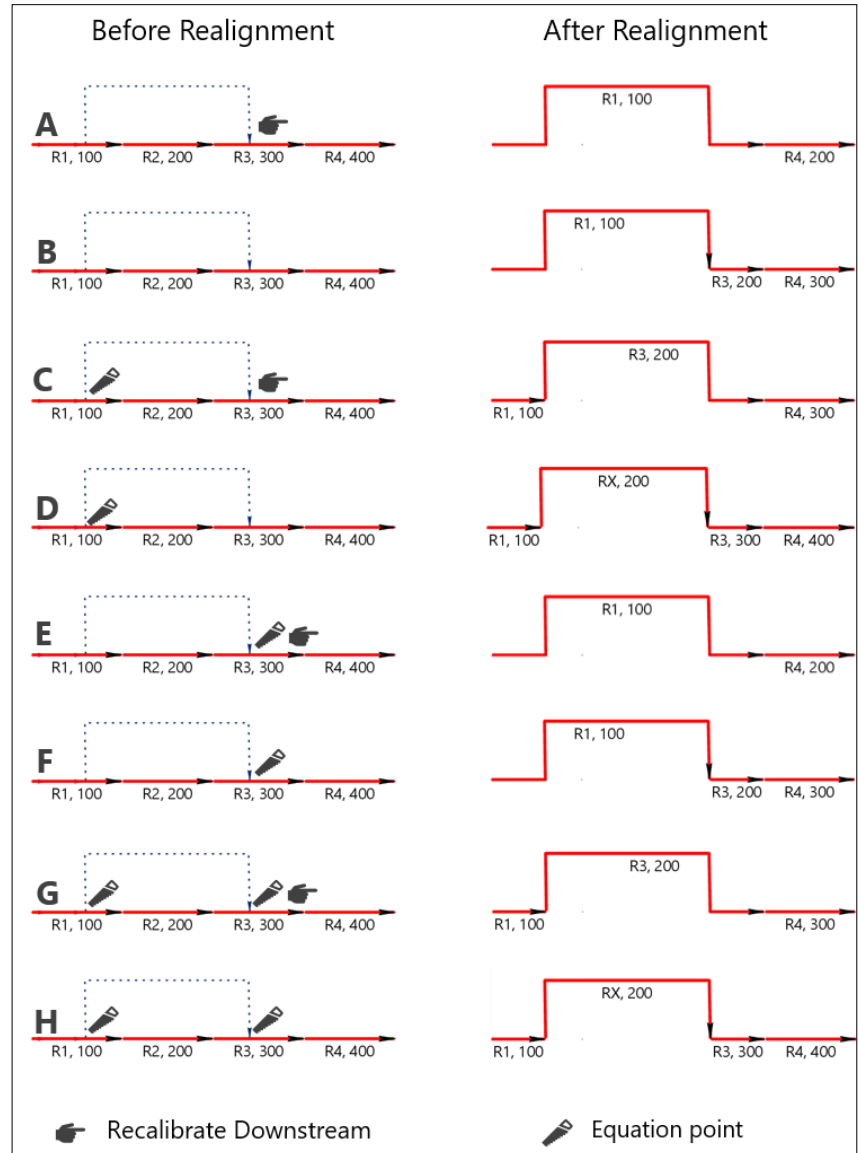


Figure 13. Various scenarios for realignment

Reassign Route

ArcGIS Pro

More Information:

<https://goo.gl/Iw8K6M>



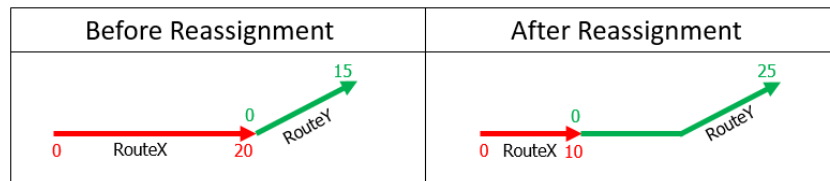
A reassignment is the way to assign a portion or entire route or line to the immediate upstream or downstream of another route or line.

Reassignment can help you in:

1. Merging multiple routes to a new route
2. Merging multiple routes to an existing route
3. Splitting an existing route to a new route
4. Splitting an existing route and merging it to an existing route
5. Renaming a route

Reassign a portion of a route to an existing route

- Reassigning a portion of a route to an existing route (route split and route merge)



A part of RouteX is split and then merged to RouteY

Data

- Data\Exercise 1-Route Editing\Reassign

Layers Needed

- Network

Methodology

1. Open project *Reassign*.

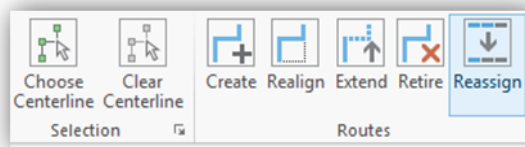
In this project you have two maps:

- a) Continuous: with Continuous network
- b) Engineering: with Line network

2. Click on the left of the Continuous map.

You will reassign a portion of a route to another existing route.

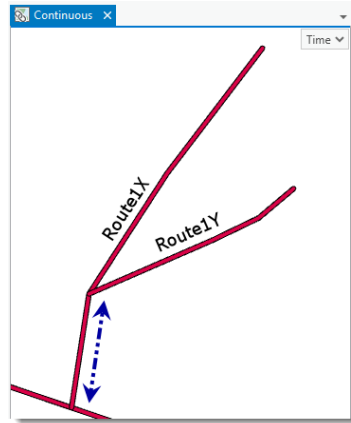
3. Click **Map>Bookmarks** and choose *Reassign: Existing*.
4. Click the **Location Referencing** ribbon and in the Routes section, click **Reassign**.



Click the Reassign tool

The **Reassign Route** dialog box appears.

5. Ensure that *P_ContinuousNetwork* is set for the **Network** parameter.
You'll reassign a route that belongs to this network.
6. Click the **Effective Date** calendar button and choose 8/15/2016 as the date for reassignment.
This is the date when the reassignment becomes effective.
7. In the Source Route section, use the route picker tool to choose *Route1X* on the map.



Portion of the Source Route to be reassigned

The source route is the route that has the portion we are going to reassign. We'll take the lower portion of Route1X and assign it to an existing route Route1Y. Therefore, we'll split Route1X and merge the split part to Route 1Y.

8. Type 0 in the **From Measure** box.

The reassignment will commence from this location on Route1X.

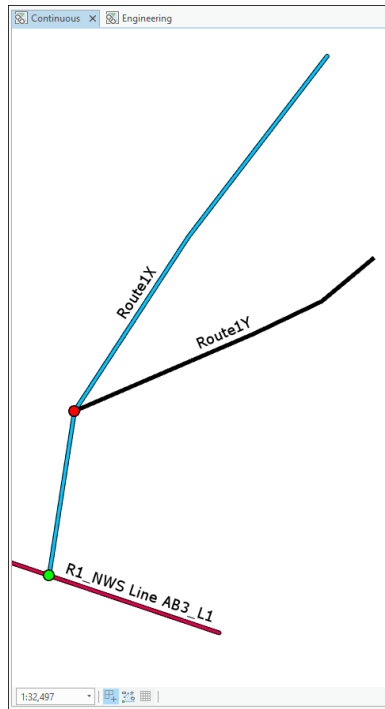
A green point ● gets dropped at the route start measure i.e. 0.

Alternatively, you can use the measure picker tool  to choose the measure from the map or check the **Use route start measure** option.

9. Type 5945.323 in the **To Measure** text box.

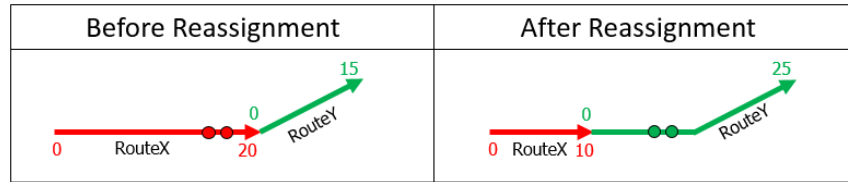
The reassignment will be effective up to this location on Route1X.

A red point ● gets dropped at that measure. The portion of Route1X between the green and the red dots will be reassigned to another route (Route1Y).



Choosing the from and to measures of the portion of the route to be reassigned

10. Ensure the **Recalibrate route downstream** option is checked.
This action will assign the length to Route1Y and recalibrate measures of Route1X.
11. In the Target Route section, use the route picker to choose *Route1Y*.
The reassigned portion gets added to this target route.
The From Measure and To Measure values are auto-populated.
The From Measure value is calculated as the source geometry length minus (-) the To Measure value. This value is the from measure value on the portion to be added to Route1Y.
The To Measure value is calculated as the source geometry length plus (+) the From Measure value. This value is the to measure value on the portion to be added to Route1Y.
Alternatively, you can type the measure values of your choice. These measure values are valid for the reassigned portion getting added to the target route.
12. Ensure the option to **Recalibrate route downstream** is checked.
This allows the length of the reassigned portion will be added to the target route.
13. Check the **Transfer calibration points to target route** option.
The non-end calibration points (the points that are located between the start and end of the route) that were part of the reassigned portion of the source route (Route1X) will get transferred to the target route (Route1Y).



Transferring the calibration points from the source route to the target route

Location Referencing

Reassign Route

Network
P_ContinuousNetwork

Effective Date
8/15/2016

Source Route

Route Name
Route1X

From Measure (in feet)
0.000
☐ Use route start measure

To Measure (in feet)
5945.323
☐ Use route end measure
☒ Recalibrate route downstream

Target Route

Route Name
Route1Y

From Measure (in feet)
0.000

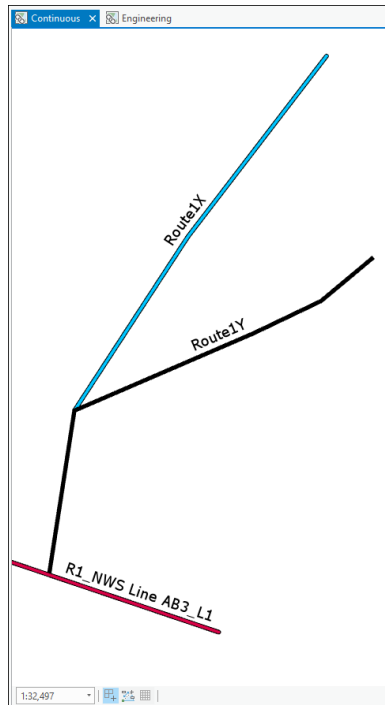
To Measure (in feet)
5945.323

☒ Recalibrate route downstream
☒ Transfer calibration points to target route

Run ▶

The reassign route dialog

- Click **Run**.
The portion of route Route1X will get reassigned.

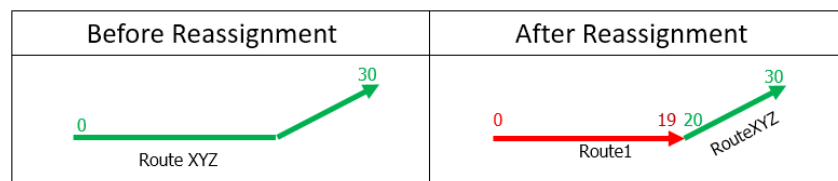


The lower portion of Route1X gets reassigned to Route1Y

15. Identify the reassigned part and confirm that it is now part of Route1Y.
16. Use the **Time Slider** to view the status of the route before the reassignment.
17. Do not save any edits.

Reassign part of a route to a new route

- Reassigning part of a route to a new route (route split)



A part of RouteXYZ is split into a new route Route1

Data

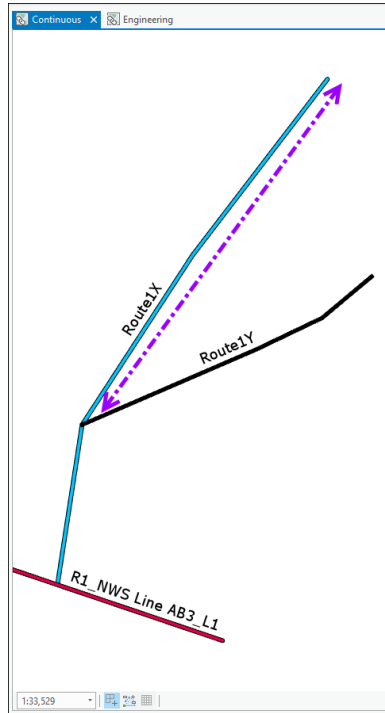
- Data\Exercise 1-Route Editing\Reassign

Methodology

1. Click the **Location Referencing** ribbon and in the Routes section, click **Reassign**.
2. Click **Map>Bookmarks** and click **Reassign to a new route**.
3. Click on the left of the Continuous map.
In the Reassign Route dialog box,
4. Ensure that *P_ContinuousNetwork* is set in the **Network** parameter.

The route to be reassigned belongs to this network.

5. Click the **Effective Date** calendar button and choose 8/15/2016 as the date for reassignment.
6. In the Source Route section, use the route picker tool to choose *Route1X* on the map.



This part of Route1X will be split into a new route

The source route is the route portion which we are going to reassign. We'll take a part of Route1X as shown in the map and assign it to a new route, *Route5D*.

7. Type 5945.323 in the **From Measure** text box.
The reassignment commences from this location.
A green point gets dropped at that measure on the route. Alternatively, you can use the measure picker tool to choose the measure from the map.
8. Check the **Use route end measure** check box to populate the **To Measure** text box.
The reassignment is valid up to this location.
A red point gets dropped at that measure. The portion of Route1X between the green and the red dots will be reassigned to a new route.
9. Uncheck the **Recalibrate route downstream** option, since we are already reassigning to the end of the route.
10. In the Target Route section, type *Route5D* or a name of your choice for a new route.
The reassigned portion gets converted to this new route.
11. The From Measure value of this new route starts at 0 but you can edit it.
12. Click the **To Measure** calculator.
The To Measure value is calculated as the source geometry length plus (+) the From

Measure value. Alternatively, you can type the measure value of your choice. These measure values will be the From and To Measures of the new route.

13. Uncheck the **Recalibrate route downstream** option.

Location Referencing

Reassign Route

Network
P_ContinuousNetwork

Effective Date
8/15/2016

Source Route

Route Name
Route 1X

From Measure (in feet)
5945.323
☐ Use route start measure

To Measure (in feet)
21515.040
☒ Use route end measure
☒ Recalibrate route downstream

Target Route

Route Name
Route 5D

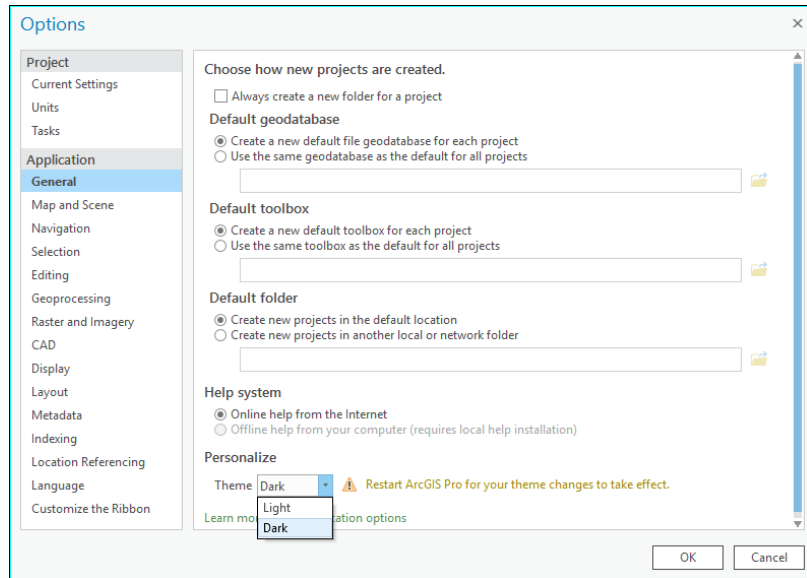
From Measure (in feet)
0.000

To Measure (in feet)
15569.717
☐ Recalibrate route downstream
☒ Transfer calibration points to target route

Run ►

The reassign route dialog

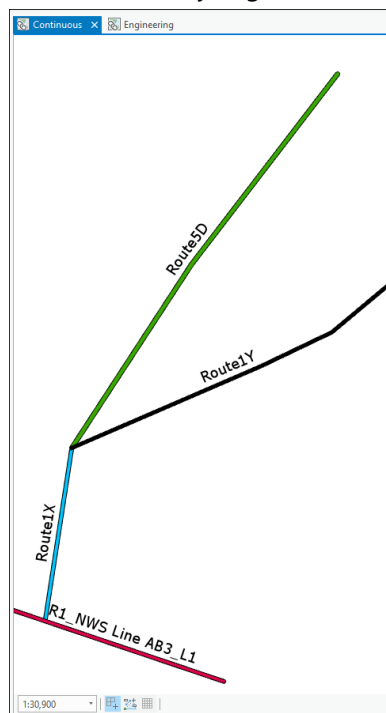
Note: You can activate the ArcGIS Pro dark mode by going to **Project>Options>Application>General>Personalize>Theme**.



Invoking the dark mode for ArcGIS Pro

14. Click **Run**.

The portion of route Route1X will get reassigned to a new route, *Route5D* (or whichever name you gave it).

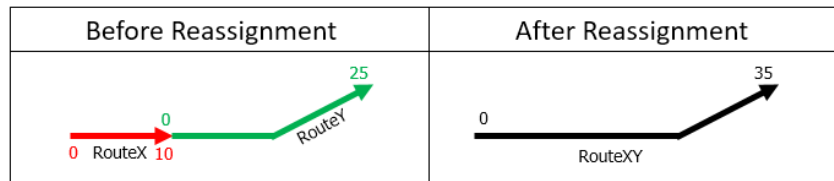


The part of the route is reassigned to a new route

15. Use the identify tool on the reassigned part to verify that that it now belongs to the new route.
16. Use the **Time Slider** to view the status of the route before the reassignment.
17. Close ArcGIS Pro without saving the edits.

Merge multiple routes to a new route

- Merge multiple routes to a new route



RouteX and RouteY will be merged to a new route RouteXY

Data

- Data\Exercise 1-Route Editing\Reassign

Layers Needed

- Network

Methodology

1. Open project *Reassign*.
In this project we have two maps:
 - a) Continuous: with Continuous network
 - b) Engineering: with Line network
2. Click on the right of the *Engineering* map.
3. Click **Map>Bookmarks** and choose **Reassign: Merge**.
4. Click the **Location Referencing** ribbon and in the Route Editing section, click **Reassign**.
In the Reassign Route dialog box
 5. Ensure that *P_EngineeringNetwork* is set in the **Network** parameter.
We will reassign routes that belong to this network.
 6. Click the **Effective Date** calendar button and choose 8/15/2016 as the date for reassignment
This is the date when the reassignment becomes effective.
 7. In the Source Route section, use the route picker tool to choose *RouteB1* on the map as the From Route name.

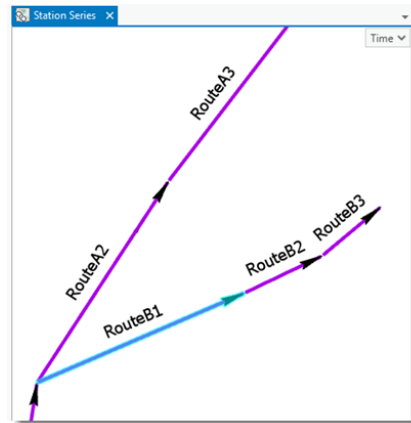


Figure 2. Choose routes for reassignment

You will now merge routes RouteB1, RouteB2 and RouteB3 that belong to the line to make a new route named RouteG1.

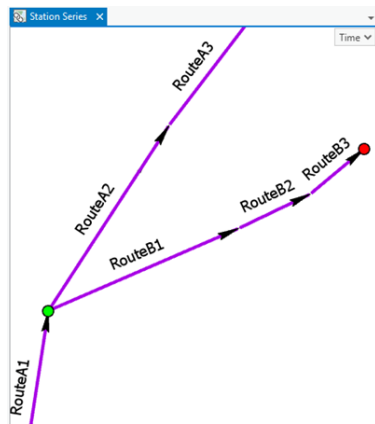
8. Check the **Use route start measure** check box.

A green point gets dropped at the route's start measure i.e. 0. The reassignment will start from this location.

9. Use the route picker tool to choose *RouteB3* on the map as the To Route name.

10. Check the **Use route end measure** check box.

A red point gets dropped at the route's end measure i.e. 11863.613. The reassignment will be valid up to this location.



The start and end locations for the reassignment

11. Uncheck the **Recalibrate route downstream** check box since you are reassigning to the end of the route.
12. In the Target Route section, type *RouteG1* or a name of your choice for a new route.
The reassigned routes will be merged to the new route.
The From Measure value of this new route starts at 0 but you can edit it.
13. Click the **To Measure** calculator.

The To Measure value is calculated as the source geometry length plus (+) the From Measure value. Alternatively, you can type the measure value of your choice. These measure values will be the From and To Measures of the new route.

14. Check the **Transfer calibration points to target route** check box.

This allows the calibration points that are located between the start and end of the route, that were part of the reassigned portion of the source route, to get transferred to the target route.

The screenshot shows a software dialog box titled "Location Referencing" with a sub-header "Reassign Route". It contains the following fields and options:

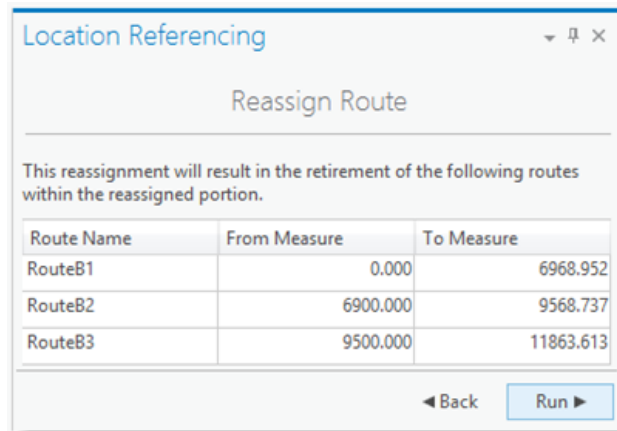
- Network:** A dropdown menu showing "P_Engineering_Network".
- Effective Date:** A text field showing "8/15/2016" with a calendar icon to its right.
- Source Route:**
 - From Route Name:** A dropdown menu showing "RouteB1".
 - From Measure (in feet):** A text field showing "0.000" with a calculator icon to its right.
 - ☒ *Use route start measure*
 - To Route Name:** A dropdown menu showing "RouteB3".
 - To Measure (in feet):** A text field showing "11863.613" with a calculator icon to its right.
 - ☒ *Use route end measure*
 - ☒ *Recalibrate route downstream*
- Target Route:**
 - Route Name:** A text field showing "RouteG1" with a calculator icon to its right.
 - From Measure (in feet):** A text field showing "0.000" with a calculator icon to its right.
 - To Measure (in feet):** A text field showing "12001.302" with a calculator icon to its right.
 - ☒ *Transfer calibration points to target route*

At the bottom right of the dialog is a "Next ►" button.

The reassign route dialog

15. Click **Next**.

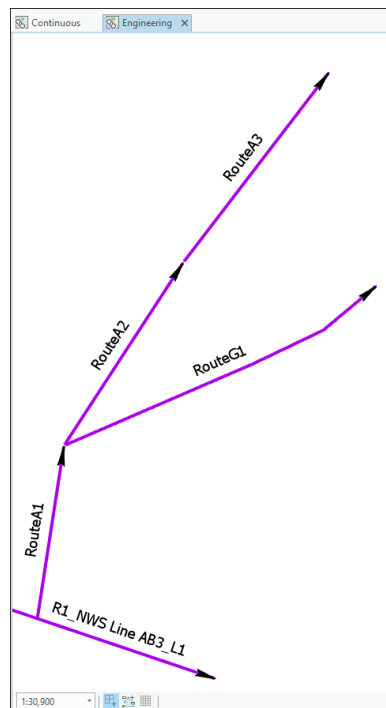
The retirement portion of the input routes are shown in the table.



The routes to be retired

16. Click **Run**.

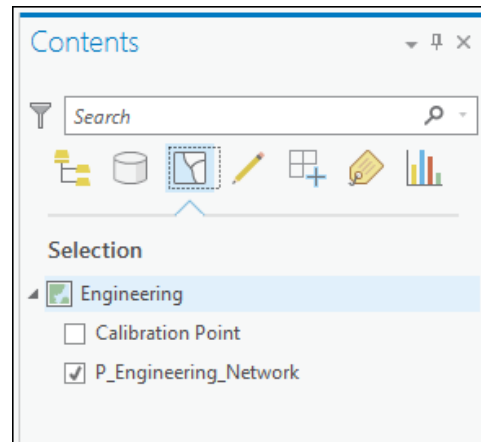
The routes get reassigned to the new route RouteG1.



The routes get merged

17. Click the **Identify Routes** tool and click on the reassigned part to verify that it now belongs to the new route RouteG1.

Tip: Make sure to turn the selection of your network on before clicking the **Identify Routes** tool.



Choosing the selectable layers

18. Use the **Time Slider** to view the status of the route before the reassignment.
19. Close ArcGIS Pro without saving edits.

Cartographic Realignment

ArcGIS Pro

ArcGIS Pipeline Referencing allows you to change the shape of centerlines and preserve the calibration of the underlying routes as they existed before the cartographic realignment was applied.

The centerline used in this exercise already exists in the tutorial data.

Objective

- Perform a cartographic realignment of an underlying centerline feature of a route. This will be done to correct the geometry against updated aerial imagery.
- Verify that both networks are affected by the cartographic realignment.

Note

- Editing the shape of a centerline will result in the modification of the shape of all routes in all LRS networks that reference that centerline. An edit to a centerline geometry is considered a correction to the shape and will also impact all routes associated across all time spans, including any retired routes.

Data

- Data\Exercise 1-Route Editing\Cartographic Realignment

ArcGIS Pro Project Name

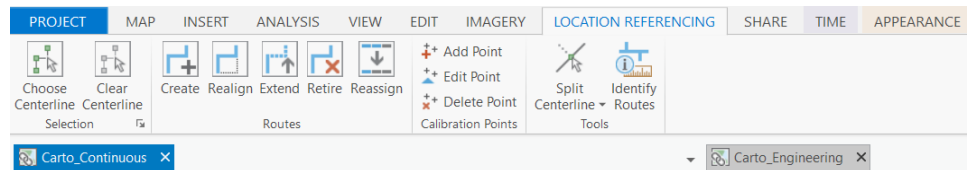
- CartoRealign

Layers Needed

- Centerline
- Network

Methodology

- Open the *CartoRealign* project and verify the *Carto_Continuous* map is active.



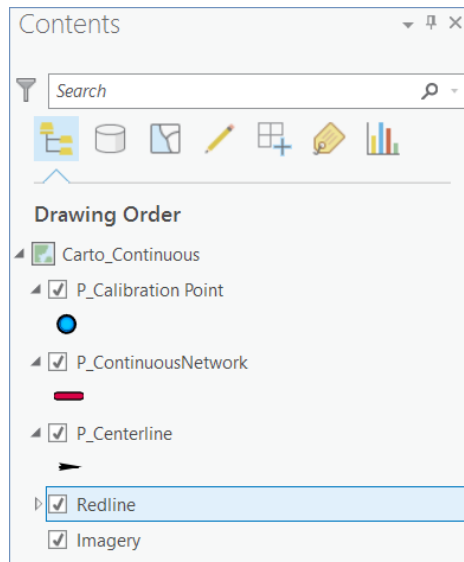
There is also a map called *Carto_Engineering* that contains an Engineering Network that supports lines. This map participates in a linked view and will automatically follow your progress as you complete this exercise in the *Carto_Continuous* map.

- Click **Map>Bookmarks**, and under *Carto_Continuous* Bookmarks, choose *CartoRealign*.

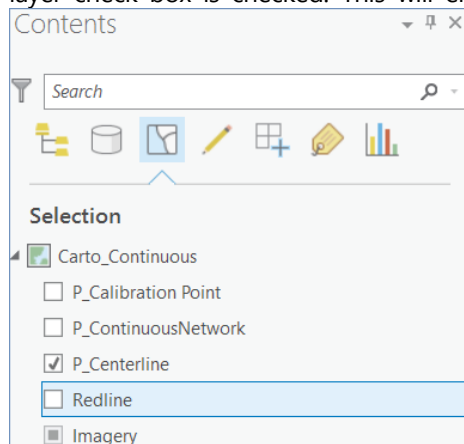
You can tell there is a clearing in the tree cover in the middle of the image, which is where the pipeline is actually routed. *Route41* needs to be cartographically realigned so that the digital route corresponds with the actual route on the ground.



3. Turn on the **Redline** layer for the **Carto_Continuous** map within the **Drawing Order** tab of the **Contents** pane.

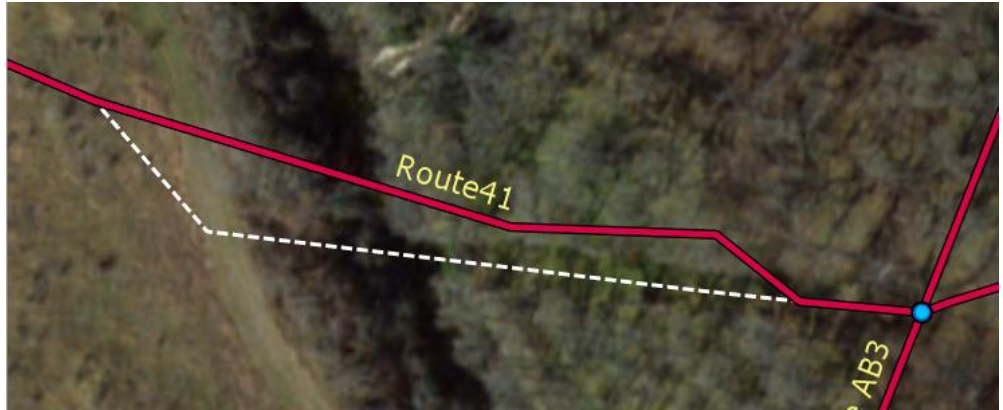


4. Switch to the **Selection** tab of the **Contents** pane and verify only the **P_Centerline** layer check box is checked. This will ensure you only edit the centerline feature.



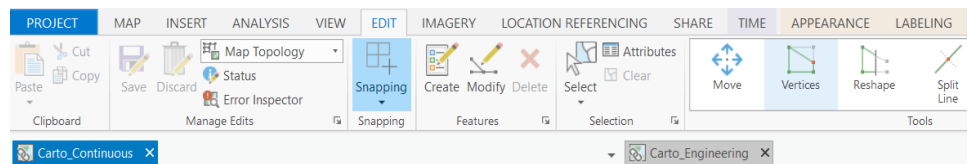
5. Shown in the next image, you can now see a dashed white line that shows what the course of the pipeline should be based on the updated imagery.

Editing the geometry of a route outside of the Location Referencing editing tools will corrupt the LRS Network. Always edit the underlying centerline if a shape correction is needed



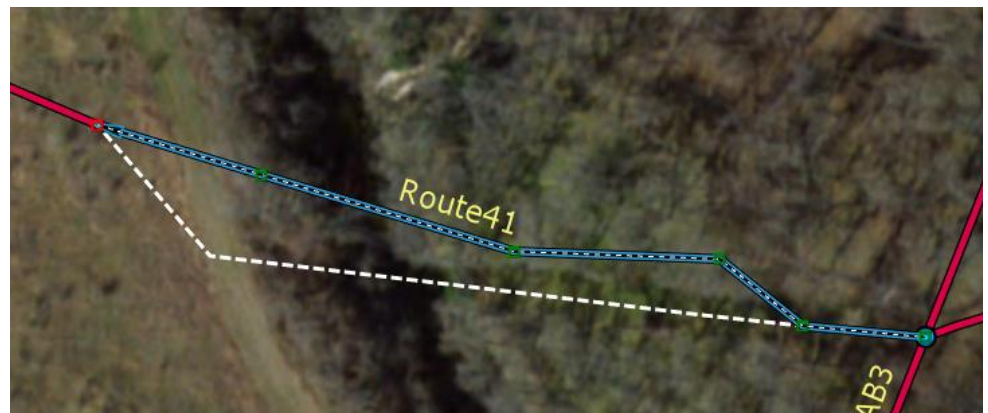
You will alter the vertices of the underlying centerline of *Route41* to align with the white line that falls within the clearing.

6. To edit the vertices of the centerline, go to the **Edit** ribbon tab and click on the **Vertices** button in the Tools section.



7. Click on *Route41*.

The vertices of the underlying centerline will be exposed, shown as green squares.



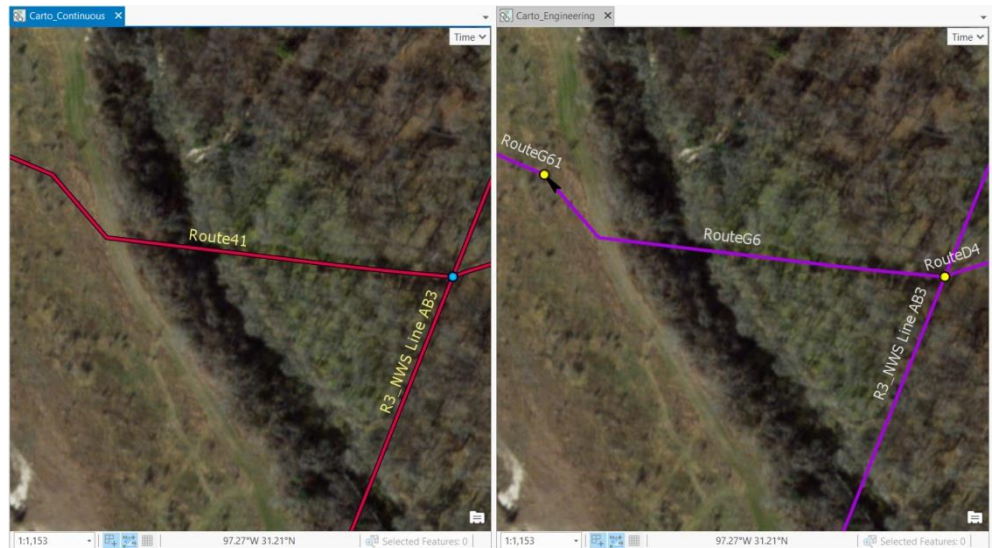
8. Edit the vertices so that the route will follow the clearing and align with the white line feature from the *Redline* layer. You can drag the vertices to snap to the white line.



9. Finish the operation by clicking anywhere in the map other than on a route.
10. Notice that *Route41* from the network in the *Carto_Continuous* map as well as *RouteG6* from the Engineering Network in the *Carto_Engineering* map have both snapped to the cartographically realigned centerline feature.

This edit will also cartographically realign representations of the route with dates in the past and the future that may not be shown in the map or in the attribute table based on the time filter that is set.

*Use the **Realign Route** tool in the **Location Referencing** ribbon to perform a route realignment at a specific point in time. You can use an existing centerline feature or draw a new feature for the realignment.*



This change in route geometry is effective for both the networks present in the ALRS because these two routes share the centerline feature that was edited.

The measures for the cartographically realigned routes were not changed, nor were the measures of the calibration points on these routes.

11. Use the ArcGIS Pro **Time Slider** experience to navigate through time. If you slide to a date prior to 8/15/2016, you will see that the route is still impacted by the cartographic realignment because it affects all representations of the route across time.
12. Close ArcGIS Pro without saving your edits or changes to the project.

Identify Routes Tool

ArcGIS Pro

In the **Identify Routes** dialog box, you can change the unit of measure, but by default it will select the networks unit of measure.

Objective

- Find the measure of a route where a pipeline crosses a body of water

Data

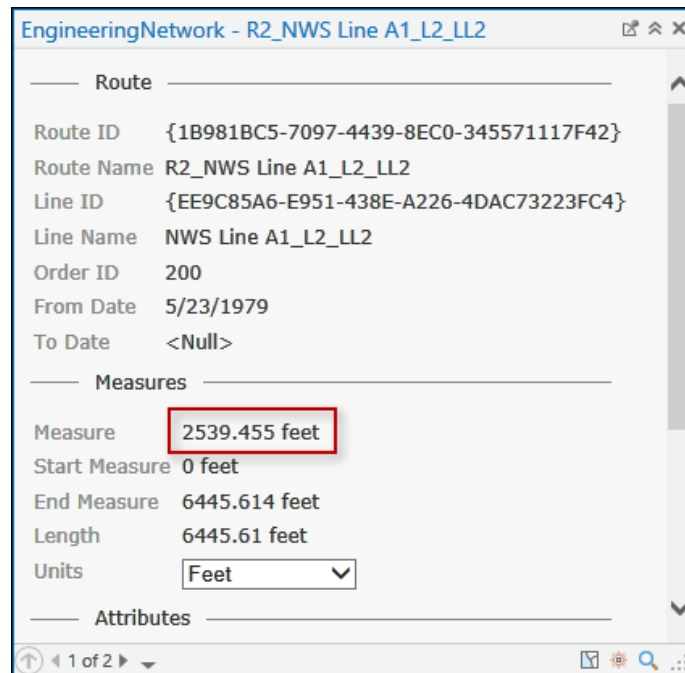
- Data\ Exercise 2-Editing Calibration Point

Layers Needed

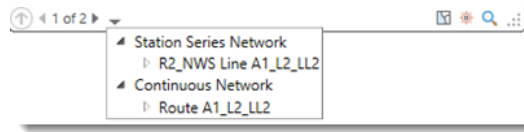
- Engineering Network
- Continuous Network

Methodology

- Open the *CP_CL_Editing.aprx* project.
- Click **Map>Bookmarks** and choose **Identify Measure**.
- On the **Location Referencing** ribbon click the **Identify Routes** button .
- Click on the route named *R2_NWS Line A1_L2_LL2*.
A dialog box appears.
- Look at the Measures section to find the exact measure on that location.



You can use the paging or drop-down control to look at the measure for all routes at that location.



Add Calibration Point

ArcGIS Pro

[Add Calibration Points](#)

Objective

- Add a calibration point at a specific location to set a certain measure at that location

Data

- Data\ Exercise 2-Editing Calibration Point

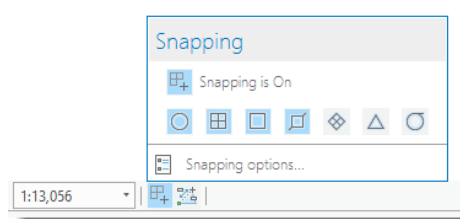
Layers Needed

- Engineering Network layer
- Engineering Calibration Point layer

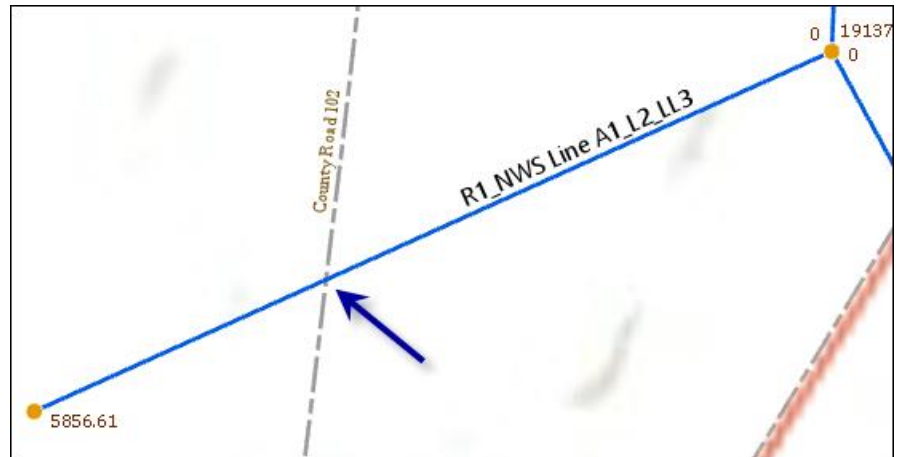
Methodology

There may be cases where engineering records or field surveys arrive with precise measures at specific locations along a route. To refine the accuracy of measures on the routes, calibration points can be added to specify a measure at a given location. The route is then recalibrated taking into account this specific measure at the location where a calibration point was added.

1. Open the *CP_CL_Editing.aprx* project.
2. Click **Map>Bookmarks** and choose **Add Calibration Point**.
3. Uncheck the **Continuous Network** layer in the table of contents to turn it off in the map.
4. Check the **TxDot_Roadways** layer to display it in the map.
5. Make sure snapping is enabled on the **Edit** ribbon.



6. Click the **Identify Routes** tool, and click route R1_NWS Line A1_L2_LL3 where the route and roadway (County Road 102) cross.



EngineeringNetwork - R1_NWS Line A1_L2_LL3

Route

Route ID {94B9D592-0458-4DA0-80D8-74A2996405B5}

Route Name R1_NWS Line A1_L2_LL3

Line ID {570800F6-C201-4FC9-A8B6-1CF25D46587B}

Line Name NWS Line A1_L2_LL3

Order ID 100

From Date 5/23/1979

To Date <Null>

Measures

Measure 3713.234 feet

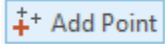
Start Measure 0 feet

End Measure 5856.611 feet

Length 5856.61 feet

Units

Attributes

7. Click other locations on the route to see the measures.
An engineering drawing shows a more accurate measure of 3950.5 feet at this location. To reflect this measure, a calibration point can be added.
8. Click the **Add Point** button  on the **Location Referencing** ribbon.
9. Click on the map where the pipeline and roadway intersect. The **Add Calibration Point** dialog box appears.
10. Update the **From Date** to 1/1/2017 and the **Measure** value to 3950.5.

If you had configured a Derived Network and wanted to update the measures on the Derived Network route, you would use the [Generate Routes](#) tool to apply the measure changes to the corresponding Continuous Network route.

Location Referencing

Add Calibration Point

Network
P_EngineeringNetwork

Route Name
R1_NWS Line A1_L2_LL3

From Date
1/1/2017

To Date

Measure (in feet)
3950.500

☐ Recalibrate route downstream

Run ►

11. Click **Run**.



12. Click the **Identify Routes** tool, and click the locations on the route you selected during Steps 6 & 7. See how the measures have changed at those locations now that the calibration point was added.

Edit Calibration Point

ArcGIS Pro

[Edit Calibration Points](#)

Objective

- Update the calibration of a route without editing the shape

Data

- Data\Exercise 2-Editing Calibration Point

Layers Needed

- Engineering Network layer
- Engineering Calibration Point layer

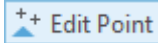
Methodology

There may be times where more accurate measures are provided for a location where a calibration point already exists. In this case, you can edit the existing calibration point measure or time range that is active with the **Edit Calibration Point** tool. After editing the calibration point, the updated measure/dates are applied to the route to recalibrate it.

1. Open the *CP_CL_Editing.aprx* project.
2. Click to **Map>Bookmarks** and choose **Edit Calibration Point**.
3. Uncheck the **Continuous Network** layer in the table of contents to turn it off in the map.
4. Click the **Identify Routes** tool, and click route *R1_NWS Line A1_L2_LL4* at various locations to see the measures.

An engineering drawing provided shows that route R1_NWS Line A1_L2_LL4 has an end measure of 4511.6 instead of the current 4821.09.



5. Click the **Edit Point** button  on the **Location Referencing** ribbon.

6. Click the calibration point at the end of route with measure 4821.09.

Location Referencing

Edit Calibration Point

Network
P_EngineeringNetwork

Route Name
R1_NWS Line A1_L2_LL4

From Date
5/23/1979

To Date

Measure (in feet)
4821.087

☐ Recalibrate route downstream

Run ►

The **Edit Calibration Point** dialog appears.

7. Update the existing measure to 4511.6.

Location Referencing

Edit Calibration Point

Network
P_EngineeringNetwork

Route Name
R1_NWS Line A1_L2_LL4

From Date
5/23/1979

To Date

Measure (in feet)
4511.600

☐ Recalibrate route downstream

Run ►

8. Click **Run**.

The calibration point measure as well as the calibration of the route are updated.



9. Click the **Identify Routes** tool and click the locations on the route you selected during Step 4.

See how the measures have changed at those locations now that the calibration point was edited.

Delete Calibration Point

ArcGIS Pro

[Delete Calibration Points](#)

Objective

- Delete the route calibration point that was added erroneously

Data

- Data\ Exercise 2-Editing Calibration Point

Layers Needed

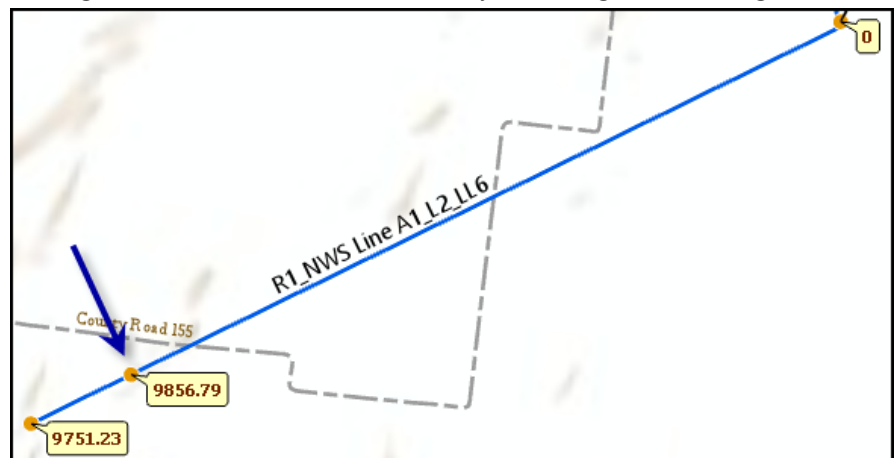
- Engineering Network layer
- Engineering Calibration Point layer

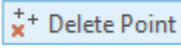
Methodology

There are potential situations where calibration points were erroneously added to a route and need to be removed. The **Delete Calibration Point** tool will delete a calibration point from a given location and recalibrate the route using the nearest upstream and downstream calibration points from the location.

1. Open the *CP_CL_Editing.aprx* project.
2. Click **Map>Bookmarks** and choose **Delete Calibration Point**.
3. Click the **Identify Routes** tool and click route *R1_NWS Line A1_L2_LL6* at various locations to see the measures.

Notice there is a calibration point with measure 9856.79 along the route causing it to be non-monotonic (not strictly increasing or decreasing).



4. Click the **Delete Point** button  on the **Location Referencing** ribbon.
5. Click the calibration point of route with measure 9856.79.

*Note that deleting a calibration point is not the same thing as retiring a calibration point. Retiring a calibration point would involve populating the retire, or to date on an existing calibration point. You would use the **Edit Calibration Point** tool for that workflow.*

Location Referencing

Delete Calibration Point

Network
P_EngineeringNetwork

Route Name
R1_NWS Line A1_L2_LL6

From Date
5/23/1979

To Date

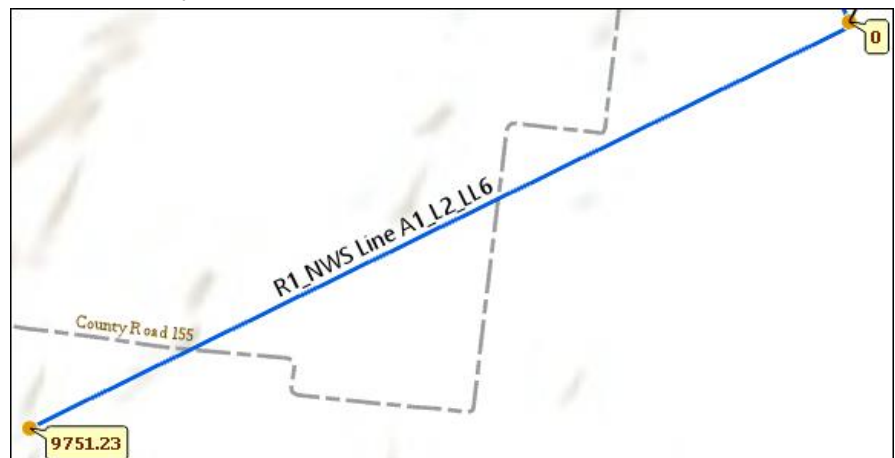
Measure (in feet)
9856.79

Run ►

The **Delete Calibration Point** dialog box appears.

- Click **Run**.

The calibration point is deleted and the route is recalibrated.



- Click the **Identify Routes** tool and click the locations on the route you selected during Step 3.

See how the measures have changed at those locations now that the calibration point was deleted and how the route is strictly increasing.

- Close the ArcGIS Pro project. Click **No** if prompted to save changes.

Apply Event Behavior

ArcGIS Pro
Updates the
event locations
for all event
feature classes
registered with
the network.

Objective

In this exercise you will learn how to apply event behaviors when route edit activities are performed. To achieve this, you will first extend an existing route in an Engineering Network. Then you will run the **Apply Event Behaviors** geoprocessing tool to observe how the event(s) location and/or measure get updated.

Data

- Data\ Exercise 3-GP Tool Applying Event Behaviors

ArcGIS Pro Project Name

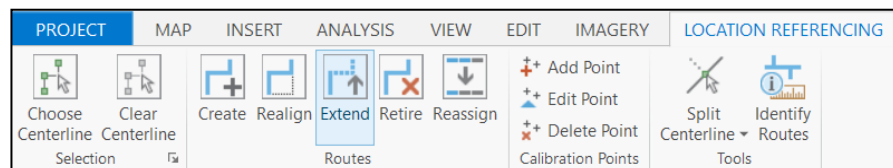
- ApplyEventBehavior

Map to Use

- Extend Route
- Event Behaviors

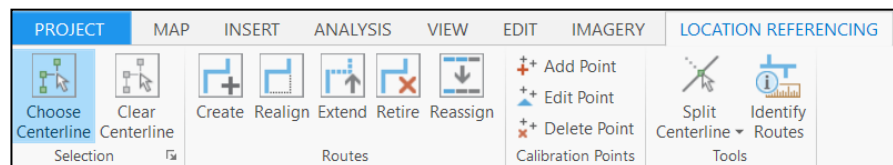
Methodology

- Open project *ApplyEventBehavior.aprx* from the folder ApplyEventBehavior.
In this project you have two maps:
 - Extend Route: consists of route, centerline and calibration point layers to perform the extend activity.
 - Event Behaviors: consists of route and event layers to apply event behaviors.
- Verify the **Extend Route** map is active.
- Click **Map>Bookmarks** and choose **Extend**.
- Click the **Location Referencing** ribbon and in the Routes section, click on **Extend**.



The **Extend Route** pane appears.

- Click the **Location Referencing** ribbon and click **Choose Centerline**.



- You will now select a centerline feature (see the next figure) to be used to extend a route.

Notice the arrows that appear when a centerline is selected. These show the direction of digitization.



A centerline that is selected with this tool will automatically be input into the active **Extend Route** pane. You can use the **Clear Centerline** tool if you need to change your selection.

7. Use the route picker tool from within the **Extend Route** pane to choose the route *R1_NWS Line AB2_L5* from the map.

The route that is chosen at this step will be extended onto the currently selected centerline features.

8. Click the **Effective Date** calendar button and choose *1/19/2017*.

The effective date will be the date which this edit operation takes place within the LRS Network. Prior to this date, the route extension will not exist as it has not occurred yet.

9. Accept the default value for the **From Measure** parameter.

Alternatively, you could type a value. The from measure is the measure of the selected route at which the extension will begin. In this case, it is the end measure of the selected route.

10. Accept the default value for the **To Measure** parameter.

Alternatively, you could type a value. The to measure will be the end measure of the extended route.

11. Prior to clicking the **Run**, your tool input should look like the following image:

The from measure and to measure values are automatically populated with the geometric length of the chosen centerline(s). Alternatively, you can type a value of your choice.

To learn more on extend edit activity events, see [Extend](#)

To learn more on configuration of events, see [Configuration of event behavior rules in ArcMap.](#)

To learn more on event behavior concepts, see [What is event](#)

Extend Route: NWS Line AB2_L5

Network
EngineeringNetwork

Route Name
R1_NWS Line AB2_L5

Effective Date
1/19/2017

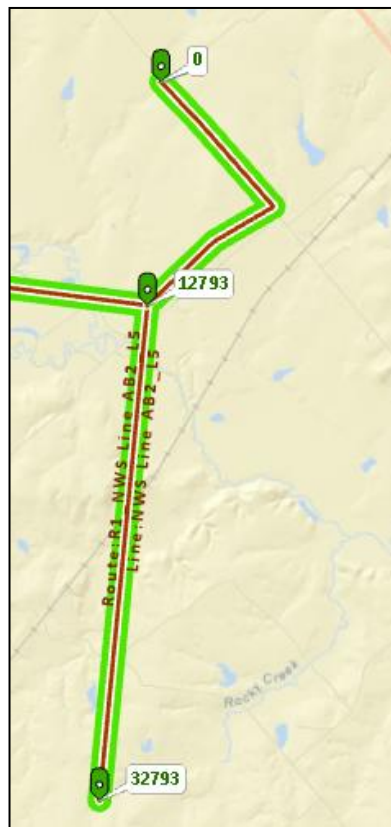
Extended Section

From Measure (in feet)
0.000

To Measure (in feet)
12793.089

12. Click **Run**.

Route *R1_NWS Line AB2_L5* is extended, as of 01/19/2017



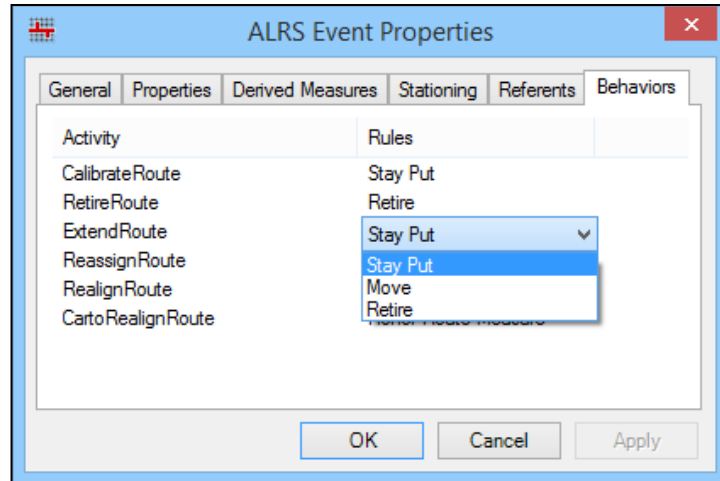
Events so far have not been updated to reflect new measures or location. You will now continue to the next part of the exercise to update event behaviors.

13. Click **Map>Bookmarks** and choose **Event Behavior**.

For this exercise, event and their behaviors are already configured.

14. Optionally, you can open ArcCatalog and browse to **ApplyEventBehavior>ApplyEventBehavior.GDB>ALRS>EngineeringNetwork**. Right-click on any of the events, click **Properties** and click the **Behaviors** tab to see event behavior configuration.

[behaviors?](#)

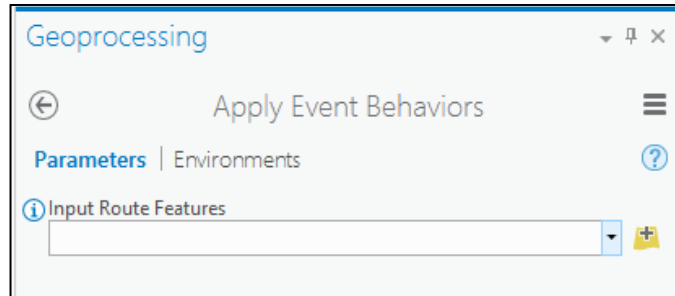


15. Before you update events, let's take a closer look at the event layers in the map.
 - DOTClass polyline event layer is configured to Retire. The retire behavior preserves both measure and geographic location; event is retired.
 - OperatingPressure polyline event layer is configured to Stay Put. The stay put event behavior preserves the geographic location of the event; measures may change.
 - Document point event layer is configured to Move. The move event behavior preserves the measure or measures of the event; geographic location may change.
16. Click **Map>Explore** and identify the following event layers for the route that you just extended and note the event's From Measure, To Measure, From Date and To Date fields.

Before running **Apply Event Behaviors** tool

Route Name	Event Layer	From Measure	To Measure	From Date	To Date
R1_NWS Line AB2_L5	DOT Class	0	19335.702	1/1/2000	<Null>
	Operating Pressure	0	19335.702	1/1/2000	<Null>
	Document	0	n/a	8/9/1987	<Null>

17. Open the **Apply Event Behaviors** geoprocessing tool.
 - a. Within the **Analysis** tab, click **Tools**.
 - b. On the **Geoprocessing** dialog box, within Find Tools, type *apply event*, and click on the **Apply Event Behaviors** tool



18. Click the **Input Route Features** drop-down arrow and choose *Engineering Network*.

19. Click **Run**.

A message should appear after the tool runs stating it has completed successfully.

Note that after running tool event layers got updated based on the event configuration.

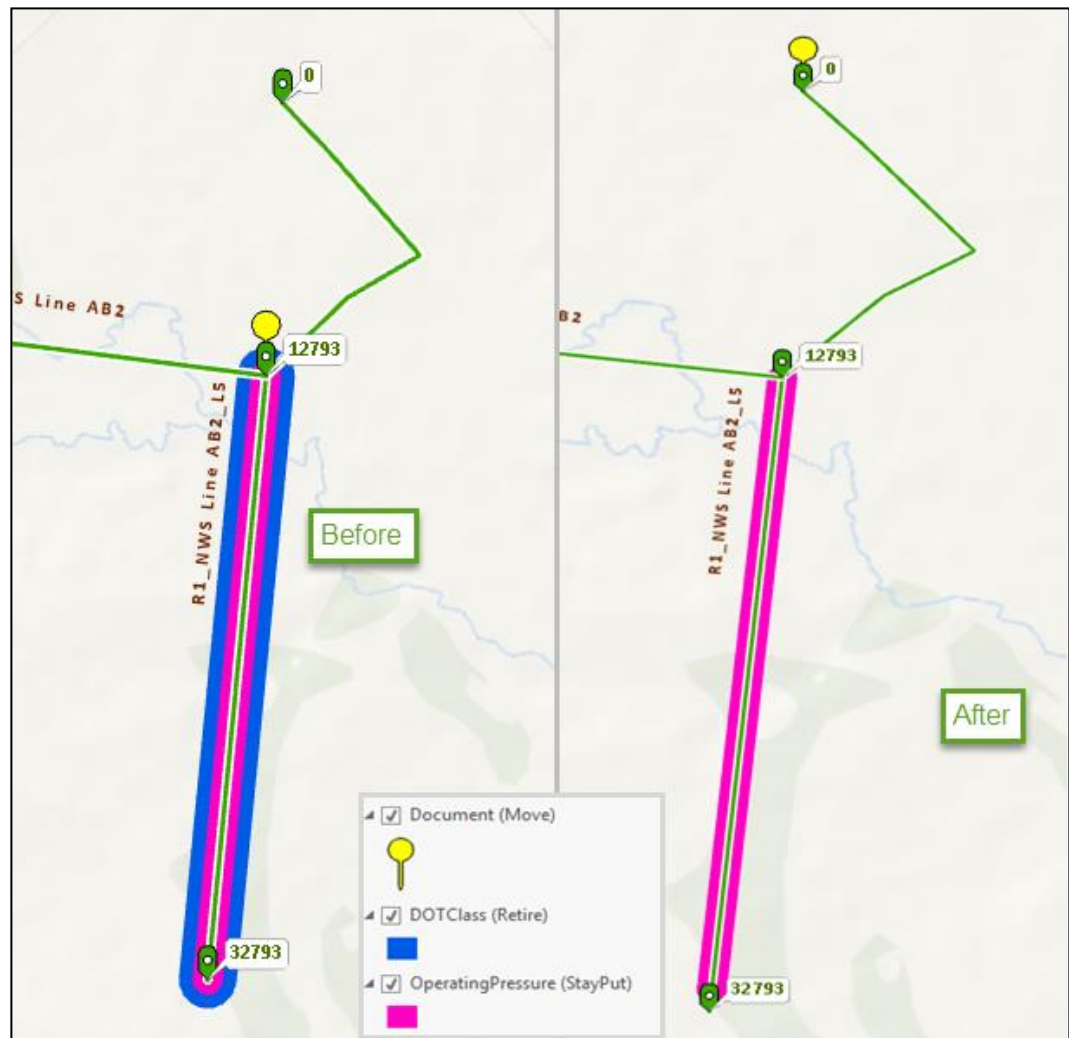
20. Click **Map>Explore** and identify the following event layers to note the event's From Measure, To measure, From Date and To Date fields.

After running **Apply Event Behaviors** tool

Event Layer	From Measure	To Measure	From Date	To Date
DOT Class				
Operating Pressure				
Document				

For more information,
see [Time awareness in
Pipeline Referencing](#).

21. Use the ArcGIS Pro **Time Slider** experience to navigate through time. If you slide to a date prior to the route extension effective date of 1/19/2017, you will not be able to see the extended route or updated events.



- DOTClass event is retired.
- OperatingPressure stay put event behavior preserved the geographic location of the event; measures changed.
- Document point event moved by preserving the measure of the event; geographic location got updated based on measure values.

Derived Network Workflow

ArcGIS Pro

To understand concepts of a Derived Network, see [What is an LRS network?](#)

To learn more on configuring a Derived Network, see [Creating an LRS Derived Network](#)

To learn more on Generate Routes, see [Generate Routes](#)

Objective

In the previous exercise you extended an existing route in an engineering network. Event behaviors were then applied using the **Apply Event Behaviors** geoprocessing tool.

In this exercise, you will learn to:

- Use the **Generate Routes** geoprocessing tool to update a Derived Network based on route edit activities that you have performed on your Engineering Network.
- Use the **Derive Event Measures** geoprocessing tool to update derived measures for events.

Data

- Data\Exercise 4-Updating Derived Networks and Event Measures

ArcGIS Pro Project Name

- DerivedNetwork

Map to Use

- Generate Routes
- Derived Event Measures

Methodology

Generate Routes

In this exercise, a Derived Network has already been registered. When a Derived Network is configured against an Engineering Network, running the **Generate Routes** tool will also update the Derived Network. The following steps outline the workflow to update a Derived Network.

1. Open project *DerivedNetwork.aprx* from the folder DerivedNetwork.

In this project we have two maps:

- a. **Generate Routes** : consists of route, centerline and calibration point layers to update the derived network.
 - b. **Derived Event Measures** : consists of route and event layers to update derived event measures.
2. Verify the *Generate Routes* map is active.
 3. Click **Map>Bookmarks** and choose **Generate Routes**.
 4. Open the **Generate Routes** geoprocessing tool.
 - c. Within the **Analysis** tab, click on **Tools**.
 - d. On the **Geoprocessing** dialog box, within the Find Tools search, type *generate routes*, and click on the **Generate Routes** tool.

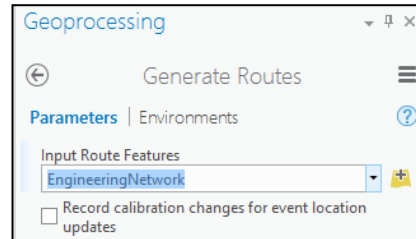
The geoprocessing tool will run on the full layer input, or on a selected set of

features.

Next, you will select the newly extended route in the Engineering Network.

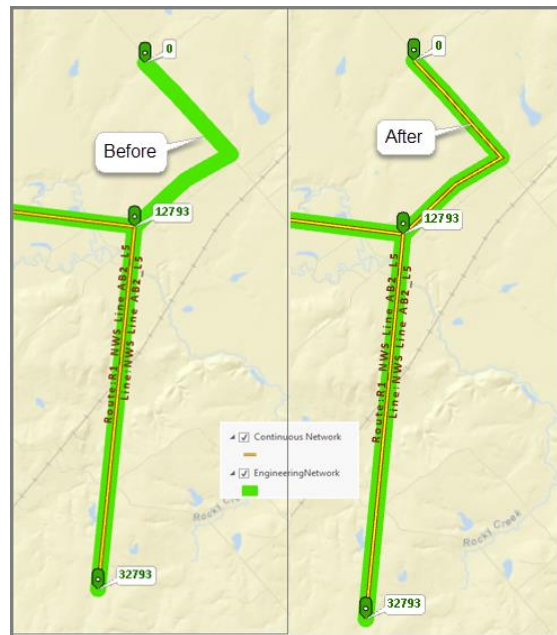
5. In the **Edit** tab, click the **Select** tool.
6. Click and drag across the extended route to select it.
7. Click the **Input Route Features** drop-down arrow and choose *Engineering Network*.

Since no calibration points have been created, modified or deleted outside the ArcGIS Pipeline Referencing tools, there is no need to check the option to **Record calibration changes for event location updates**.



8. Click **Run**.

A message should appear after the tool runs stating it has completed successfully.



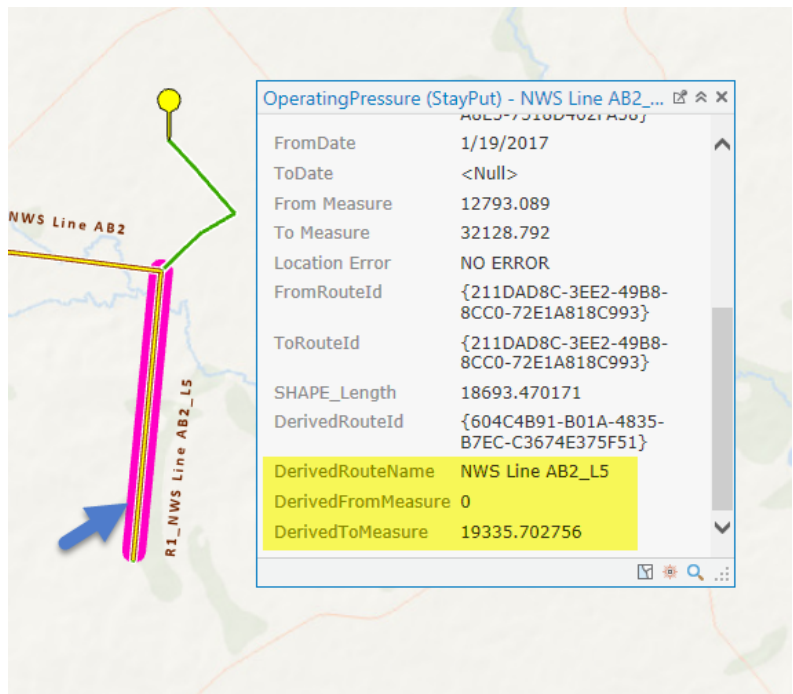
To learn more on configuring **Derived Event Measures**, see— [Maintain Route and Measure fields for derived network](#)

Derive Event Measure

In this part of the exercise, you will update derived measures for all the events that are registered to the Engineering Network. Derived event measure fields have already been configured for the events.

In the previous steps, you ran the **Generate Routes** geoprocessing tool to update the Derived Network. The following steps outline the workflow to maintain route and measure fields for a Derived Network.

1. Verify the *Derive Event Measures* map is active.
2. Go to **Map>Bookmarks** and choose **Derive Event Measures**.
3. In the **Map** tab, click the **Explore** tool.
4. On the map, click (identify) the Operating Pressure (Stay Put) event layer and note the **DerivedFromMeasure** and **DerivedToMeasure** fields.



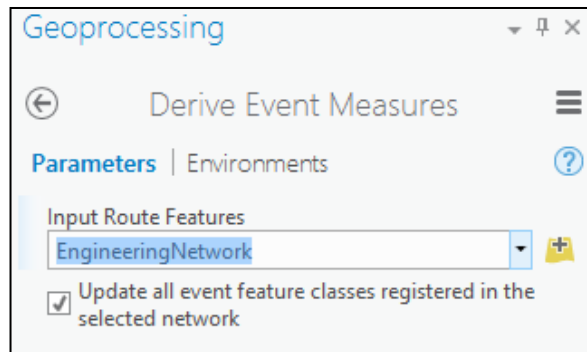
*Note: The tool is designed to be executed as part of a larger workflow. The [Apply Event Behaviors](#) and [Generate Routes](#) tools should be run before executing **Derive Event Measures**. Running this tool without running the previous tools in the workflow may result in inaccurate data.*

5. Open the **Derive Event Measures** geoprocessing tool.
 - a. Within the **Analysis** tab, click **Tools**.
 - b. On the **Geoprocessing** dialog box, within the Find Tools search, type *Derive Event Measures*, and click on the **Derive Event Measures** tool.

The geoprocessing tool can be run against one, multiple, or all events within a line network.

6. Click the **Input Route Features** drop-down arrow and choose *Engineering Network*.

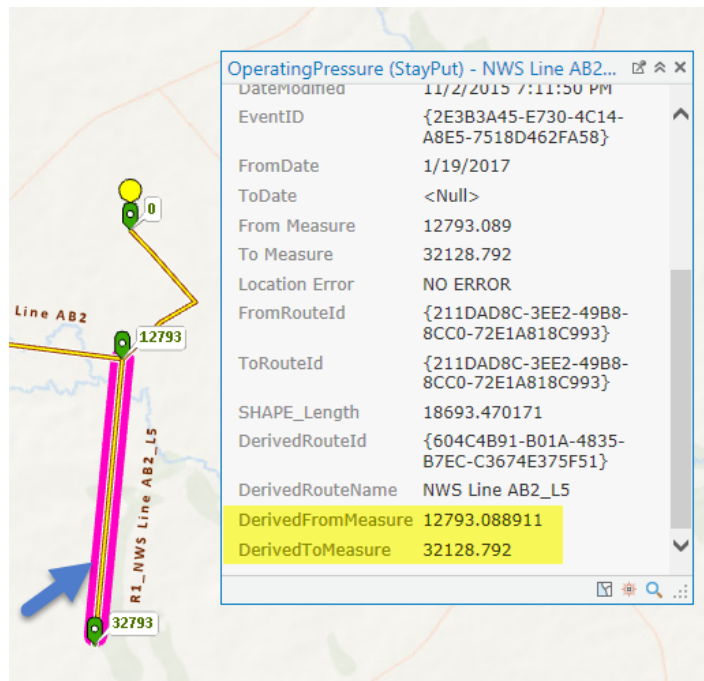
Check the **Update all event feature classes registered in the selected network** check box.



7. Click **Run**.

A message should appear after the tool runs stating it has completed successfully.

8. On the map, click (identify) the Operating Pressure (Stay Put) event layer and note the **DerivedFromMeasure** and **DerivedToMeasure** fields. Note that they have been updated.



To learn more on Derive Event Measures, see [Derive Event Measures](#)

Overlay Events

ArcGIS Pro

The *Overlay Events*

geoprocessing tool overlays one or more linear event feature layers against a target network feature class and outputs a feature class or table that represents the dynamic segmentation of the inputs.

The valid input for this tool is one or more linear event layers that are registered with a Pipeline Referencing LRS network.

This is a representation of the route and the event features as of the date 8/15/2016. For this exercise the route is not represented by any other time slices, but be aware that this tool is time-aware and will dynamically segment routes and events across time.

Objective

- Dynamically segment linear event layers using the **Overlay Events** geoprocessing tool
- Observe the dynamic segmentation in the output feature class

Data

- Data\Exercise 5-GP Tool Overlay Events

ArcGIS Pro Project Name

- OverlayEvents

Layers Needed

- Network
- Event Layers

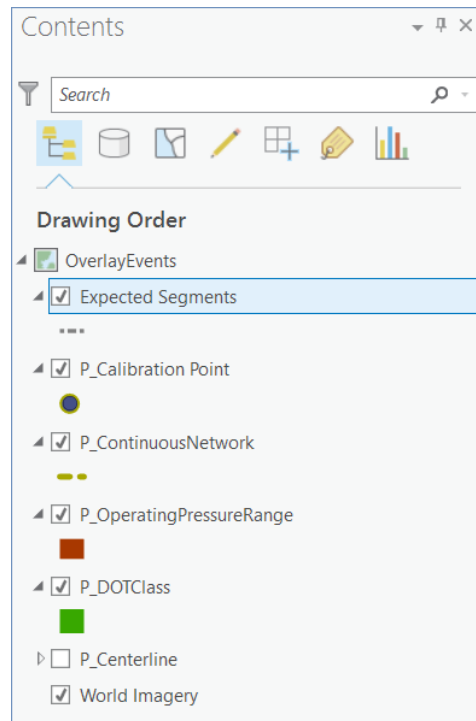
Methodology

1. Open the *OverlayEvents* project.
2. Click **Map>Bookmarks**, and under *OverlayEvents* Bookmarks, choose **OverlayEvents**.
3. Observe the relationship between the route and the events shown in the map:
 - *Route AB2* shown in yellow has measures of 0 to 150000
 - The linear event *P_OperatingPressureRange* contains a feature shown in red that is located along *Route AB2* between the measures of 25000 and 125000
 - The linear event *P_DOTClass* contains a feature shown in green that is located along *Route AB2* between the measures of 50000 and 100000



4. Turn on the *Expected Segments* layer in the **Contents** pane so that you can see how the route will be segmented based on where the event features are

located and where the event features overlap with either the route or other event features.



5. This layer shows that the tool will create five segments in this scenario, consisting of the following measures and event features:



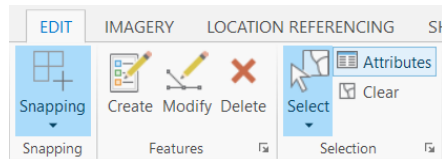
- Segment 1 with measures of 0 to 25000 consisting of only *Route AB2*
- Segment 2 with measures of 25000 to 50000 consisting of *Route AB2* and *P_OperatingPressureRange*
- Segment 3 with measures of 50000 to 100000 consisting of *Route AB2*, *P_OperatingPressureRange*, and *P_DOTClass*
- Segment 4 with measures of 100000 to 125000 consisting of *Route AB2* and *P_OperatingPressureRange*
- Segment 5 with measures of 125000 to 150000 consisting of only *Route AB2*

The event layers in the map already have definition queries applied to only show the event features that are located along Route AB2.

The network feature class only has a label definition query applied, so you need to select the route or else the entire network will be added to the output.

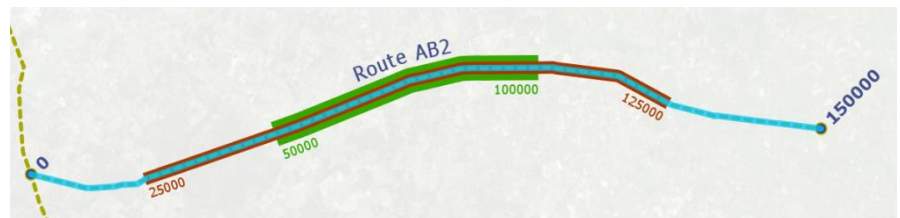
In this exercise, you only want to dynamically segment *Route AB2*. You need to select this route to only process *Route AB2*.

6. Click the **Edit** ribbon tab and click the **Select** tool.



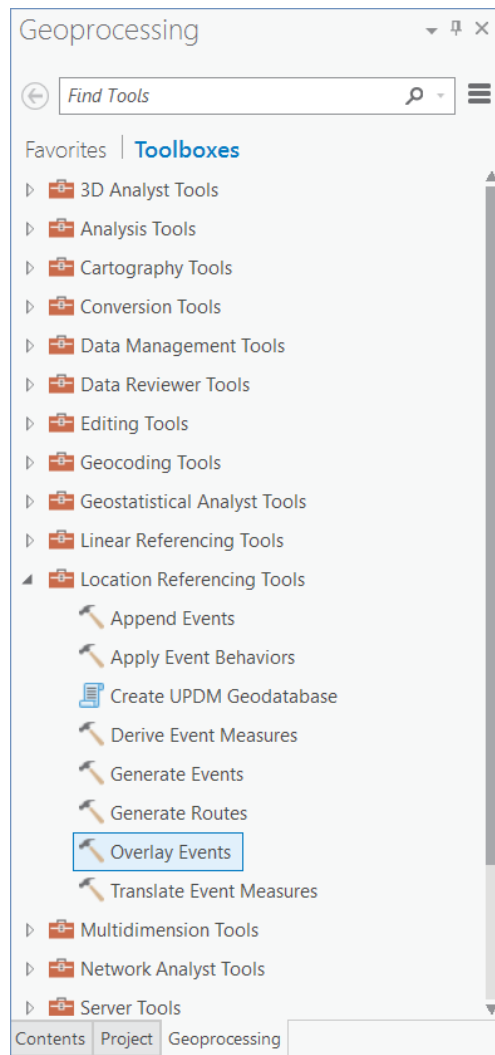
The **Overlay Events** geoprocessing tool supports selections and definition queries, and will only process a selection and/or definition that is active when the tool is run.

7. Click on *Route AB2* to select the route, as shown in light blue in the image below:



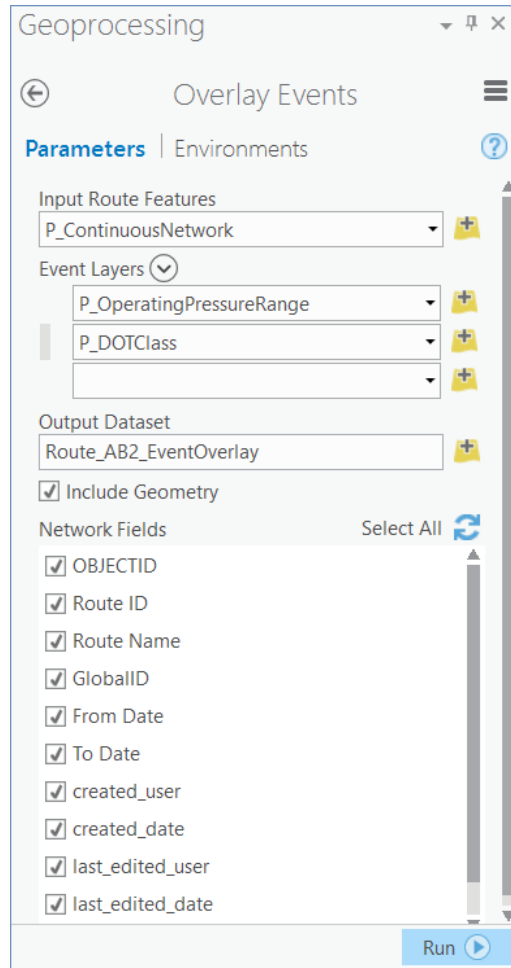
8. Browse to the **Overlay Events** geoprocessing tool via the **Geoprocessing** pane and click **Toolboxes> Location Referencing Tools> Overlay Events**, as shown in the following image:

This tool does not alter any existing data, but creates an output feature class to used for analysis and reporting purposes.



The output of this tool will also have indexes built on the important LRS maintained fields such as dates and measures..

9. Click the **Input Route Features** drop-down arrow and choose *P_ContinuousNetwork*.
The network fields of *P_ContinuousNetwork* are populated in the tool. These fields will be copied into the output of the tool for additional analysis if needed. You can leave these checked.
10. Click the **Event Layers** drop-down arrow and choose both *P_OperatingPressureRange* and *P_DOTClass*.
These event layers will be dynamically segmented against the selected network.
11. Type *Route_AB2_EventOverlay* for the **Output Dataset** parameter.
Your workspace is already set to use the *OverlayEvents* tutorial geodatabase.
12. Check the **Include Geometry** check box
This will copy the shapes of the segments into the output in addition to the attributes.
13. Prior to clicking **Run**, the populated tool should look like the following:



14. Click **Run**.

The output feature class called *Route_AB2_EventOverlay* is added to your map and **Contents** pane. The rest of the steps are optional, and provide an explanation of the output. If you are unfamiliar with dynamic segmentation you are encourage to continue.

15. Switch back to the **Contents** pane and turn off the *P_ContinuousNetwork* layer.

16. Right-click the new *Route_AB2_EventOverlay* layer and click **Design > Fields**.

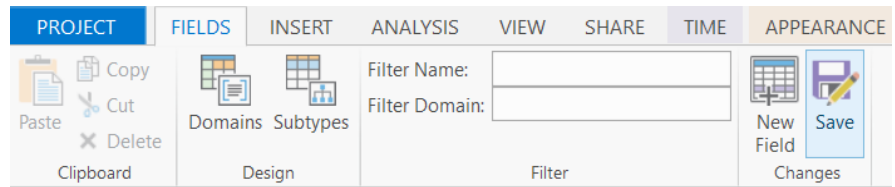
17. In the top left of the **Fields** pane, uncheck the box **Visible** check box.

This will turn off all fields in the new output layer.

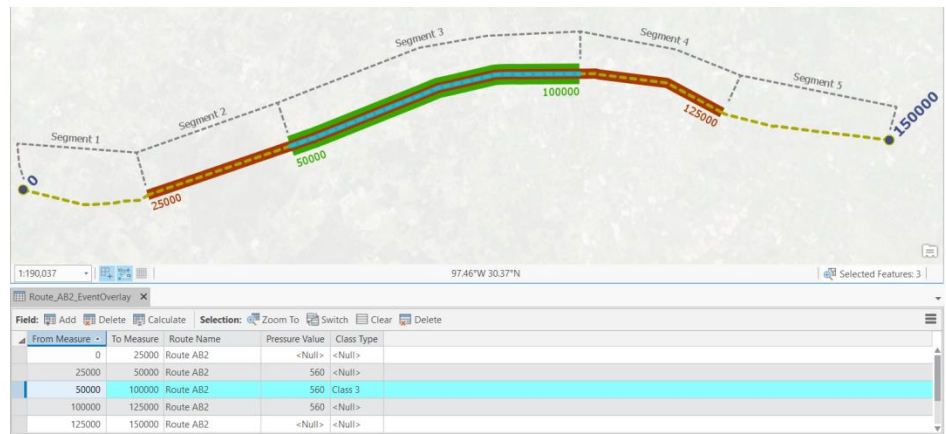
18. Scroll through the fields and only turn on the following fields:

- **from_measure**
- **to_measure**
- **ROUTENAME**
- **PRESSUREVALUE**
- **CLASSTYPE**

19. Click **Save** in the **Fields** ribbon tab on the top right corner.



20. Close the **Fields** pane.
21. Right-click the *Route_AB2_EventOverlay* layer and choose **Attribute Table**.
22. Double-click the **From Measure** field header **From Measure ▾** in the attribute table to sort the rows by From Measure ascending values.
23. Click each row to see that segment highlighted on the map, as shown in light blue in the following image:



This highlighted segment extends from measures 50000 to 100000 and contains:

- A segment of *Route AB2*
- A segment of an event feature from the *P_OperatingPressureRange* event layer with a Pressure Value of 560
- A segment of an event feature from the *P_DOTClass* event layer with a Class Type of *Class 3*

24. Close ArcGIS Pro without saving your edits or changes to the project.

LRS Route Loading

ArcGIS Desktop
[ALRS Data Model](#)
[Creating a new ALRS](#)
[Creating an LRS](#)
[Network](#)
[Loading Routes](#)

Objectives

- Create an Advanced Linear Referencing System (ALRS) and minimum schema
- Create LRS Networks
- Load routes
- Append control points to calibrate routes

Data

- Data\ Exercise 6-Configuring Network

Data Needed

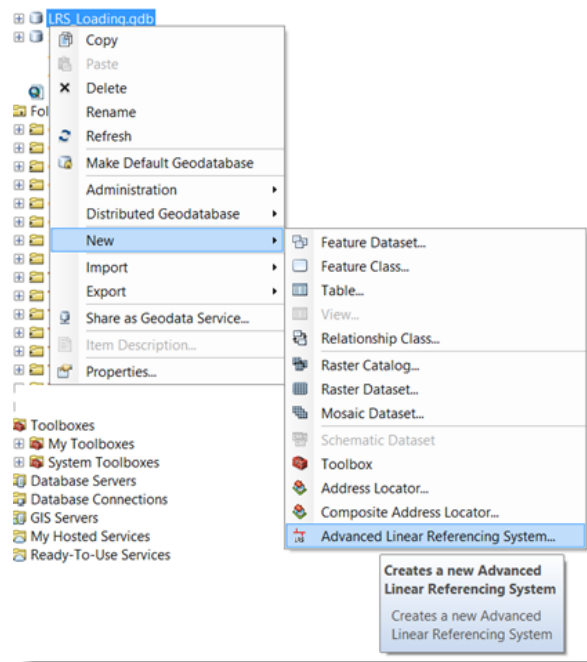
- LRS>Loading.gdb
- SourceData.gdb

Exercises

Create an ALRS

All the networks and events that will be managed by ArcGIS Pipeline Referencing are contained within an Advanced Linear Referencing System (ALRS). The ALRS provides a hierarchical view of the networks and events that will be managed by Pipeline Referencing and creating one is the first step in the data migration/loading process. In this exercise, you will create an ALRS in an empty geodatabase.

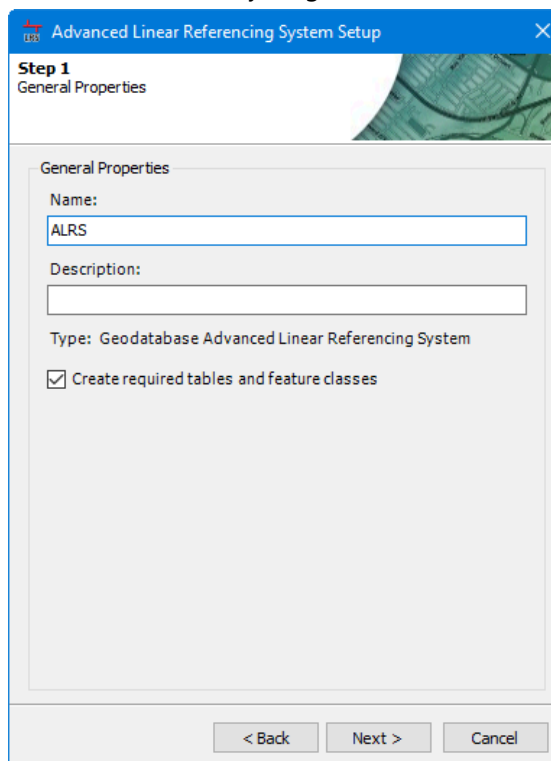
1. Open LRSDatLoad.mxd in the Configuring Network folder.
2. In the **Catalog** window, right-click **LRS>Loading.gdb** and click **New > Advanced Linear Referencing System**.



The ALRS setup wizard appears.

3. Click **Next**.
4. In the **Name** text box, type **ALRS**.
5. Check the **Create required tables and feature classes** check box.
Note: If you unchecked this option, you would need to select the minimum schema items from your geodatabase.

You should select the feature class with your source routes to ensure the same spatial reference, tolerance, and resolution settings are applied to your minimum schema items in your ALRS.



6. Click **Next**.
7. Click the **Import Spatial References from existing feature class** button to the right of the XY Tolerance text box.

The dialog box is titled "Advanced Linear Referencing System Setup" and is on "Step 2 of 6: Minimal schema". It contains several input fields for feature classes and tolerances. The "Centerline Feature Class" field is highlighted with a blue border and contains the text "Centerline". The "Calibration Point Feature Class" field contains "Calibration_Point". The "Redline Feature Class" field contains "Redline". The "Relationship Table" field contains "Centerline_Sequence". The "XY Tolerance (Unknown Units)" field contains "0.001" and has a red square highlighting the "..." button to its right. The "Z Tolerance" field contains "0.001". The "Spatial Reference" field is empty and has a "..." button to its right. At the bottom are buttons for "< Back", "Next >", and "Cancel".

8. Browse to **SourceData.gdb** and click the **Engineering_Source** feature class.

The "Browse Data" dialog box shows the "Look in:" field set to "SourceData.gdb". The file list contains three items: "Continuous_Source", "Engineering_Source" (which is highlighted with a blue selection bar), and "StationSeries". At the bottom, the "Name:" field contains "Engineering_Source" and the "Show of type:" dropdown is set to "Polyline feature classes". There are "Select" and "Cancel" buttons at the bottom right.

XY Tolerance, Z Tolerance, and Spatial Reference are populated.

If you want your minimum schema items (Centerline, Centerline Sequence, etc.) to have different names in the geodatabase, you can change them in this step.

Advanced Linear Referencing System Setup

Step 2 of 6
Minimal schema

Minimal Schema

Centerline Feature Class:
Centerline

Calibration Point Feature Class:
Calibration_Point

Redline Feature Class:
Redline

Relationship Table:
Centerline_Sequence

XY Tolerance (Feet):
0.00328083333333

Z Tolerance:
0.001

Spatial Reference:
NAD83 Albers Equal Area, 48 States, Panhandle, US Foot

< Back Next > Cancel

9. Click **Next** through *Step 6*, then click **Finish** to close the wizard.

If the minimum schema wasn't created during the ALRS creation, you would need to verify the schema and field mapping steps.

Advanced Linear Referencing System Setup

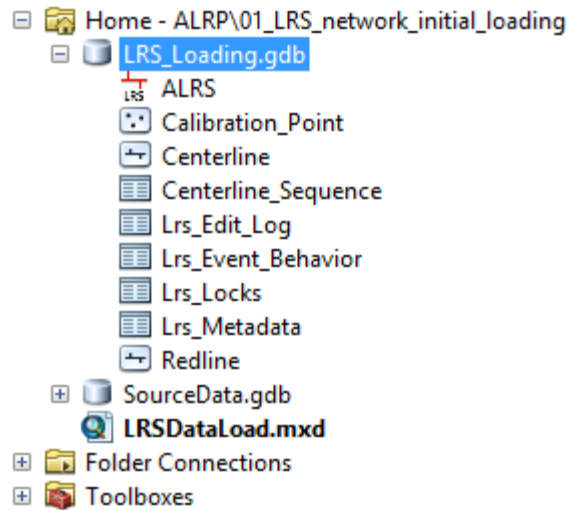
The Advanced Linear Referencing System setup wizard completed

Click Finish to exit the wizard.

< Back Finish Cancel

If you were ready to create your network at this point, clicking Yes would open the **Create LRS Network** wizard.

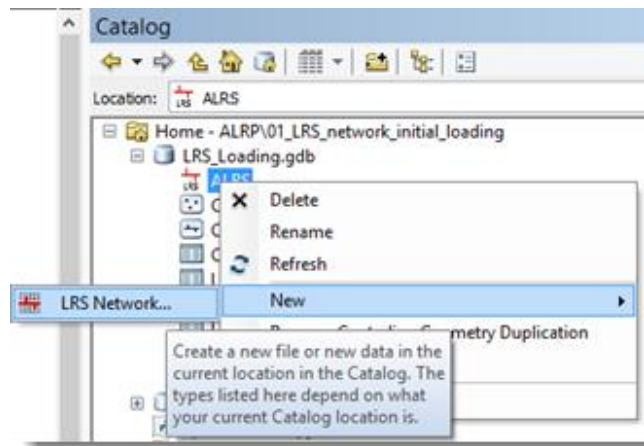
10. Click **No** when prompted about creating a new network. The ALRS now appears in the LRS_Loading geodatabase.



Create an Engineering (Line) Network

Once the ALRS is created, LRS Networks can be created/registered with the ALRS so that Pipeline Referencing can manage them. In this exercise, you will create an engineering network (this type of network is also called a line network in Pipeline Referencing).

1. In the LRS>Loading geodatabase, right-click the newly created ALRS, and click **New > LRS Network**.



*If you modeled your network feature class in advance, select the **Use an existing feature class** option.*

The **Create new LRS Network** wizard appears.

2. Choose the **Create a new feature class** option.
3. In the **Feature class name** text box, type *EngineeringNetwork*.
4. Click the **Unit of measure** drop-down arrow and select **Feet**.

Clicking the **Tolerance and Resolution** button will show the measure precision of the network along with the XY, Z, and M tolerance and resolution for the feature class.

Create new LRS Network

General Network Properties
Select general network properties such as network name, alias and units of measure.

☒ Create a new feature class
☐ Use an existing feature class

Feature class name:
EngineeringNetwork

Feature class alias:
EngineeringNetwork

Units of measure:
Feet

Tolerance and Resolution

☐ Derive from a network with lines

Network with lines:

< Back Next > Cancel

5. Click **Next**.
6. Check the **Include columns to support route lines** check box.

Engineering (Line) networks support events that span routes. The line concept is used to support these event types, so the network must support lines.

Create new LRS Network

Network Feature Class Columns
Configure the column names to create for the LRS network feature class.

Field	Field Name	Field Type
Route ID	RouteId	Text(255)
Route Name	RouteName	Text
From Date	FromDate	DateTime
To Date	ToDate	DateTime

☒ Include columns to support route lines

Field	Field Name	Field Type
Line ID	LineId	Text(38)
Line Name	LineName	Text
Line Order	LineOrder	Integer

< Back Next > Cancel

7. Click **Next**.
The LRS Network is created.
8. Click **Finish**.
9. Click **No** when prompted to load routes.
The EngineeringNetwork is now inside the ALRS tree in the **Catalog** window.

When creating your network, you can change the field names in the network feature class.

- [-] Home - Desktop\01_LRS_network_initial_loading
 - [+] LRS>Loading.gdb
 - [-] ALRS
 - EngineeringNetwork
 - Calibration_Point
 - Centerline
 - Centerline_Sequence
 - Lrs_Edit_Log
 - Lrs_Event_Behavior
 - Lrs_Locks
 - Lrs_Metadata
 - Redline
 - [+] SourceData.gdb
 - LRSDataLoad.mxd

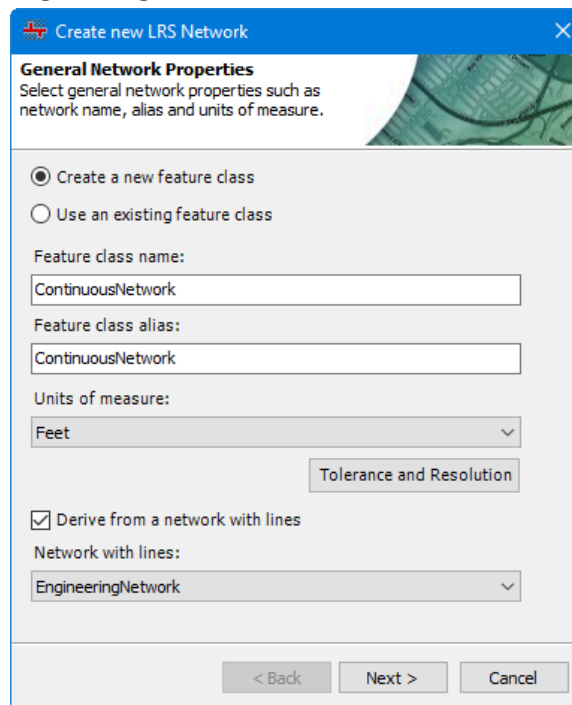
Create a Continuous (Derived) Network

Pipeline Referencing supports the concept of a derived network to support the need within some organizations to support both continuous and engineering measure networks. The advantage of using a derived network is that it can be updated using a geoprocessing tool whenever needed. This means edits to routes only need to be performed on the engineering (line) network, and the edits can be applied to the continuous (derived) network via the geoprocessing tool as necessary.

1. In the LRS_Loading geodatabase, right-click the ALRS and click **New > LRS Network**.

The **Create new LRS Network** wizard appears.

2. Choose the **Create a new feature class** option.
3. In the **Feature class name** text box, type *ContinuousNetwork*.
4. Click the **Units of measure** drop-down arrow and select **Feet**.
5. Click the **Derive from a network with lines** check box.
6. Click the **Network with lines** drop-down arrow and select **EngineeringNetwork**.



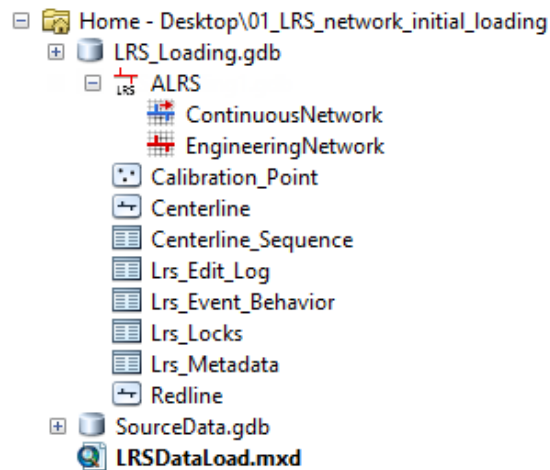
7. Click **Next** then click **Next** again.

The LRS Network is created.

8. Click **Finish**.

9. Click **No** if prompted to load routes.

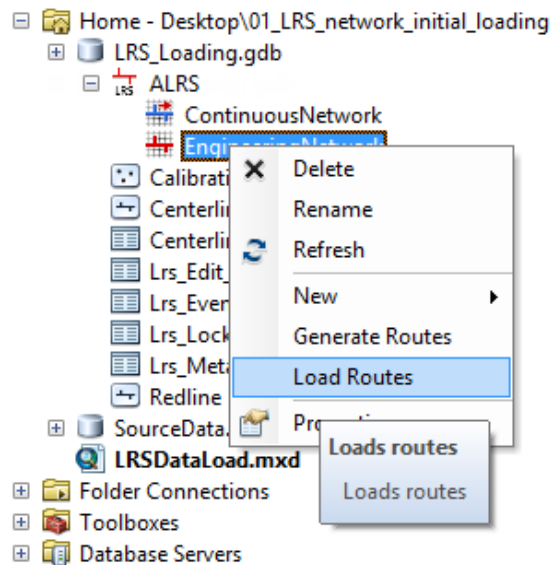
The ContinuousNetwork is now inside the ALRS tree in the **Catalog** window.



Load routes into Engineering (Line) Network

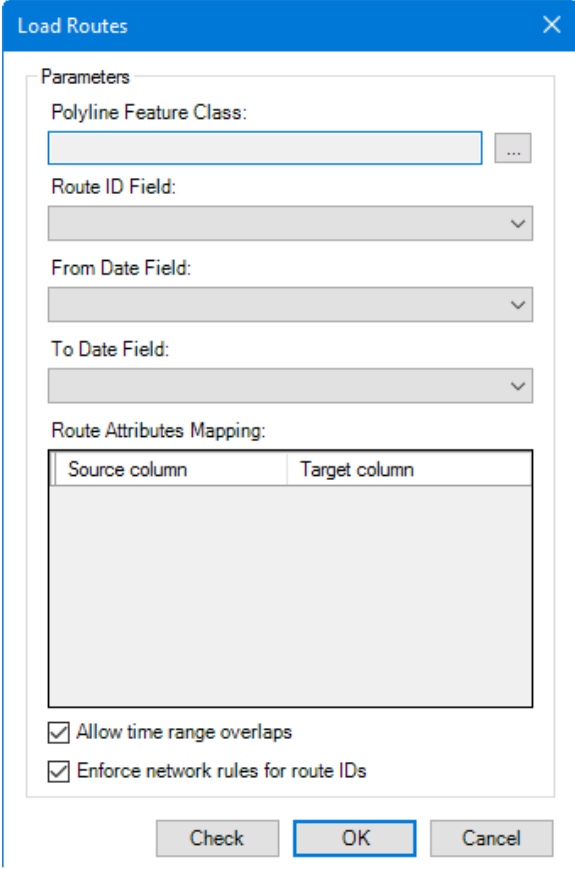
Once a network is registered with an ALRS, routes can be loaded into the network. The **Load Routes** tool will load source routes into the Network feature class, the centerline feature class, and the centerline sequence table. In this exercise, you will use the **Load Routes** tool to load source data into the engineering (line) network that was registered in a previous exercise.

1. Right click the EngineeringNetwork in the ALRS in the **Catalog** window and click **Load Routes**.



Remember your source routes should have one route feature per unique RouteID.

The **Load Routes** dialog box appears.



Load Routes

Parameters

Polyline Feature Class:
 ...

Route ID Field:

From Date Field:

To Date Field:

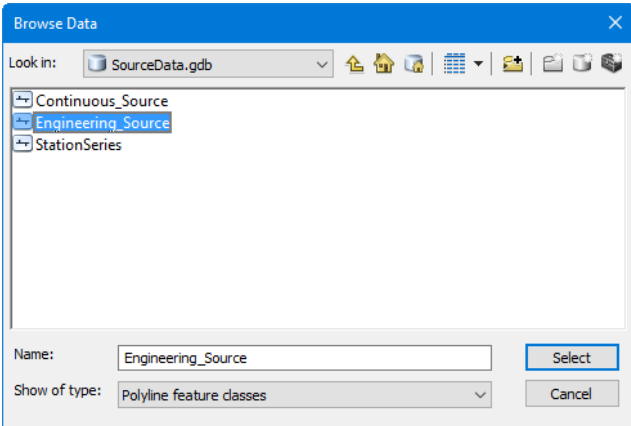
Route Attributes Mapping:

Source column	Target column

☒ Allow time range overlaps
☒ Enforce network rules for route IDs

Check OK Cancel

2. Click the **Polyline Feature Class** ellipsis button .
3. Browse to the Engineering_Source feature class in the SourceData geodatabase and click **Select**.



Browse Data

Look in: SourceData.gdb

Continuous_Source
Engineering_Source
 StationSeries

Name: Engineering_Source **Select**

Show of type: Polyline feature classes Cancel

4. Click the **Route ID Field** drop-down arrow and choose **EventID**.
5. Click the **From Date Field** drop-down arrow and choose **EffectiveFromDate**.
6. Click the **To Date Field** drop-down arrow and choose **EffectiveToDate**.
7. In the **Route Attributes Mapping** section, map the following source and target columns:

Any additional fields present in the source routes feature class will appear in the **Route Attribute Mapping** section. These fields can be mapped to existing fields in the network feature class or added when loading routes.

- a. For **LineLoopEventID** in Source, select **LineID** in Target
- b. For **SeriesOrder** in Source, select **LineOrder** in Target
- c. For **StationSeriesName** in Source, select **RouteName** in Target
- d. For **LineName** in Source, select **LineName** in Target

Load Routes

Parameters

Polyline Feature Class:
C:\Users\nath7392\Desktop\01_LRS_network_initia...

Route ID Field:
EventID

From Date Field:
EffectiveFromDate

To Date Field:
EffectiveToDate

Route Attributes Mapping:

Source column	Target column
OperationalStatus	<Do not map>
FromConnectionStationV...	<Do not map>
FromStationSeriesEventID	<Do not map>
LineLoopEventID	LineID
Parent StationSeriesEven...	<Do not map>
RefMode	<Add to Network>

☒ Allow time range overlaps

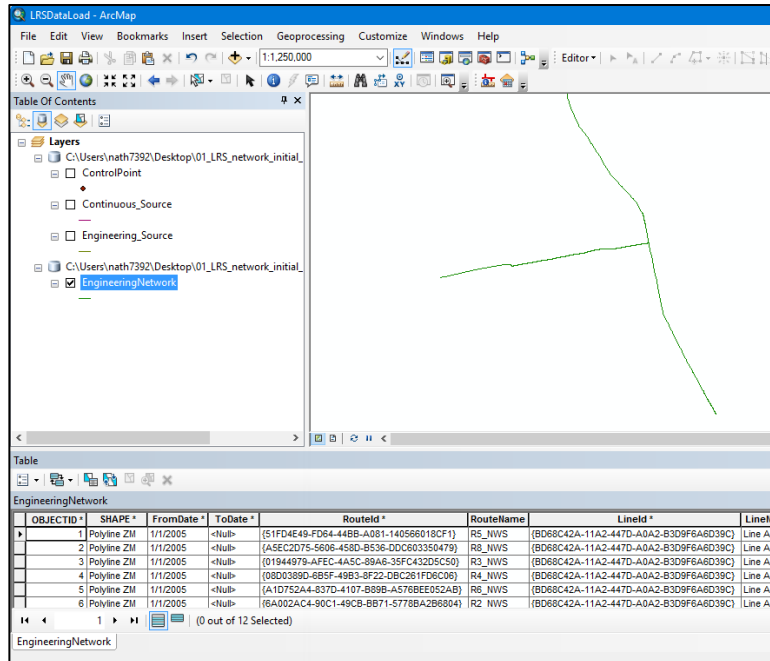
☒ Enforce network rules for route IDs

Check OK Cancel

8. Click **Check** to ensure no duplicate RouteIDs exist.
9. Click **OK** if no duplicates were found.
10. Click **OK** to load the routes, then click **Done** when finished.
11. Click **No** when prompted to update calibration points.
12. Add the EngineeringNetwork feature class to your map.

Routes are now present in this network. Open the attribute table to verify they are populated.

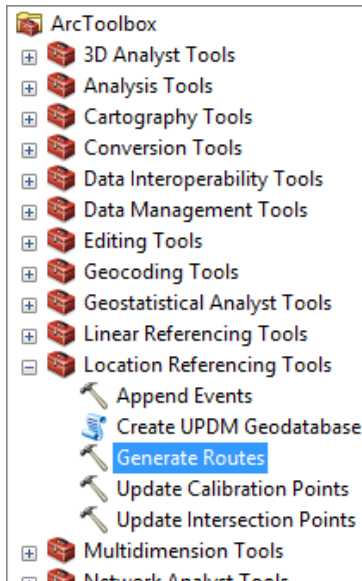
*If you did not have calibration points to migrate from an existing system, you could select **Yes** and use Pipeline Referencing to generate the points for you.*



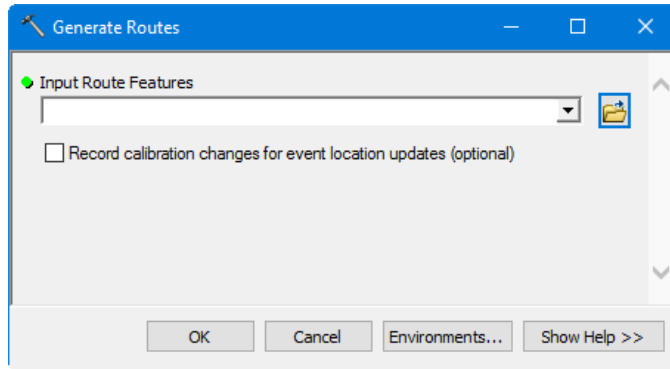
Generate routes in the Continuous (Derived) Network

As mentioned in a previous section, a derived network can be configured to build continuous measure routes from a line (engineering) network. The **Generate Routes** geoprocessing tool allows for the derived network routes and measures to be updated when run. In this exercise, the generate routes tool will be used to get routes in the continuous network from the engineering network.

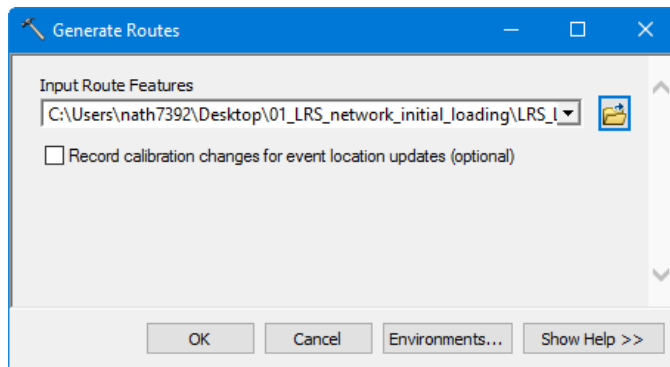
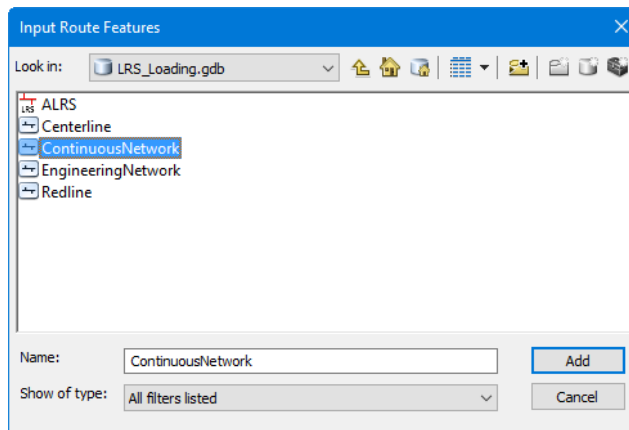
1. Expand the **Location Referencing Tools** toolbox within **ArcToolbox**.



2. Double-click the **Generate Routes** tool.



3. Click the **Input Route Features** browse button .
4. Browse to the **ContinuousNetwork** feature class in the LRS_Loading geodatabase and click **Add**.



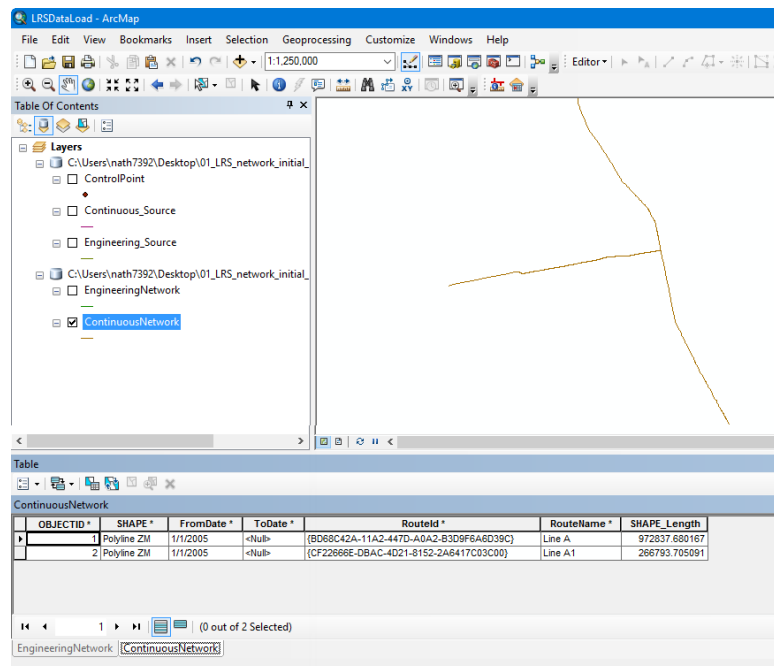
5. Click **OK**.

The routes from the engineeringstation network are used to build the routes in the ContinuousNetwork.

Note: You could have selected either the engineering or continuous network and the routes in the continuous network would have been updated. Running the **Generate Routes** tool against a line network will update both the line network and the derived network.

6. Add the ContinuousNetwork feature class to your map. Routes are now present in this network. Open the attribute table to

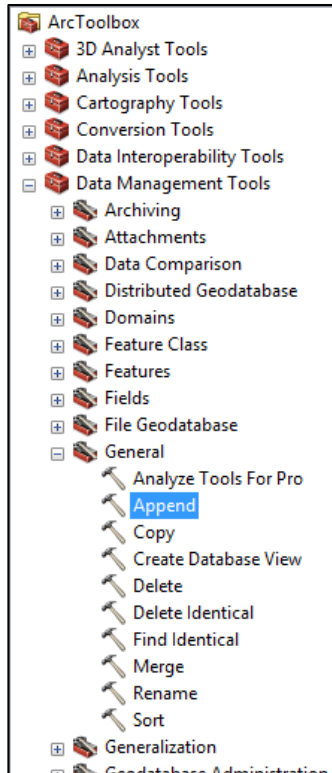
verify they are populated.



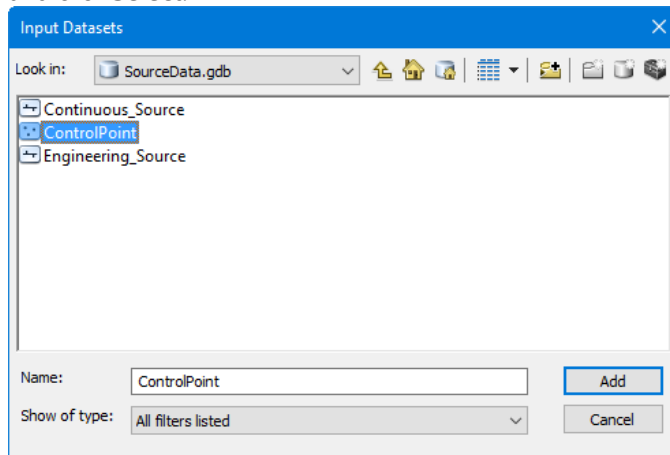
Appending calibration points to the Engineering Network

Once routes are loaded, the next step is to append calibration points to calibrate the routes. In this exercise, you will append existing control points into the calibration point feature class then calibrate the routes in the network. **Note:** Some preprocessing has been done to the calibration points that are being appended, such as adding and populating the networkID field. If you're migrating your data from APDM, PODS, or another database, you will need to populate these values to ensure calibration is correctly applied to your routes.

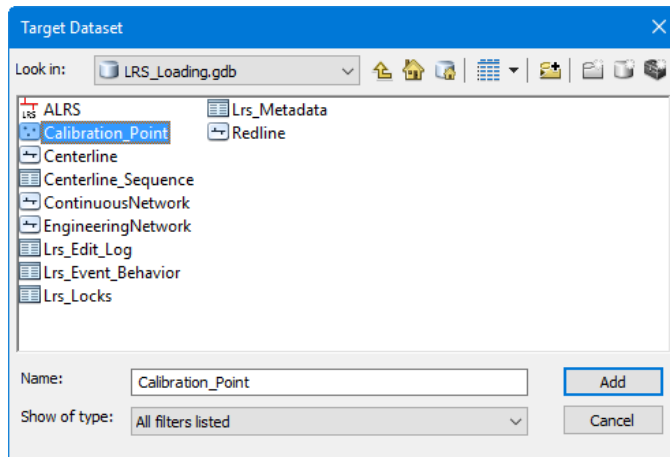
1. Expand the **Data Management Tools** toolbox within **ArcToolbox**.
2. Expand the **General** Toolset and double-click the **Append** tool.



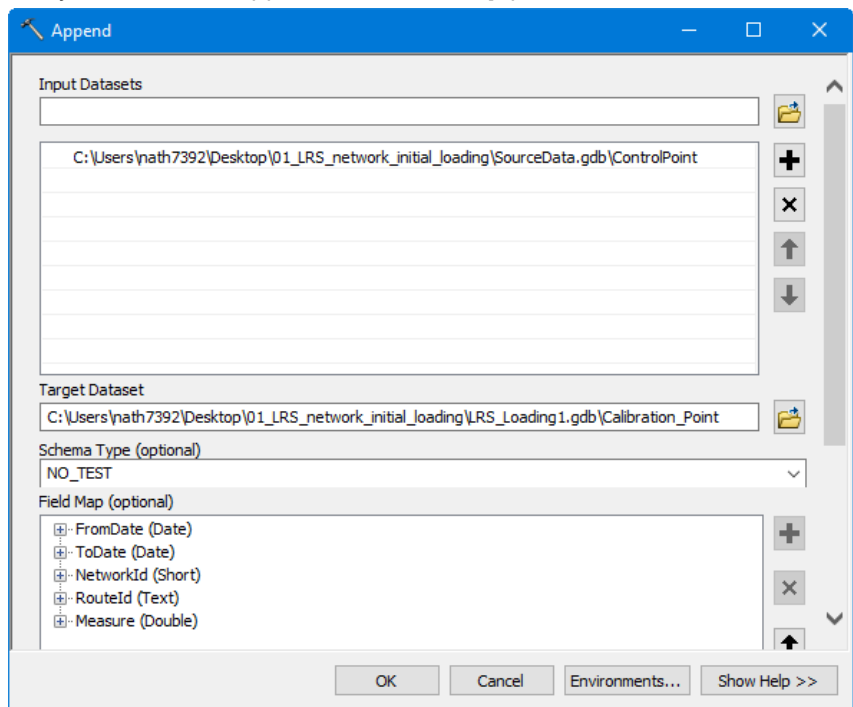
3. Click the **Input Datasets** browse button .
4. Browse to the **ControlPoint** feature class in the SourceData geodatabase and click **Select**.



5. Click the browse button  for the Target Dataset parameter, then navigate to the **Calibration_Point** feature class in the LRS>Loading geodatabase and click **Add**.



6. Select **NO_TEST** for **Schema Type**.
7. Verify all fields are mapped in the **Field Map** parameter.



8. Click **OK**.

The control points are appended into the Calibration Point feature class.

Note: The measures from the calibration points haven't been applied to the routes yet. To get calibration applied, you need to run the **Generate Routes** tool.

9. Expand the **Location Referencing Tools** toolbox within **ArcToolbox**.
10. Double-click the **Generate Routes** tool.

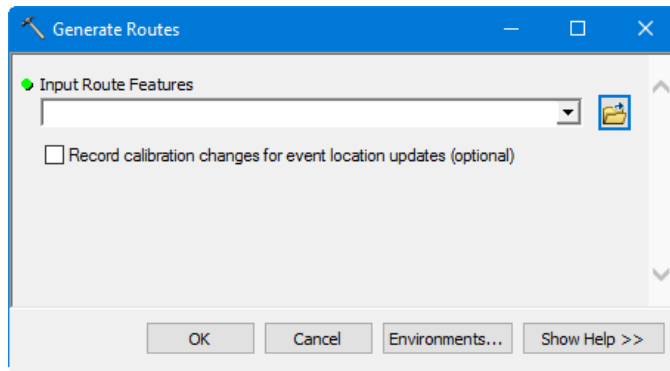
You could also do one of the following to verify calibration on routes in a network:

- Select a feature in the network layer on the map and view the M values of

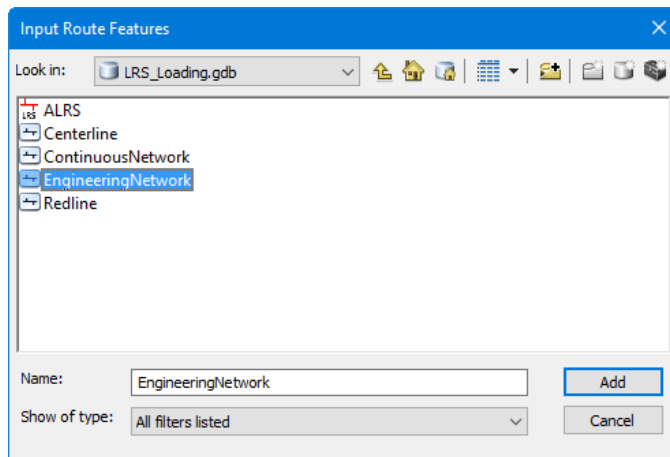
the feature using **Sketch Properties** on the editing toolbar

- Right-click the network layer in the table of contents, select the **Routes** tab, and check the options to **Show where measures do not have any value** and **Show where measures do not increase**

You may load routes for two different networks that are at the same geographic locations; resulting in two centerlines. This tool will remove any duplicates for you, resulting in one centerline for two or more routes at a given location.



11. Click the **Input Route Features** browse button .
12. Browse to the **EngineeringNetwork** feature class in the LRS>Loading geodatabase and click **Add**.

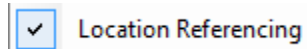


13. Click **OK**.

The calibration points are used to apply measures in both the engineering and Continuous Networks.

14. Verify calibration was applied to your routes using the **Identify LRS Route Locations** tool on the **Location Referencing** toolbar.

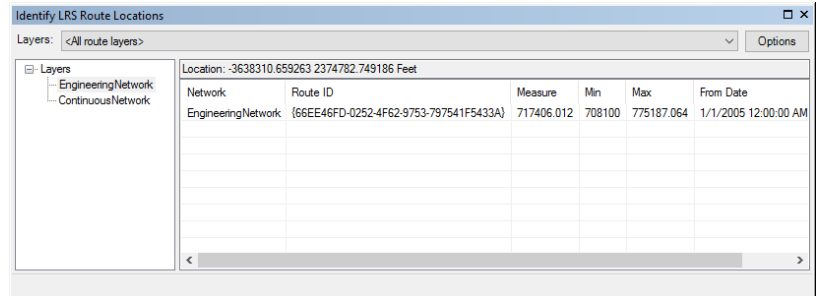
- a. Right-click the ArcMap toolbar area and click the check box for the **Location Referencing** toolbar.



- b. Click the **Identify LRS Route Locations** button.



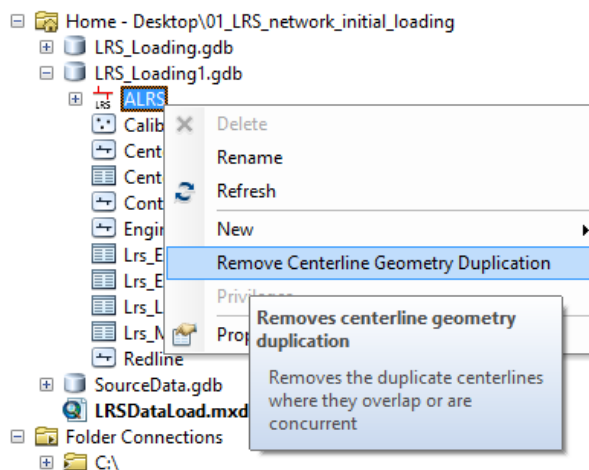
- c. Click one of the Engineering- and ContinuousNetwork routes on the map. The **Identify LRS Route Locations** dialog box appears with the RouteID and Measure of the route at the location clicked on the map. The measure in the measure column confirms that calibration was successfully added to the routes in the network.



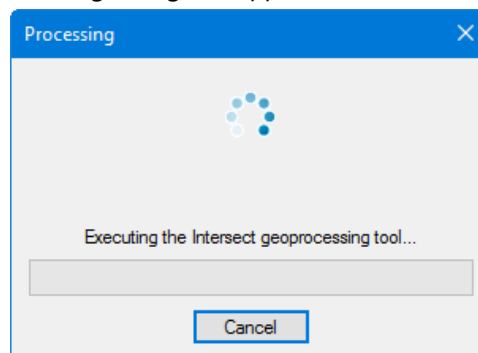
Deduplication of centerlines in the ALRS

The final step in the loading process is to remove any duplicate centerlines. Pipeline Referencing supports multiple networks within the same geodatabase. These networks share a common centerline feature class, calibration point feature class, and centerline sequence table. If any routes are concurrent in a network or if more than one network had routes loaded, there could be duplicate/overlapping centerlines. In this exercise, you will run the **Remove Centerline Geometry Duplication** tool to remove any overlapping/duplicate centerlines.

1. Expand the LRS>Loading geodatabase in the **ArcCatalog** window.
2. Right-click the ALRS and click **Remove Centerline Geometry Duplication**.



A processing dialog box appears and the tool begins to run.



When the tool finishes, the dialog box will close and duplicate/overlapping centerlines will be removed.

LRS Event Loading

ArcGIS Desktop

Objectives

- Configure an event in a LRS Network
- Load source events into an LRS Event using the Append Events geoprocessing tool
- Update the derived event measure column on events using the Generate Events geoprocessing tool

Data

- Data\ Exercise 7-Event Configuration and Loading

Data Needed

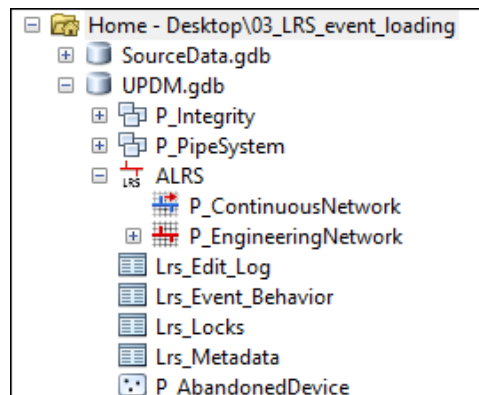
- SourceData.gdb
- UPDM.gdb

Exercises

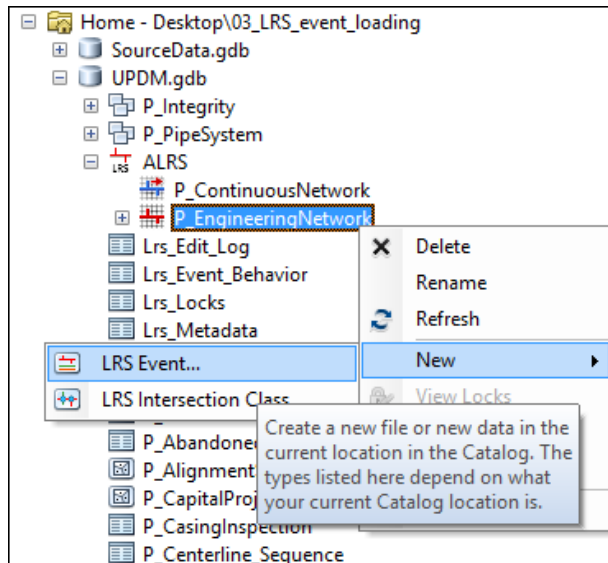
Setup an LRS Event

Events that will be managed by Pipeline Referencing must be registered with the LRS Network they will be referenced against. This process is completed using the LRS Event setup wizard. The exercise below will walk you through the steps of registering an event with the P_EngineeringNetwork in a UPDM geodatabase.

1. Open EventLoading.mxd in the Event Configuration and Loading folder.
2. In the **Catalog** window, browse to and expand the ALRS in the UPDM.gdb in the Event Configuration and Loading folder.

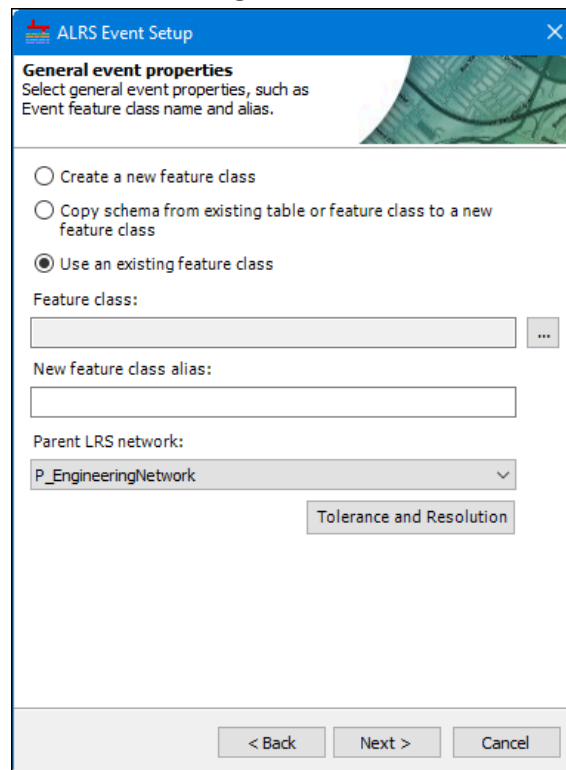


3. Open the **ALRS Event** setup wizard by right-clicking the P_EngineeringNetwork and clicking **New > LRS Event**.



The **ALRS Event Setup** wizard appears.

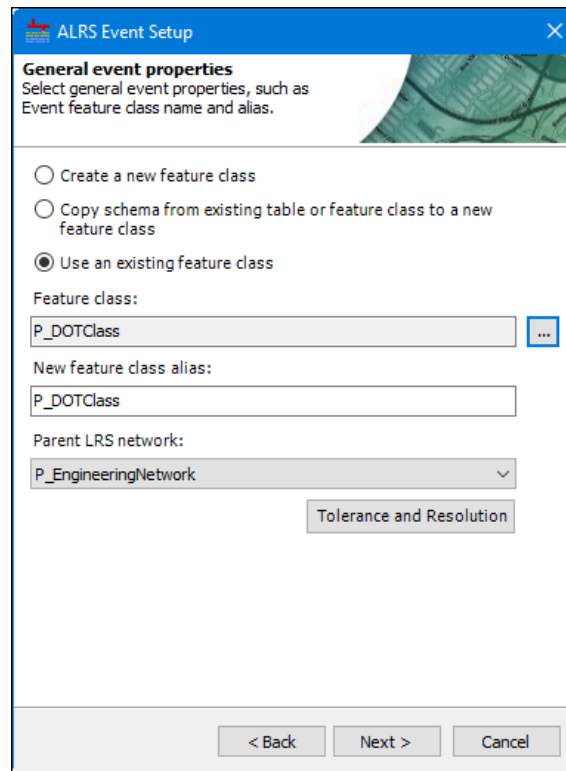
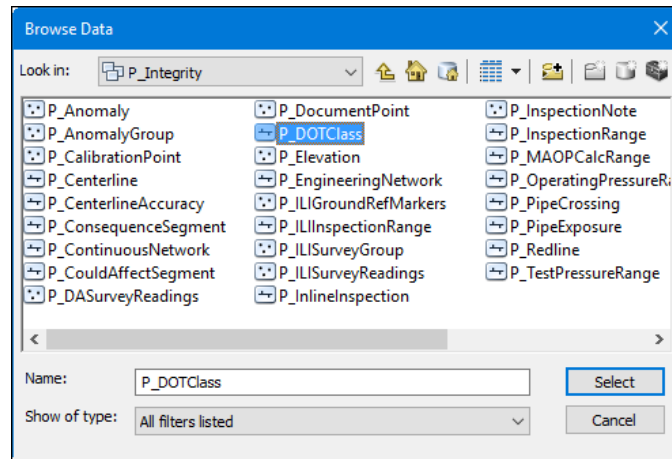
4. Click **Next**, and then **Next**.
5. Click **Use an existing feature class**.



6. Click the ellipsis button , browse to and select the **P_DOTClass** feature class within the P_Integrity feature dataset inside the UPDM.gdb in the EventLoading folder.

The choices you make when you register your own events will depend on a few factors, such as if the event feature class is already in the ALRS geodatabase or if the schema for the event exists in another database and can be copied to a new feature class in the ALRS geodatabase.

Since you've selected an event within the ALRS and use the existing feature class option, the feature class selected needs to be in the same geodatabase as the ALRS.



Click [here](#) for more information on these check boxes.

7. Click **Next**.
8. On the General event properties section, check the **Store Route Name with event records** and **Events can span routes** check boxes.
9. Map the following fields:
 - a. Event ID – EVENTID
 - b. From Route ID – ENGRROUTEID
 - c. From Measure – ENGFROMM
 - d. To Route ID – ENGTORROUTEID
 - e. To Measure - ENGTMOM
 - f. From Date – FROMDATE
 - g. To Date – TODATE

If the field names in the feature class selected were different than the default names (Event ID, etc.), you would need to map them using the drop-down arrows.

If you configured a Derived Network within your ALRS (like the Continuous Network in UPDM) and you register an event with the line network that it derives from (like the Engineering Network in UPDM), you have an option to also store the measures for the derived network on the event. The process to populate and maintain this field is covered in a later tutorial, but this is a way to keep both the engineering and continuous measures for an event in a single feature class.

- h. From Route Name – ENGROUTENAME
- i. To Route Name – ENGTOROUTENAME
- j. Location Error - LOCATIONERROR

ALRS Event Setup

General event properties
Select general event properties, such as geometry type and key fields.

Event feature class:
P_DOTClass

Event location:
ALRS event feature class

Geometry type:
☐ Point event
☒ Line event

☐ Create location error field
☒ Store Route Name with event records
☒ Events can span routes

Field mapping:

Field	Field Name	Required Field Type
Event ID	EVENTID	Text(>=32)
From Route ID	ENGRROUTEID	Text
From Measure	ENGFROMM	Double
To Route ID	ENGTOROUTEID	Text

< Back Next > Cancel

10. Click **Next**.
11. Check the **Maintain route and measure fields from derived network** check box.
12. Map the following fields:
 - a. Derived Route ID – CONTINROUTEID
 - b. Derived Route Name – CONTINROUTENAME
 - c. Derived From Measure – CONTINFROMM
 - d. Derived To Measure – CONTINTOM

Remember that stationing point events that would be configured in this step are different from events in an Engineering Network.

ALRS Event Setup

Derived network field settings
Map the fields that will store the derived network fields.

☒ Maintain route and measure fields from derived network
☐ Create derived fields

Field mapping:

Field	Field Name	Field Type
Derived Route ID	CONTINROUTEID	Text(38)
Derived Route Name	CONTINROUTENAME	Text(100)
Derived From Measure	CONTINFROMM	Double
Derived To Measure	CONTINTOM	Double

< Back Next > Cancel

13. Click **Next**.
14. Do not change anything on the stationing step. Click **Next**.
15. Check the **Store referent locations with event record** check box.
16. Map the following fields:
 - a. From Referent Method – FROMREFMETHOD
 - b. From Referent Location – FROMREFLOCATION
 - c. From Referent Offset – FROMREFOFFSET
 - d. To Referent Method – TOREFMETHOD
 - e. To Referent Location – TOREFLOCATION
 - f. To Referent Offset – TOREFOFFSET

Edit behaviors, or rules, are configured on an edit type by edit type basis for each event.

Many of these properties configured on this step and the previous ones can be changed for events that have already been registered with an LRS Network in the ALRS.

If you were ready to add events to the newly registered event, clicking **Yes** would bring you to the **Append Events** geoprocessing tool.

ALRS Event Setup

Event referent offset field settings
Map the fields that will store reference offset values.

☒ Store referent locations with event record

Offset unit of measure:
Feet

☐ Create referent fields

Field mapping:

Field	Field Name	Field Type
From Referent Method	FROMREFMETHOD	Short
From Referent Location	FROMREFLOCATION	Text
From Referent Offset	FROMREFOFFSET	Text
To Referent Method	TOREFMETHOD	Short
To Referent Location	TOREFLOCATION	Text
To Referent Offset	TOREFOFFSET	Text

< Back Next > Cancel

17. Click **Next**.

18. Change the event behavior for the *CalibrateRoute*, *RetireRoute*, *ExtendRoute*, *ReassignRoute*, and *RealignRoute* activities by clicking the drop-down arrow to the right of each activity and changing it to *Retire*.

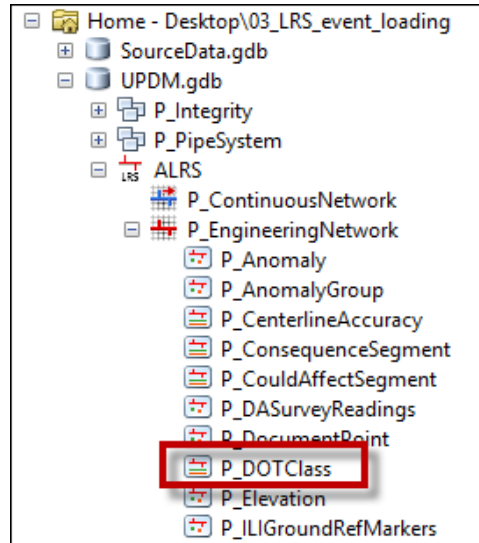
ALRS Event Setup

Event Behavior Rules
Behavior Rules specify how events must be modified when parent route is modified.

Activity	Rules
CalibrateRoute	Stay Put
RetireRoute	Stay Put
ExtendRoute	Move
ReassignRoute	Retire
RealignRoute	Stay Put
CartoRealignRoute	Honor Referent Location

< Back Finish Cancel

19. Click **Finish**.
 20. Click **No** when prompted about whether you want to load event records.
 21. **Expand P_EngineeringNetwork** inside the ALRS in the **Catalog** window.
- The P_DOTClass event is now configured with this network.



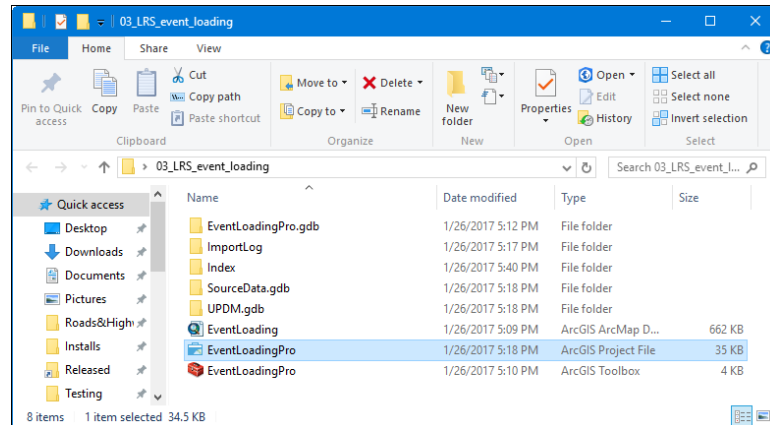
22. Close ArcMap. Don't save the map if prompted.

Remember that certain fields are required to append event records into an event managed by Pipeline Referencing. These include RouteID, measure, and date fields.

Loading an LRS Event

Event records can be added in bulk to an event managed by Pipeline Referencing using the **Append Events** geoprocessing tool. This exercise will walk you through the steps of appending event records to the P_DOTClass event that was registered in the previous exercise.

1. Open the *EventLoadingPro* project in the LRS Event Loading folder.

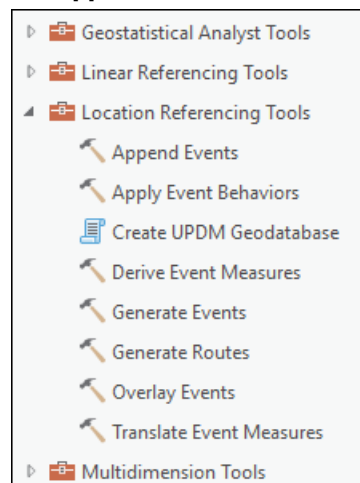


2. Open the attribute table for the *RegulatorySegment* layer in the table of contents.

Notice the required fields (Route ID, From Measure, From Date, etc.) are present.

RouteID	Shape_Length	FromDate	ToDate	EventID	EngRouteID	EngRouteID	EngFromM	EngToM	ClassType
1 (607599-44C2-4A9A-802A-A8E9B840D22)	20630.264556	1/1/2005	<Null>	<Null>	(8A002AC4-90C1-49CB-B871-5778BA2B6094)	(81944879-AFEC-4A5C-80A6-39FC42D25C50)	144994.988	49276.209	
1 (87708E2A-18D3-4750-8F62-3EAC8C8C7E3)	113805.035569	1/1/2005	<Null>	<Null>	(81944879-AFEC-4A5C-80A6-39FC42D25C50)	(80D0089D-6B9F-4983-8F22-08C261F06C96)	408276.209	532880.058	
1 (358031B-C4C3-48AA-8289-AFFC0883A0DE)	101470.059707	1/1/2005	<Null>	<Null>	(208C2DCE-FCB4-4E8D-91F7-C9D477887F)	(208C2DCE-FCB4-4E8D-91F7-C9D477887F)	0	156694.193	
1 (F9A325C2-149D-4F86-8118-5ADA7293244E)	66048.926489	1/1/2005	<Null>	<Null>	(51F04E49-FD64-44B8-A081-14D566019CF1)	(80EE49FD-0252-4F42-8753-797541F5433A)	532780.058	775187.063	
1 (89CFC0C8-45D6-45AA-868D-47C421302899)	143126.307172	1/1/2005	<Null>	<Null>	(8FBC66E6-25CE-49C7-82F3-C96706A0D0C3)	(8A002AC4-90C1-49CB-B871-5778BA2B6094)	0	144994.988	
1 (CA2FFD0D-F358-4C8B-AB84-5388F233587)	25443.43889	1/1/2005	<Null>	<Null>	(A3EC2D75-5606-458D-8536-DDC60330479)	(A3EC2D75-5606-458D-8536-DDC60330479)	775100	905540.388	
1 (31998084-4C35-44C2-4D03-86F891596D5)	78416.447117	1/1/2005	<Null>	<Null>	(70EE3E37-4C72-434B-8764-4875D8C8B8AF)	(70EE3E37-4C72-434B-8764-4875D8C8B8AF)	0	23456.554	
1 (A039F483-48D5-4C7C-8D3B-9F97C3F37C44)	35661.153275	1/1/2005	<Null>	<Null>	(A75393FF-9F9F-4CC1-AA70-619FD63C3C22)	(A75393FF-9F9F-4CC1-AA70-619FD63C3C22)	231100	266783.705	
1 (7C9C161A-962A-4C32-A2A3-69388222DA54)	67475.146884	1/1/2005	<Null>	<Null>	(C2C9D8CF-17EB-4C14-A206-77FF598E99A9)	(C2C9D8CF-17EB-4C14-A206-77FF598E99A9)	905500	973015.534	
1 (D0F9AC62-0D4F-43E7-8E7F-2529814C8ED)	5363.67061	1/1/2005	<Null>	<Null>	(F1E512D8-8A10-4C0E-9D11-064E4707BF25)	(F1E512D8-8A10-4C0E-9D11-064E4707BF25)	196587.902	231122.552	
1 (7759ACCS-AB19-48A1-8282-A056A01F7259)	34537.344327	1/1/2005	<Null>	<Null>	(F1E512D8-8A10-4C0E-9D11-064E4707BF25)	(F1E512D8-8A10-4C0E-9D11-064E4707BF25)	156690	196587.902	

3. Close the attribute table.
4. In ArcToolbox, expand the **Location Referencing** toolbox, and double-click the **Append Events** tool.



The input can be a feature class, table, or layer.

5. Click the **Input Event** drop-down arrow and choose the *RegulatorySegment*

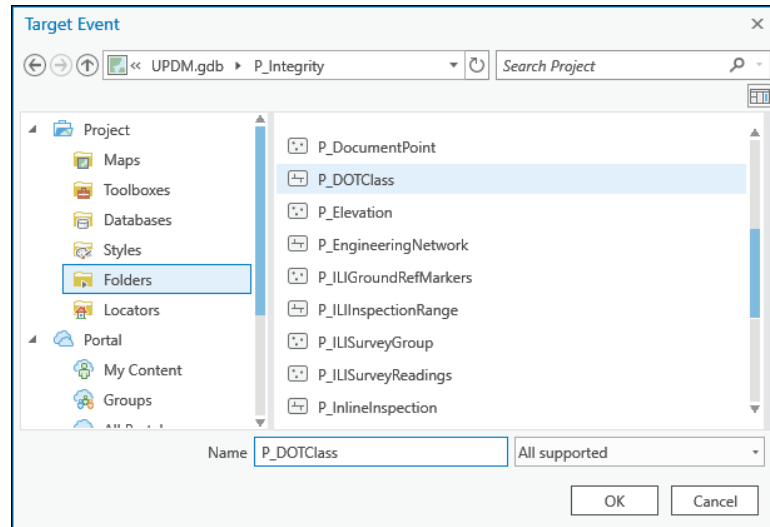
The derived route and measure fields will be updated in a later section. The class fields are not required by Pipeline Referencing and can be left unmapped. The referent fields are optional as well, even though they are configured in the target event.

There are 4 different methods for the load type. The one you choose to use will be based on the data being loaded, whether records are already present in the event feature class and whether the added records are new or are replacing existing event records.

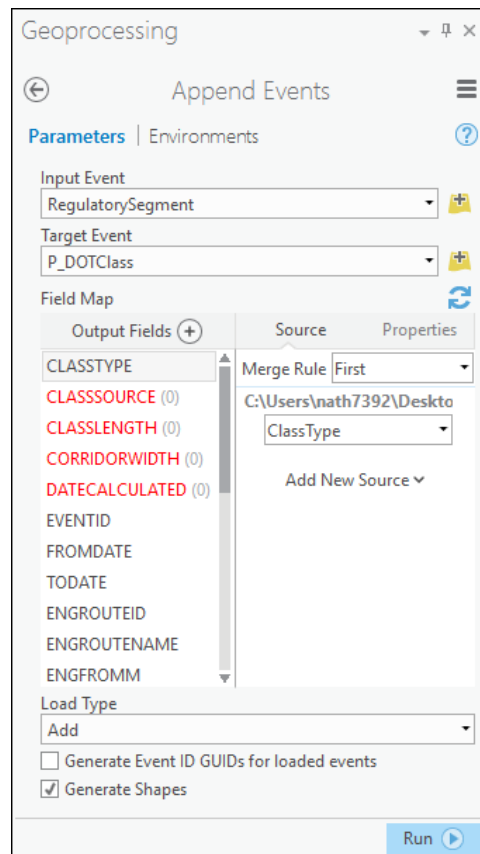
The EventID for events in Pipeline Referencing is different from EventID in UPDM.

layer.

- For the **Target Event** parameter, click the browse button , and browse to and select the *P_DOTClass* feature class in the P_Integrity feature dataset within the EventLoading folder in the UPDM geodatabase.



- In the **Field Mapping** parameter, verify the following fields have black text in the Output Fields column: CLASSTYPE, EVENTID, FROMDATE, TODATE, ENGRROUTEID, ENGRROUTENAME, ENGFROMM, ENGTORROUTEID, ENGTORROUTENAME, ENGTOM.



8. Click the **Load Type** drop-down arrow and choose **Add**.
9. Check the **Generate Event ID GUIDs for loaded events** check box.

Geoprocessing

Append Events

Parameters | Environments

Input Event: RegulatorySegment

Target Event: P_DOTClass

Field Map

Output Fields (+)	Source	Properties
CLASSTYPE	Merge Rule	First
CLASSSOURCE (0)	C:\Users\nath7392\Desktop	ClassType
CLASSLENGTH (0)		
CORRIDORWIDTH (0)		
DATECALCULATED (0)		
EVENTID		
FROMDATE		
TODATE		
ENGROUTEID		
ENGROUTENAME		
ENGFROMM		

Load Type: Add

☒ Generate Event ID GUIDs for loaded events

☒ Generate Shapes

Run

10. Click **Run** to run the tool.

The events are appended into the P_DOTClass feature class and are now present in the map. Disregard the warning message for unmapped fields.

11. Turn on the layer and open the attribute table.

The events have been appended into P_DOTClass and will now be managed by Pipeline Referencing.

Shape	OBJECTID	Creation User	Date Created	Date Modified	Last User	Class Type	Class Source	Class Length	Corridor Width	Date Calculated	GlobalID
Polyline ZM 1	NATH7392	1/27/2017 8:38:30 PM	1/27/2017 8:38:30 PM	NATH7392	Class 3	<Null>	<Null>	<Null>	<Null>	<Null>	1A020949-4803-4762-9F4D-3F8891A2D...
Polyline ZM 2	NATH7392	1/27/2017 8:38:30 PM	1/27/2017 8:38:30 PM	NATH7392	Class 4	<Null>	<Null>	<Null>	<Null>	<Null>	224F0832-762F-41A8-B83F-E8312C78D...
Polyline ZM 3	NATH7392	1/27/2017 8:38:30 PM	1/27/2017 8:38:30 PM	NATH7392	Class 3	<Null>	<Null>	<Null>	<Null>	<Null>	8D278817-7979-4501-8D78-4688D623D...
Polyline ZM 4	NATH7392	1/27/2017 8:38:30 PM	1/27/2017 8:38:30 PM	NATH7392	Class 3	<Null>	<Null>	<Null>	<Null>	<Null>	C47788D3-81CD-478D-A55C-A8D809482...
Polyline ZM 5	NATH7392	1/27/2017 8:38:30 PM	1/27/2017 8:38:30 PM	NATH7392	Class 4	<Null>	<Null>	<Null>	<Null>	<Null>	22584863-4803-4802-4C38-10D9D229D...
Polyline ZM 7	NATH7392	1/27/2017 8:38:30 PM	1/27/2017 8:38:30 PM	NATH7392	Class 2	<Null>	<Null>	<Null>	<Null>	<Null>	753E7528-8734-4D5D-9A05-4796A23F9...
Polyline ZM 8	NATH7392	1/27/2017 8:38:30 PM	1/27/2017 8:38:30 PM	NATH7392	Class 4	<Null>	<Null>	<Null>	<Null>	<Null>	24243C3E-40D3-488B-9A41-08D0960...
Polyline ZM 9	NATH7392	1/27/2017 8:38:30 PM	1/27/2017 8:38:30 PM	NATH7392	Class 4	<Null>	<Null>	<Null>	<Null>	<Null>	E1782A32-5454-470F-88D6-64F788C02...
Polyline ZM 10	NATH7392	1/27/2017 8:38:30 PM	1/27/2017 8:38:30 PM	NATH7392	Class 4	<Null>	<Null>	<Null>	<Null>	<Null>	08B4A903-1D04-462F-A761-4D3A12123...
Polyline ZM 11	NATH7392	1/27/2017 8:38:30 PM	1/27/2017 8:38:30 PM	NATH7392	Class 3	<Null>	<Null>	<Null>	<Null>	<Null>	EC90885A-787E-428E-B04E-473A7C708...
Polyline ZM 12	NATH7392	1/27/2017 8:38:30 PM	1/27/2017 8:38:30 PM	NATH7392	Class 3	<Null>	<Null>	<Null>	<Null>	<Null>	CC8C212C-E80B-484C-8F4F-8054DC8...

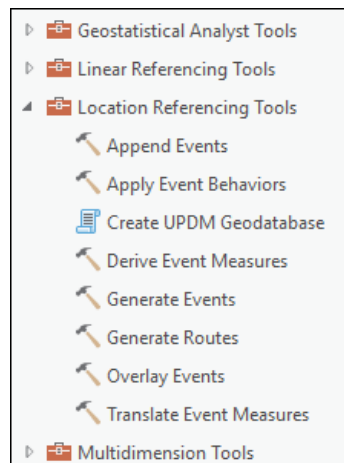
Updating the continuous route and measure columns on an event

When registering the *P_DOTClass* event in the first exercise, the **Maintain route and measure fields from derived network** option was configured. Configuring this option allows for the routes and measures from the engineering (line) and continuous (derived) to be stored in the same event feature class managed by Pipeline Referencing. The **Derive Event Measures** geoprocessing tool is used to populate/update these fields in an event.

1. Open the attribute table for the *P_DOTClass* layer in the table of contents. Notice the Continuous fields (Route ID, Route Name, From Measure, To Measure) are not populated.

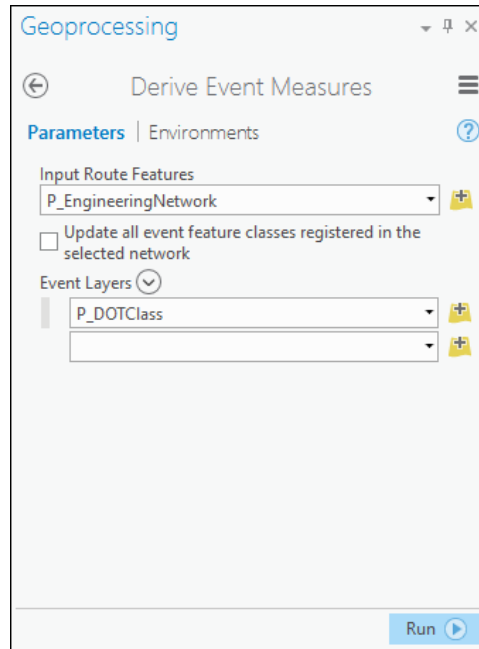
Name	Engineering From Measure	Engineering To RouteID	Engineering To Route	Engineering To Measure	Continuous Route ID	Continuous Route Name	Continuous From Measure	Continuous To Measure
409276.209	(0000309D-80F-9B3-9F22-0BC261F09C36)	R4_NWS		552000.050	<Null>	<Null>	<Null>	<Null>
552780.050	(0000309D-80F-9B3-9F22-0BC261F09C36)	R1_NWS1		156884.193	<Null>	<Null>	<Null>	<Null>
144994.988	(01944970-AFEC-4A5C-8B46-35FC43205C30)	R2_NWS		775187.063	<Null>	<Null>	<Null>	<Null>
	(0A002AC4-90C1-49CB-8B71-5778A2B8004)	R3_NWS		409276.209	<Null>	<Null>	<Null>	<Null>
	(70EE3E37-4C72-434B-9764-4B70D8C989AF)	R1_NWT2		144994.988	<Null>	<Null>	<Null>	<Null>
775100	(A5EC2D75-5606-458D-8538-DDC60330479)	R8_NWS		23456.554	<Null>	<Null>	<Null>	<Null>
231100	(A75393FF-9F6F-4CC1-AA70-619FD63C3C2)	R3_NWS1		905540.388	<Null>	<Null>	<Null>	<Null>
905500	(C2C3D8CF-17EB-4C14-A206-779F98E99A9)	R9_NWS		266783.705	<Null>	<Null>	<Null>	<Null>
196587.902	(F1E312D8-8A10-4C0E-9011-064E47078F25)	R2_NWS1		973015.534	<Null>	<Null>	<Null>	<Null>
156880	(F1E312D8-8A10-4C0E-9011-064E47078F25)	R2_NWS1		231122.552	<Null>	<Null>	<Null>	<Null>
				196587.902	<Null>	<Null>	<Null>	<Null>

2. Close the attribute table.
3. In ArcToolbox, expand the **Location Referencing** toolbox, and double-click the **Derive Event Measures** tool.



4. Click the **Input Route Features** drop-down arrow and choose the Engineering Network layer.
5. Uncheck the **Update all event feature classes registered in the selected network** check box.
6. Click the **Event Layers** drop-down arrow and choose the *P_DOTClass* layer.
7. Click **Run** to run the tool.

The continuous columns are populated in the *P_DOTClass* layer.



8. Open the attribute table for the *P_DOTClass* layer in the table of contents. Notice the Continuous fields are now populated.

Field	Value
Engineering To RouteID	409276.209
Engineering To Route Name	Engineering To Route Name
Engineering To Measure	552880.058
Continuous Route ID	(BDB8C42A-11A2-447D-AD42-83D9F6A6D39C) Line A
Continuous Route Name	Line A
Continuous From Measure	409298.354003
Continuous To Measure	552907.225066

9. Close the project. Do not save changes.

UPDM Route Loading

ArcGIS Desktop

[Create UPDM](#)

[Load Routes](#)

[Loading Additional Routes](#)

Objective

- Part 1 - Create a UPDM geodatabase
- Part 2 - Load Routes
- Part 3 - Migrate control points to calibrate routes
- Load supplemental routes into a network

Data

- Data\ Exercise 8-Network Loading

Data Needed

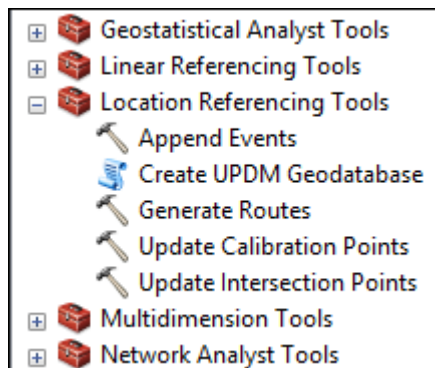
- UPDM.gdb
- SourceData.gdb

Exercises

Populate a UPDM geodatabase

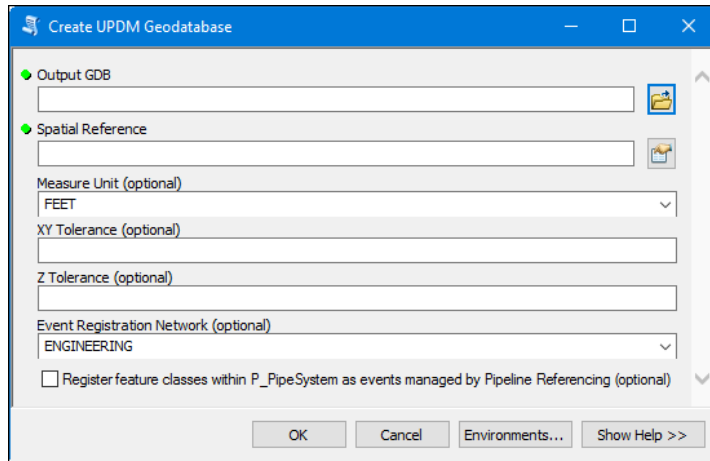
If you plan to use a UPDM geodatabase for your Pipeline Referencing data, use the **Create UPDM Geodatabase** geoprocessing tool. This will create the feature datasets, feature classes, and tables in UPDM along with the ALRS and LRS Networks for use with Pipeline Referencing.

1. Open UPDMDataLoading.mxd in the Network Loading folder.
2. Open the **Create UPDM Geodatabase** geoprocessing tool.
 - a. Open ArcToolbox.
 - b. Expand the **Location Referencing Tools** toolbox.
 - c. Double-click the Create UPDM Geodatabase tool.



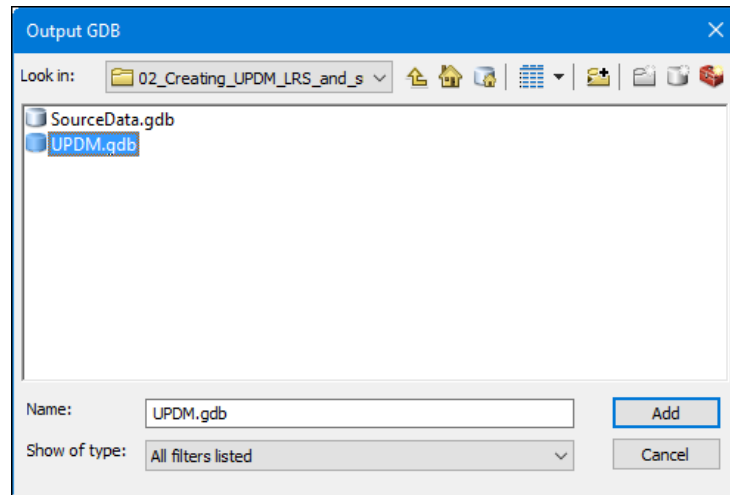
The **Create UPDM Geodatabase** dialog box appears.

If the GDB selected is already populated with tables, feature classes, or domains with the required names, the tool will first delete those items in the GDB and then populate the UPDM items if the **Overwrite Existing** option is set for your geoprocessing environment.



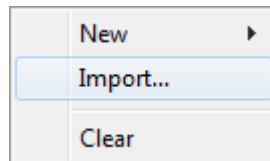
3. Populate the **Output GDB** parameter.

- Click the browse button .
- Browse to and add the UPDM.gdb inside the Network Loading folder.



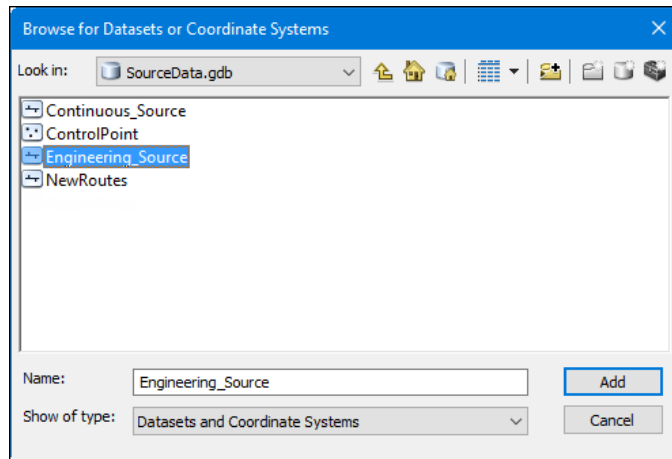
4. Populate the **Spatial Reference** parameter.

- Click the selector button .
- Click the **Add Coordinate System** button .
- Click **Import**.

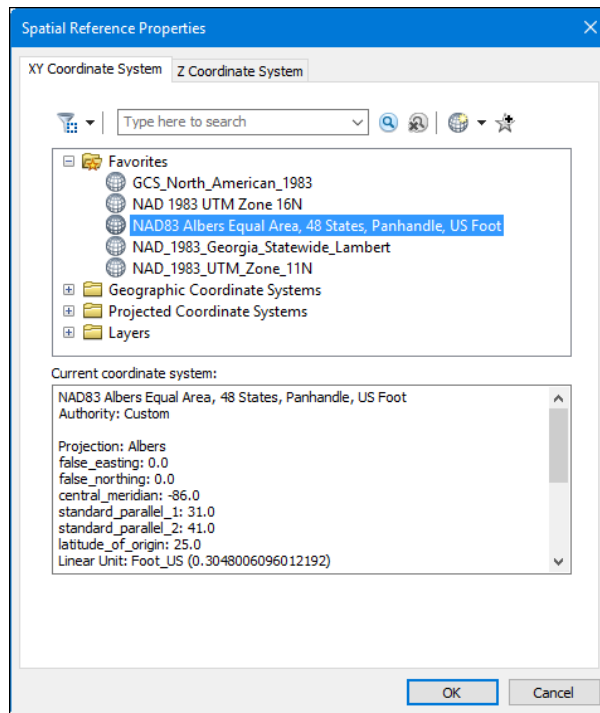


- Browse to and add the Engineering_Source feature class in the SourceData.gdb inside the Network Loading folder.

If you don't want to import your spatial reference from an existing feature class, you could browse to and select your desired coordinate system.



The coordinate system of the selected feature class is selected as the XY coordinate system.



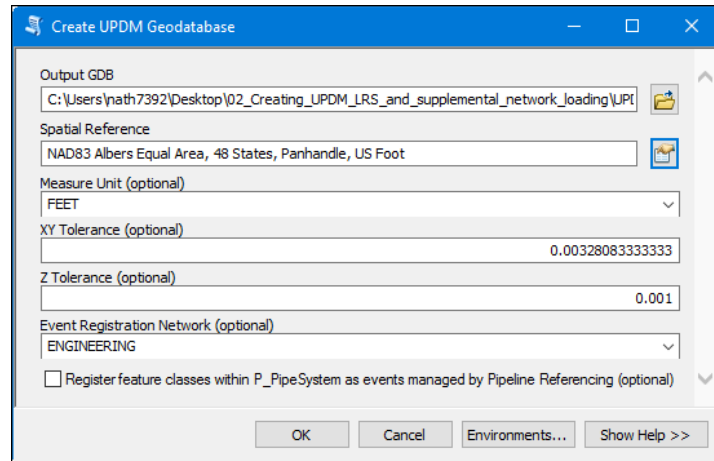
e. Click **OK**.

The tolerance values can be changed if needed. However, the tolerance values should match those of data that will be loaded into the LRS Networks for use with Pipeline Referencing.

The unit of measure selected will be the unit of measure for both networks in the ALRS.

It is recommended all events be associated with only one network. Registering events to the Engineering Network will create the Continuous Network as a derived network, which makes it easier to get translated event measures. Registering events to the Continuous Network will result in the Continuous Network being created as an LRS Network.

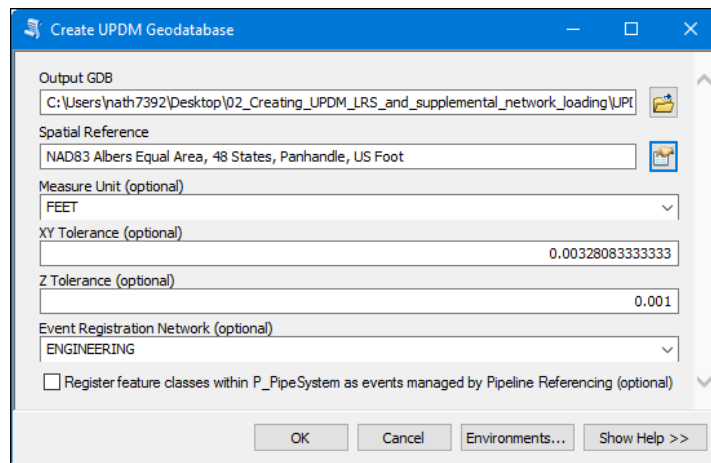
If you want the feature classes within the P_PipeSystem feature dataset to be managed as linear referenced events by Pipeline Referencing, you should check the option. If those feature classes will be managed by another application, like the Utility Network, you should leave the option unchecked so they are not linear referenced or updated by Pipeline Referencing.



5. Ensure FEET is the unit of measure in the **Measure Unit** parameter for the LRS Networks.

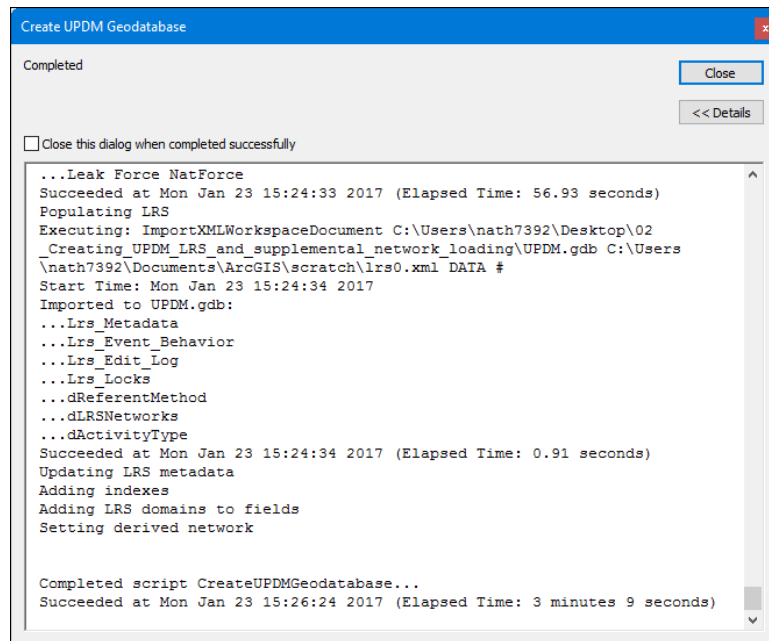
The **XY Tolerance** and **Z Tolerance** parameters are populated with the default values for the selected spatial reference.

6. Click **ENGINEERING** for the **Event Registration Network**.
7. Leave the **Register feature classes within P_PipeSystem as events managed by Pipeline Referencing** unchecked and click **OK**.

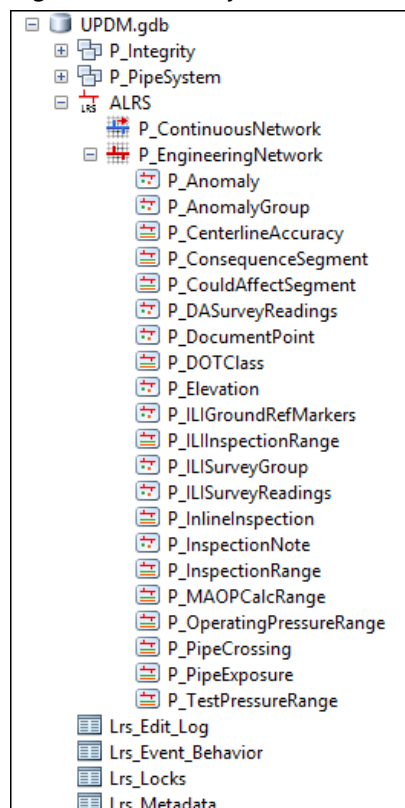


The tool runs to completion.

Notice the network selected for event measure storage has the events associated.



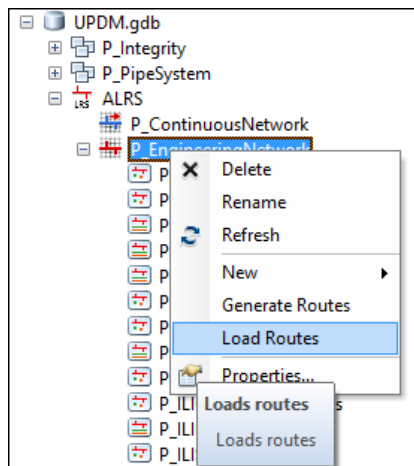
8. Click **Close**.
9. In the **Catalog** window, expand the UPDM geodatabase. The geodatabase is now populated with all UPDM feature datasets, feature classes, tables and domains. Additionally, the ALRS, LRS Networks, and LRS Events are also registered and ready to be loaded.



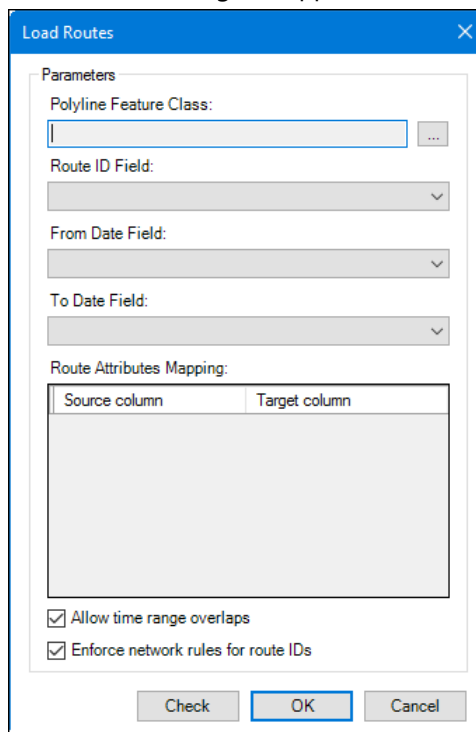
Load routes into the Engineering Network

Once a network is registered with an ALRS, routes can be loaded into the network. The **Load Routes** tool will load source routes into the Network feature class, the centerline feature class, and the centerline sequence table. In this exercise, you will use the **Load Routes** tool to load source data into the engineering network that was created within the UPDM geodatabase.

1. Right-click the P_EngineeringNetwork in the ALRS in the **Catalog** window.
2. Click **Load Routes**.

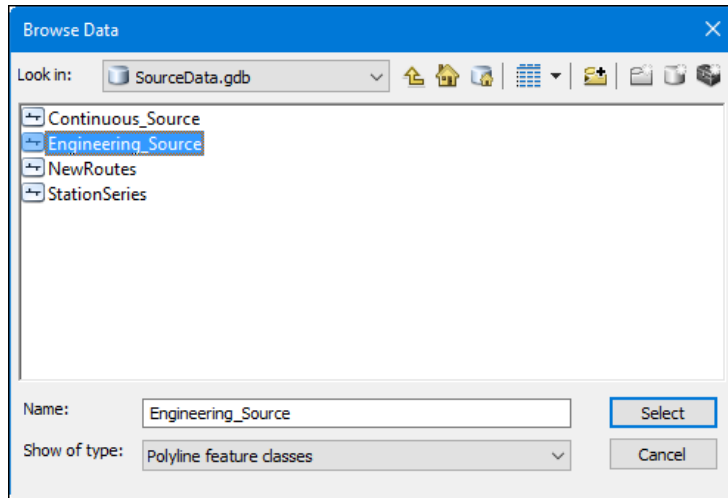


The **Load Routes** dialog box appears.



3. Click the **Polyline Feature Class** ellipsis button .

4. Browse to and select the **Engineering_Source** feature class in the SourceData geodatabase in the UPDMSupplementalDataLoading folder.



5. Click the **Route ID Field** drop-down arrow and choose **EventID**.
6. Click the **From Date Field** drop-down arrow and choose **EffectiveFromDate**.
7. Click the **To Date Field** drop-down arrow and choose **EffectiveToDate**.
8. In the **Route Attributes Mapping** section, map the following source and target columns.
 - a. For **LineLoopEventID** in Source, select **LineID** in Target.
 - b. For **SeriesOrder** in Source, select **OrderID** in Target.
 - c. For **StationSeriesName** in Source, select **RouteName** in Target.
 - d. For **LineName** in Source, select **LineName** in Target.

Load Routes

Parameters

Polyline Feature Class:
C:\Users\nath7392\Desktop\02_Creating_UPDM_LI ...

Route ID Field:
EventID

From Date Field:
EffectiveFromDate

To Date Field:
EffectiveToDate

Route Attributes Mapping:

Source column	Target column
SeriesOrder	ORDERID
StationSeriesName	ROUTENAME
ToConnectionStationValue	<Do not map> <Add to Network>
ToStationSeriesEventID	ROUTENAME
LineName	LINENAME CREATIONUSER LASTUSER

☒ Allow time range overlaps
☒ Enforce network rules for route IDs

Check OK Cancel

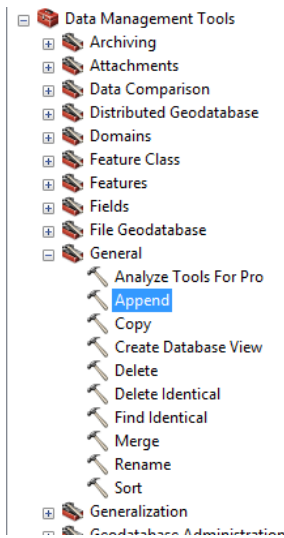
9. Click **Check** to look for duplicate routes.
10. When no duplicates are found, click **OK**.
11. Click **OK** to load the routes.
12. When the routes are successfully loaded, click **Done** to close the tool.
13. Click **No** when prompted to update calibration points.

Migrating calibration points to the Engineering Network

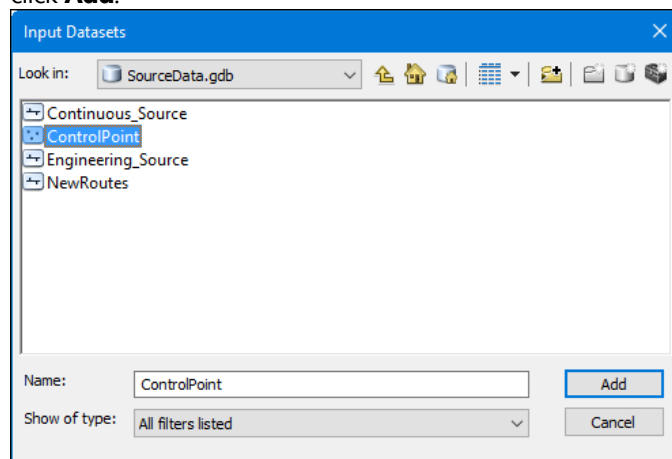
Once routes are loaded, the next step is to append calibration points to calibrate the routes. In this exercise, you will append existing control points into the calibration point feature class then calibrate the routes in the network.

Note: Some preprocessing has been done to the calibration points that are being appended, such as adding and populating the networkID field. If you're migrating your data from APDM, PODS, or another database, you will need to populate these values to ensure calibration is correctly applied to your routes.

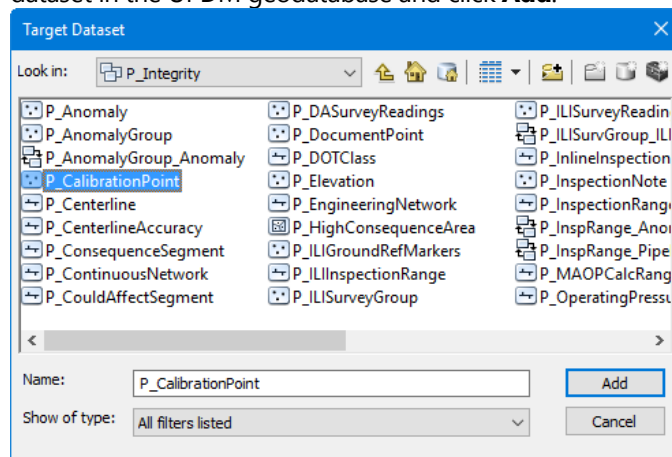
1. Expand the **Data Management Tools** toolbox within **ArcToolbox**.
2. Expand the **General** Toolset and double-click the **Append** tool.



3. Click the **Input Datasets** browse button .
4. Browse to the **ControlPoint** feature class in the SourceData geodatabase and click **Add**.

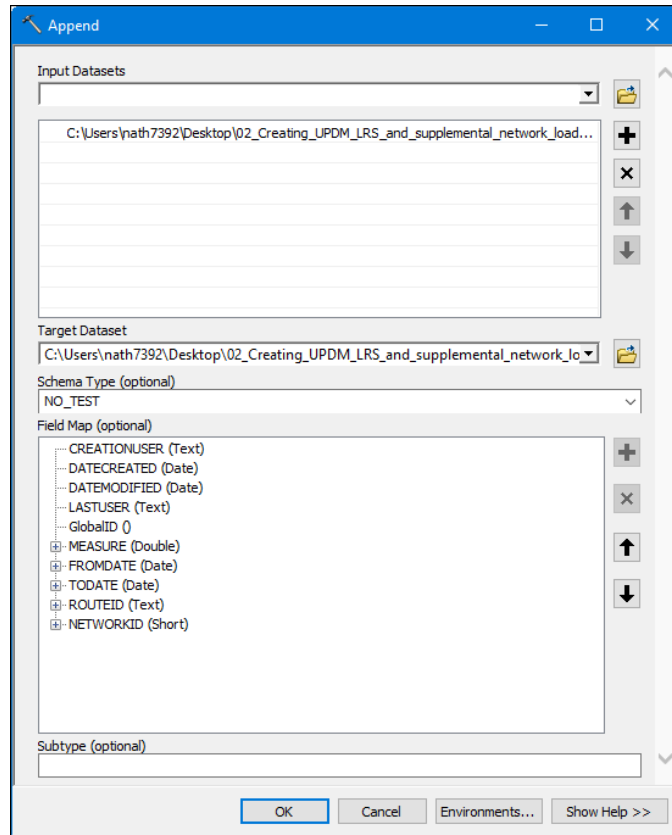


5. Click the **Target Dataset** browse button .
6. Browse to the **P_Calibration_Point** feature class in the P_Integrity feature dataset in the UPDM geodatabase and click **Add**.



Within UPDM, the Continuous Network is configured as a [Derived Network](#) from the Engineering Network. When a Derived Network is configured, running the **Generate Routes** tool against the parent network of the Derived Network (in this case the EngineeringNetwork) results in the shape and measures being updated for both the parent and Derived Network. In this case, running the **Generate Routes** tool against the EngineeringNetwork will update the shapes and measures on both the Engineering and

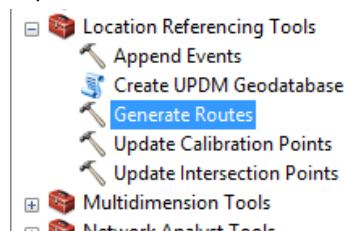
7. Click the **Schema Type** drop-down arrow and choose **NO_TEST**.
8. Verify the Measure, RouteID, NetworkID, From Date, and To Date fields are mapped in the **Field Map** parameter. The editor tracking and replication fields can be left unmapped.



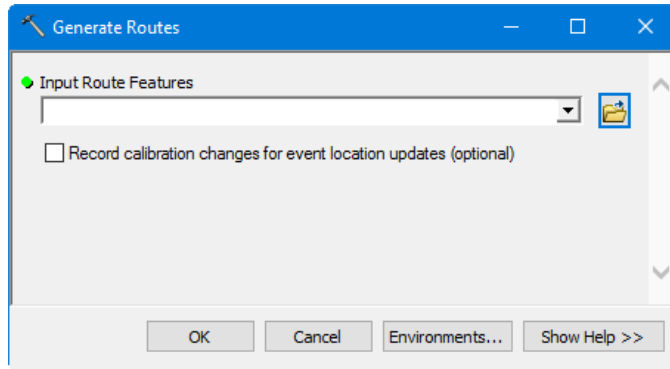
9. Click **OK**.

The control points are appended into the Calibration Point feature class.
Note: The measures from the calibration points haven't been applied to the routes yet. To get calibration applied, you need to run the **Generate Routes** tool.

10. Expand the **Location Referencing Tools** toolbox within **ArcToolbox**.

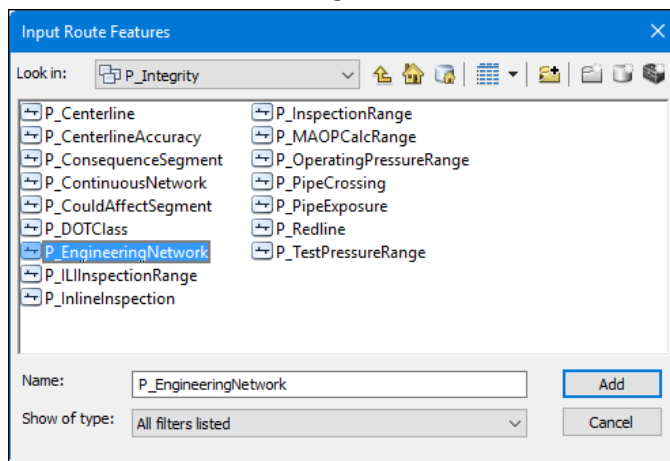


11. Double-click the **Generate Routes** tool.



12. Click the Input Route Features browse button .

13. Browse to the **P_EngineeringNetwork** feature class in the P_Integrity feature dataset in the UPDM geodatabase and click **Add**.

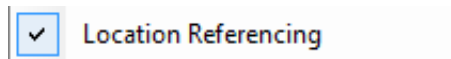


14. Click **OK**.

The Calibration Points are used to apply measures in the EngineeringNetwork, generate shapes in the ContinuousNetwork, and then apply measures in the ContinuousNetwork.

15. Verify calibration was applied to your routes using the **Identify LRS Route Locations** tool on the **Location Referencing** toolbar.

a. Right-click the ArcMap toolbar area and check the **Location Referencing** check box.



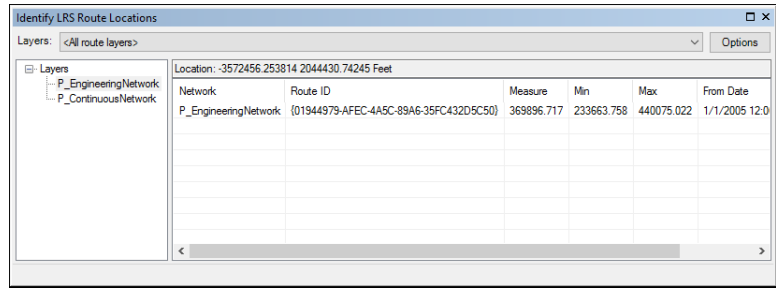
b. Click the **Identify LRS Route Locations** button .

c. Add **P_ContinuousNetwork** to the map.

d. Click one of the EngineeringNetwork and ContinuousNetwork routes on the map.

The **Identify LRS Route Locations** dialog box appears with the RouteID and Measure of the route at the location clicked on the map. The measure in the measure column confirms that calibration was successfully added to the routes in the network.

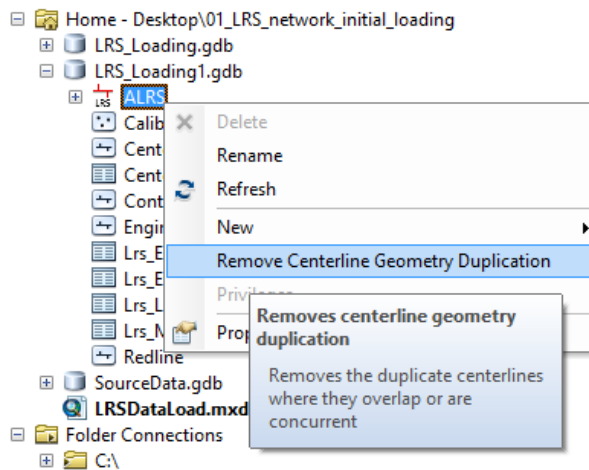
You may load routes for two different networks that are at the same geographic locations; resulting in two centerlines. This tool will remove any duplicates for you, resulting in one centerline for two or more routes at a given location.



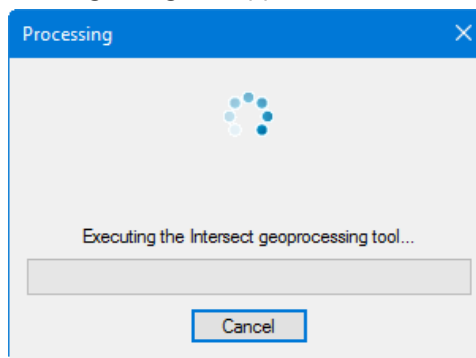
Deduplication of centerlines in the ALRS

The final step in the loading process is to remove any duplicate centerlines. Pipeline Referencing supports multiple networks within the same geodatabase. These networks share a common centerline feature class, calibration point feature class, and centerline sequence table. If any routes are concurrent in a network or if more than one network had routes loaded, there could be duplicate/overlapping centerlines. In this exercise, you will run the **Remove Centerline Geometry Duplication** tool to remove any overlapping/duplicate centerlines.

1. Expand the LRS_Loading geodatabase in the **Catalog** window.
2. Right-click the ALRS and click **Remove Centerline Geometry Duplication**.



A processing dialog box appears and the tool begins to run.



Additional/supplemental routes for the network can come from a variety of sources. To be loaded into the LRS Network they need to be a feature class/shapefile with the required fields (RouteID, RouteName, FromDate, ToDate, etc.)

Since your new route to be added has geometry, you could use Pipeline Referencing in ArcGIS Pro to add this feature as a centerline and then use the Create Route activity to add it to the network. You'll see this workflow in a later exercise. For a single route, using the editing tools to add the route makes sense. For a larger number of new/supplemental route, it makes sense to use the **Load Route Updates** tool.

The key concept here is no matter how you get your data, it needs to have a shape and values for the required attributes to be loaded using the **Load Route Updates** tool.

Notice this appears to be the same tool as the **Load Routes** tool for initial data loading. Pipeline Referencing detects whether routes are present in the network, which determines whether the route loading is initial or supplemental.

When the tool finishes, the dialog box will close and duplicate/overlapping centerlines will be removed.

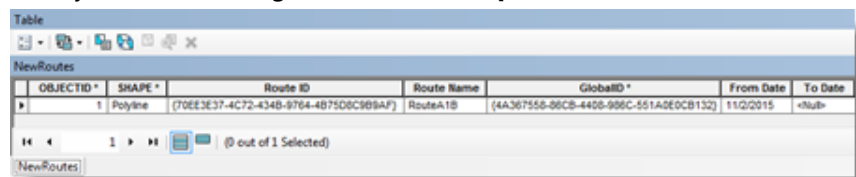
Supplemental Loading of Routes

Pipeline Referencing also supports loading multiple routes from different sources. This supplemental route loading process can include new routes (like new construction), replacements for existing routes (same routeID but changes to geometry/attributes), or both. In this exercise, you'll add new routes to an existing network using the **Load Route Updates** tool.

Note: Some preprocessing has been done to the routes that are being loaded. Depending on the format of the data you receive to be loaded, you may need to transform your routes in order to use the Load Route Updates tool.

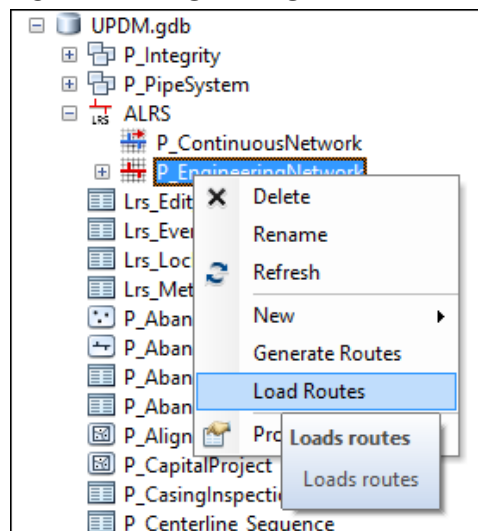
1. Open UPDMDataLoading.mxd, if not still open.
2. Add the **NewRoutes** feature class to the map.
3. Open the attribute table.

Notice the RouteID, RouteName, FromDate, and ToDate fields are populated and that the RouteID and RouteName are unique. These are the required fields to correctly load routes using the **Load Route Updates** tool.

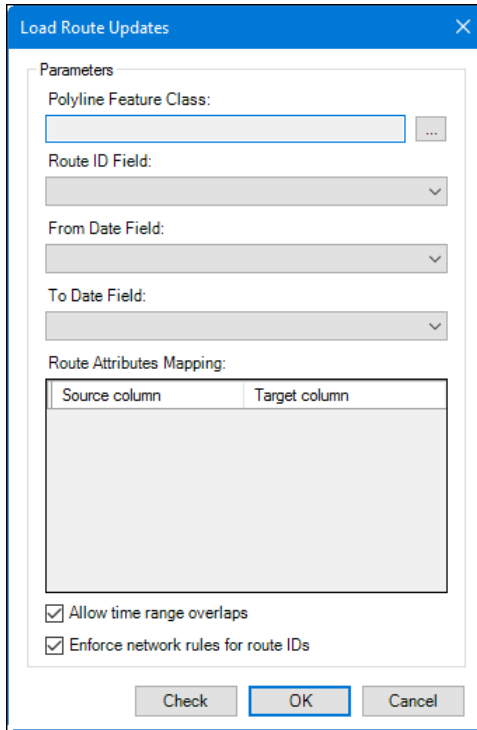


OBJECTID	SHAPE	Route ID	Route Name	GlobalID	From Date	To Date
1	Polyline	(70EE3E37-4C72-434B-9764-4B75D0C9B9AF)	RouteA1B	(4A367558-96C8-4405-996C-551A0E0CB132)	11/2/2015	<Null>

4. In the **Catalog** window, expand the ALRS in the UPDM.gdb inside the UPDMSupplementalDataLoading folder.
5. Right-click **P_EngineeringNetwork** and click **Load Routes**.



The **Load Route Updates** dialog box appears.



Load Route Updates

Parameters

Polyline Feature Class: ...

Route ID Field:

From Date Field:

To Date Field:

Route Attributes Mapping:

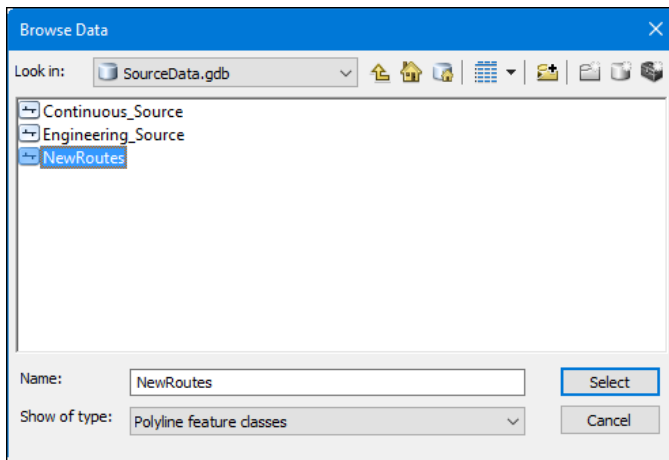
Source column	Target column

☒ Allow time range overlaps

☒ Enforce network rules for route IDs

Check OK Cancel

6. Click the **Polyline Feature Class** ellipsis button .
7. Browse to and select the **NewRoutes** feature class in the SourceData.gdb.



Browse Data

Look in:       

Continuous_Source

Engineering_Source

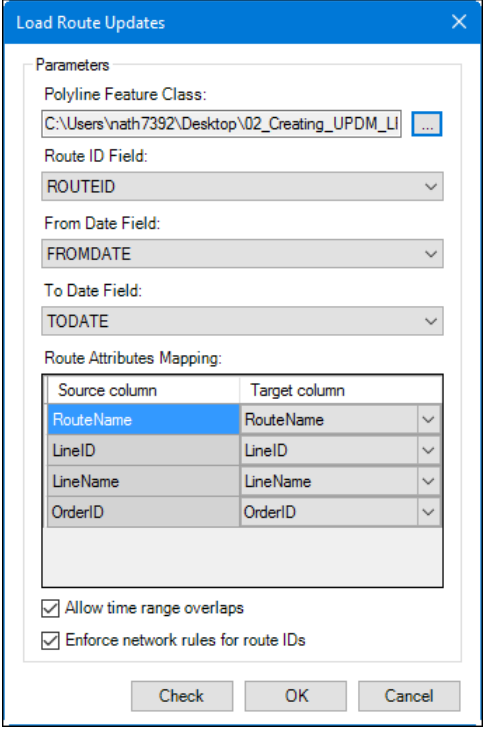
NewRoutes

Name:

Show of type:

8. Use the default mappings for **Route ID Field**, **From Date Field**, **To Date Field**, and **Route Attributes Mapping**.

Supplemental route loading requires both loading and calibrating the routes be performed in the same operation.



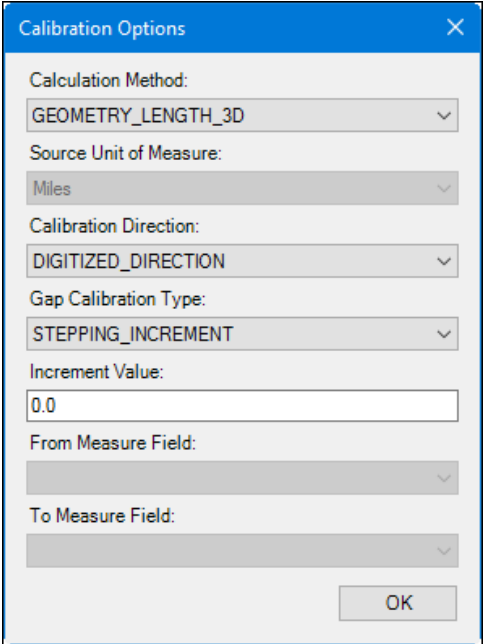
The **Load Route Updates** dialog box contains the following fields and options:

- Parameters**
 - Polyline Feature Class:** C:\Users\nath7392\Desktop\02_Creating_UPDM_LI
 - Route ID Field:** ROUTEID
 - From Date Field:** FROMDATE
 - To Date Field:** TODATE
 - Route Attributes Mapping:**

Source column	Target column
RouteName	RouteName
LineID	LineID
LineName	LineName
OrderID	OrderID
 - ☒ Allow time range overlaps
 - ☒ Enforce network rules for route IDs
- Buttons:** Check, OK, Cancel

9. Click **Check**.
10. Click **OK** when no duplicates are found.
11. Click **OK** to load the route.

Once the route is loaded, the **Calibration Options** dialog box appears.



The **Calibration Options** dialog box contains the following fields and options:

- Calculation Method:** GEOMETRY_LENGTH_3D
- Source Unit of Measure:** Miles
- Calibration Direction:** DIGITIZED_DIRECTION
- Gap Calibration Type:** STEPPING_INCREMENT
- Increment Value:** 0.0
- From Measure Field:**
- To Measure Field:**
- Buttons:** OK

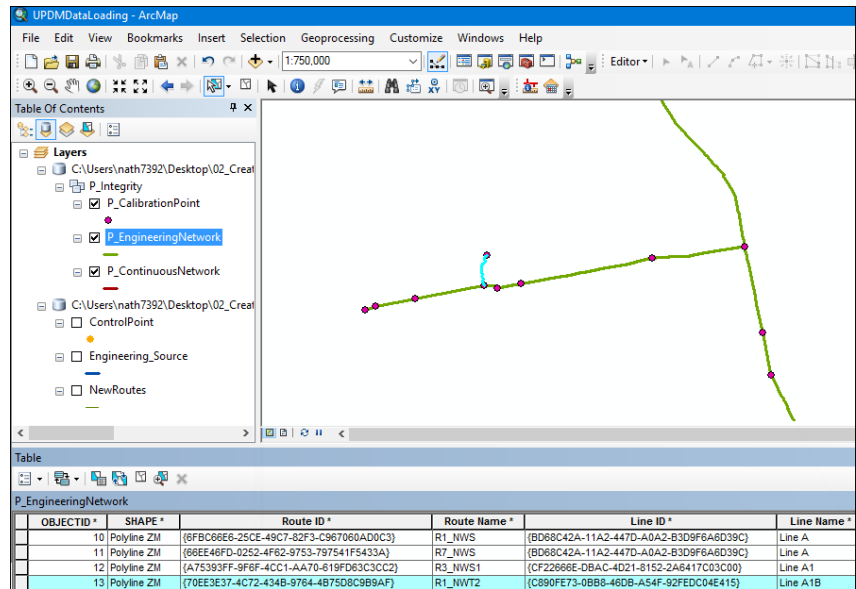
12. Use the default values and click **OK**.

The calibration points are successfully created and calibration is applied to the new route.

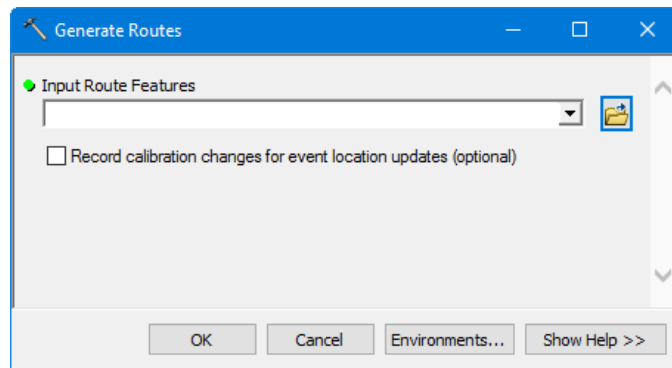
If you have additional control points at points of inflection or other locations along the routes you want to add, you can append them into the Calibration Points feature class, then generate routes. The example earlier in the exercise did this.

If the new or supplemental routes loaded had concurrent geometry in any sections, the **Remove Centerline Geometry Duplication** tool would remove the overlapping centerlines.

13. Click **Done**.
 14. When prompted to run the **Remove Centerline Geometry Duplication** tool, click **Yes**.
- The **Remove Duplicate Centerline Geometry** tool runs.
15. Refresh the map and add the P_EngineeringNetwork if not already in the map.
- The new route has been added.

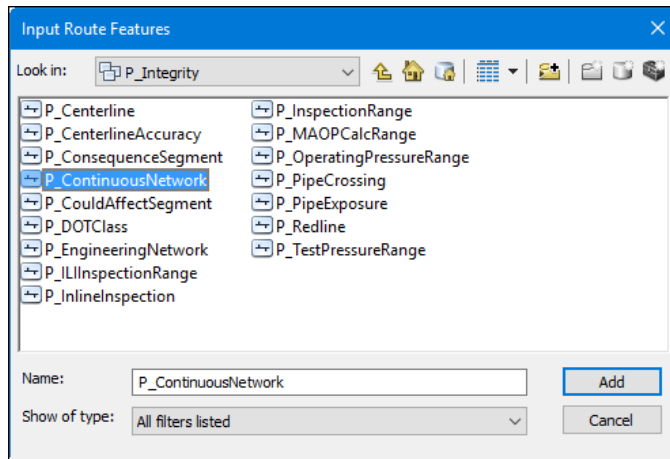


16. To add the route to the P_ContinuousNetwork, open the [Generate Routes](#) tool.



Note that selecting the P_ContinuousNetwork (the Derived Network) will result in only that network having routes generated.

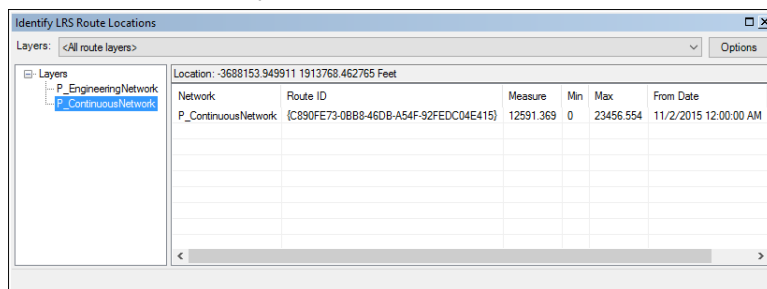
17. Click the **Input Route Features** browse button .
18. Browse to the **P_ContinuousNetwork** feature class in the P_Integrity feature dataset in the UPDM geodatabase and click **Add**.



19. Click **OK**.

The routes from the P_EngineeringNetwork are used to generate the routes in the P_ContinuousNetwork.

20. Click the **Identify LRS Route Locations** button  and click the newly added route in the map.



21. Close ArcMap.

Prepare Data for Publication

ArcCatalog

Objectives

- To access the LRS data on the web either for viewing or editing you need a map service with the Location Referencing capability. Prepare LRS data for publication through a map service.

Data

- Data\ Exercise 9-Pipeline Referencing for Server

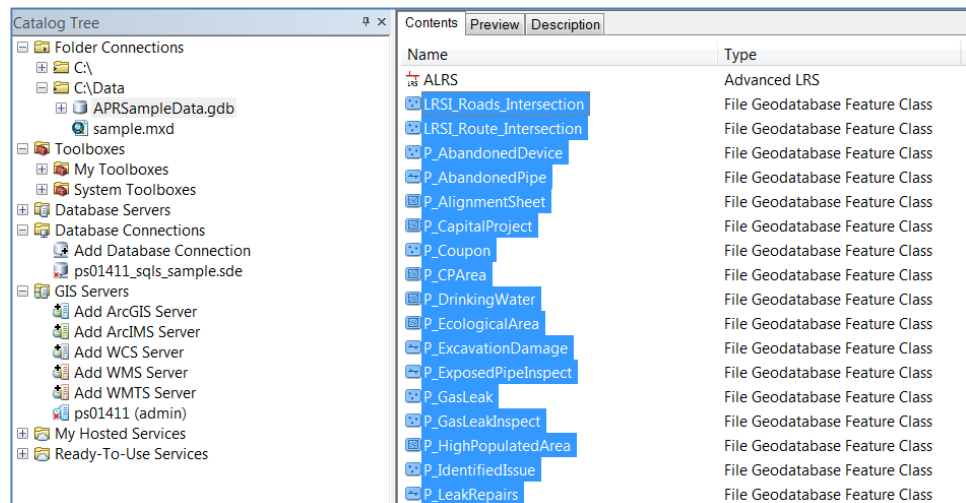
Methodology

1. Start ArcCatalog.

In the **Catalog Tree** window, browse to *Database Connections* and verify that there is a connection for your SQL Server or Oracle database instance. If a connection is not there, then add a new database connection using the database instance information that has been assigned to you.

2. Browse to the file geodatabase containing the sample LRS dataset and click on it so that its tables and feature classes are listed in the **Contents** pane.
3. *Select all items* in the **Contents** pane (tables, feature classes, feature datasets, relationship classes) with the exception of the Advanced LRS (ALRS) node.

The ALRS doesn't need to be included in the selection since it is indirectly represented by the LRS system tables.

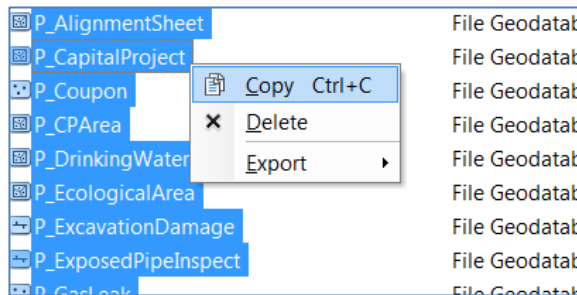


4. In the **Contents** pane, look for the 4 LRS tables shown in the next image and hold down the Shift key and click on the LRS tables to unselect them.

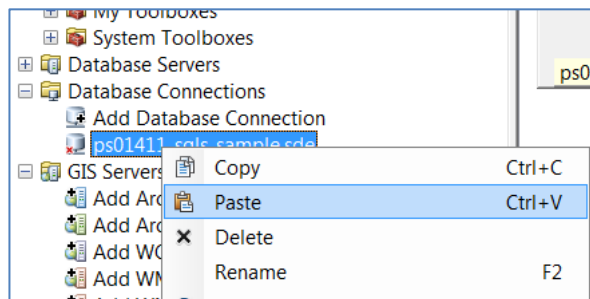
We will copy these tables in a later step.

Contents	
Preview Description	
Name	Type
P_Integrity	File Geodatabase Feature Dataset
P_PipeSystem	File Geodatabase Feature Dataset
ALRS	Advanced LRS
Lrs_Edit_Log	File Geodatabase Table
Lrs_Event_Behavior	File Geodatabase Table
Lrs_Locks	File Geodatabase Table
Lrs_Metadata	File Geodatabase Table
LRSI_Roads_Intersection	File Geodatabase Feature Class
LRSI_Route_Intersection	File Geodatabase Feature Class
LRSI_Routes_Intersection	File Geodatabase Feature Class
P_AbandonedDevice	File Geodatabase Feature Class
P_AbandonedPipe	File Geodatabase Feature Class
P_AbandonedRemovedDevice	File Geodatabase Table
P_AbandonedRemovedPipe	File Geodatabase Table
P_AlignmentSheet	File Geodatabase Feature Class

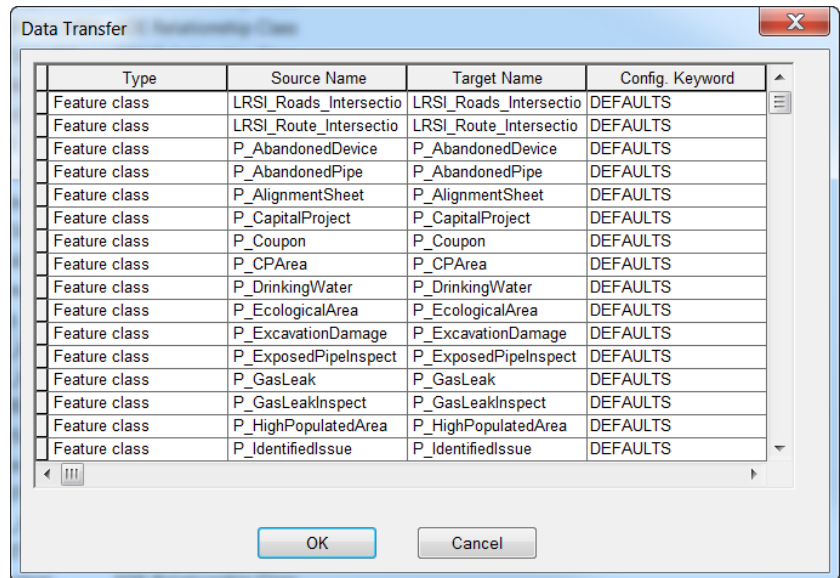
- Right-click the selected items and click *Copy* (Ctrl+C).



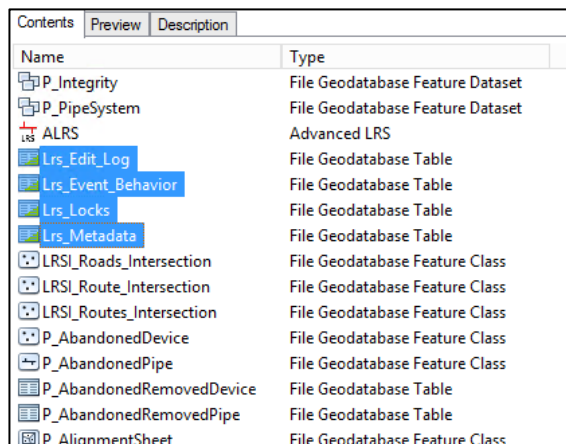
- Right-click the database connection for your enterprise geodatabase and choose *Paste* (Ctrl+V). Alternatively, you can drag and drop the selected items from your file geodatabase into the enterprise geodatabase.



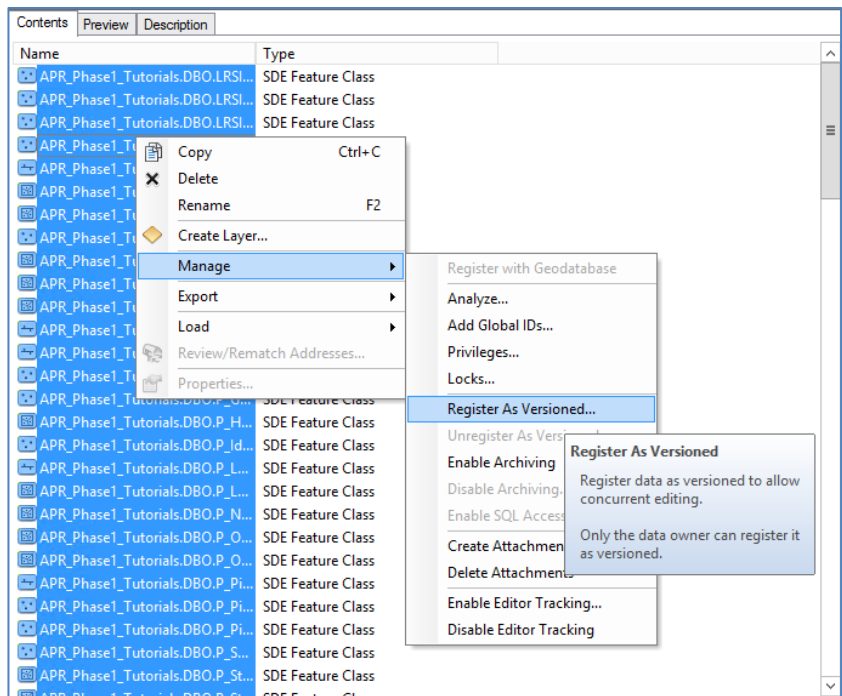
- Click **OK** when a dialog box appears confirming the data transfer. The data transfer might take some time so please be patient.



8. Once the data has finished copying, return to the file geodatabase and copy the remaining 4 LRS tables that you skipped earlier and paste them into the enterprise geodatabase.



9. Next, you must *register all tables, feature classes, and feature datasets as versioned*, with the exception of the following tables: **Lrs_Event_Behavior**, **Lrs_Locks**, and **Lrs_Metadata**. Those three tables must remain un-versioned.
 - a) Click on the enterprise geodatabase connection in the **Catalog Tree** window so that its tables and feature classes are listed in the **Contents** pane.
 - b) Click the **Type** column header to sort the items by type. This groups all tables together and all feature classes together, making them easier to select in bulk.
 - c) Select all *feature classes*, right-click on the selected items and click **Manage > Register as Versioned**.
 - d) click OK in the registration dialog box.



- e) Repeat the registration process for *feature datasets*. Select all feature datasets, right-click on them and click **Manage > Register as Versioned**.
- f) Repeat the registration process for *tables*. Select all tables, with the exception of the 3 tables mentioned above, right-click on them and click **Manage > Register as Versioned**.

Now your data is ready to be used with the next exercise.

Map Service Publishing

ArcMap

To read more about Event Editor, read <https://goo.gl/vgdlii>



Objectives

- Publish a map service with linear referencing capability so that LRS data can be accessed using the web for viewing or editing purposes.
- Publish a map service with linear referencing capability to use with the Event Editor application, which can be optionally installed and configured to perform the event editing at your organization.

Software Prerequisites

- ArcGIS Server which is part of ArcGIS Enterprise
- ArcGIS Pipeline Referencing for Desktop
- ArcGIS Pipeline Referencing for Server
- Enterprise Geodatabase (SQL Server or Oracle)

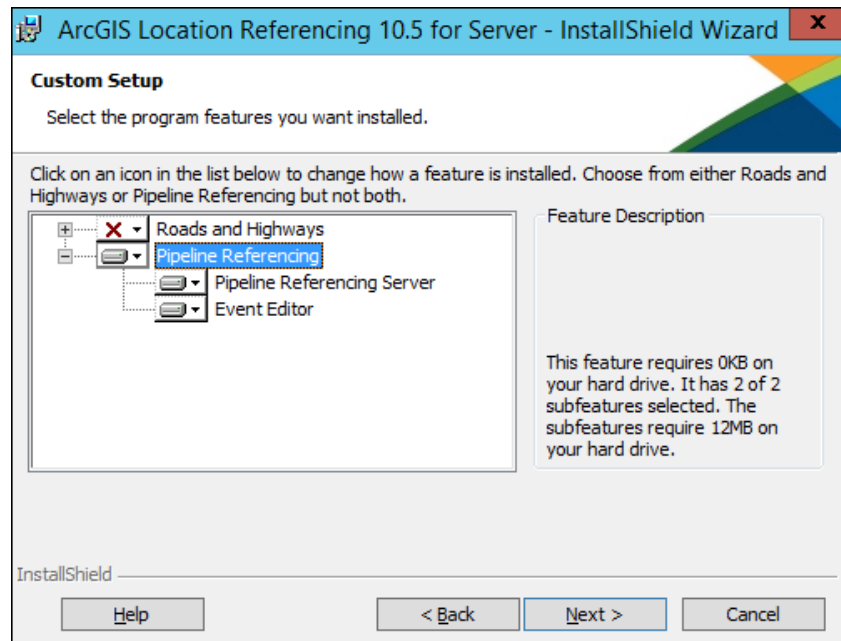
Layers Needed

- Networks (*Continuous Network and Engineering Network*)
- Point Events
- Line Events

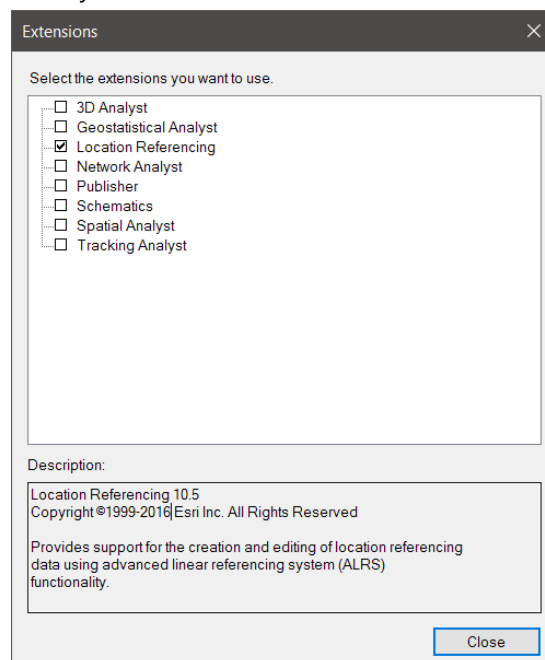
Methodology

1. On your ArcGIS Server machine(s), start the installation wizard for the ArcGIS Pipeline Referencing for Server software.
In the installer, you will see the software referred to as ArcGIS Location Referencing for Server.
2. Choose all features under **Pipeline Referencing** to be installed.

If you have the ArcGIS server and Web Server on separate machines, then install Pipeline Referencing Server feature on ArcGIS Server and Event Editor feature on Web Server machine.



3. Continue with the default installation settings.
4. Start ArcMap.
5. Enable the **Location Referencing** ArcMap extension by clicking *Customize > Extensions* and checking the **Location Referencing** check box if it is not already checked.

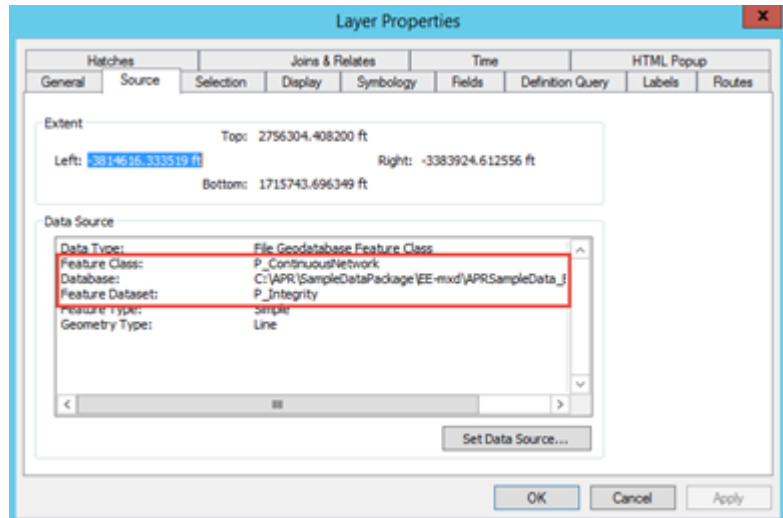


6. Use the *sample.mxd* map document to get started.
 - a. Map layers in *sample.mxd* are currently sourced to data from a file geodatabase. The layers need to be re-sourced to the data that you

You may start with a blank map document and add network and event layers to your map.

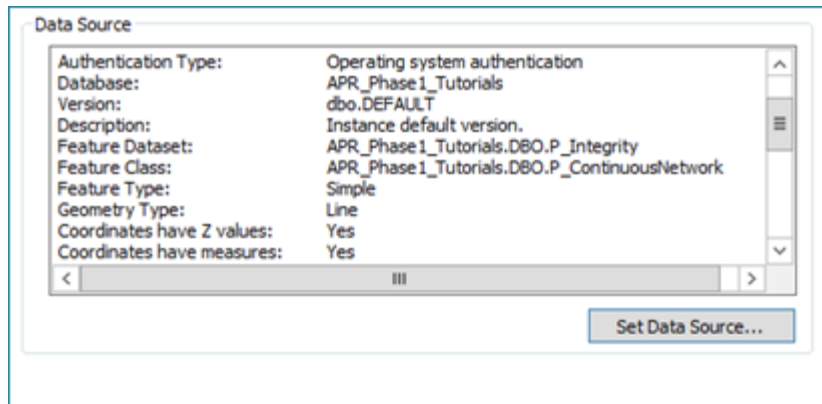
copied into your enterprise geodatabase instance.

- b. For each layer in the map open its *Properties* dialog box and go to the *Source* tab.
- c. Take note of the feature class name and then click *Set Data Source*.

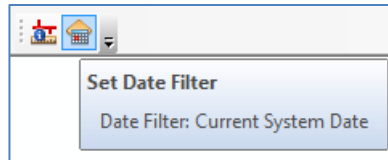


- d. Browse to your enterprise geodatabase and locate the feature class by name.
- e. Select that feature class and click **Add**.

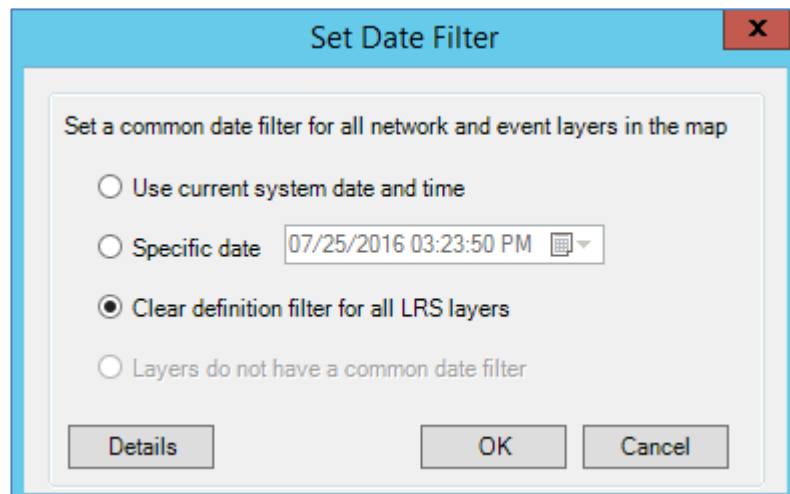
The data source properties for the layer should update to your SQL Server or Oracle database instance.



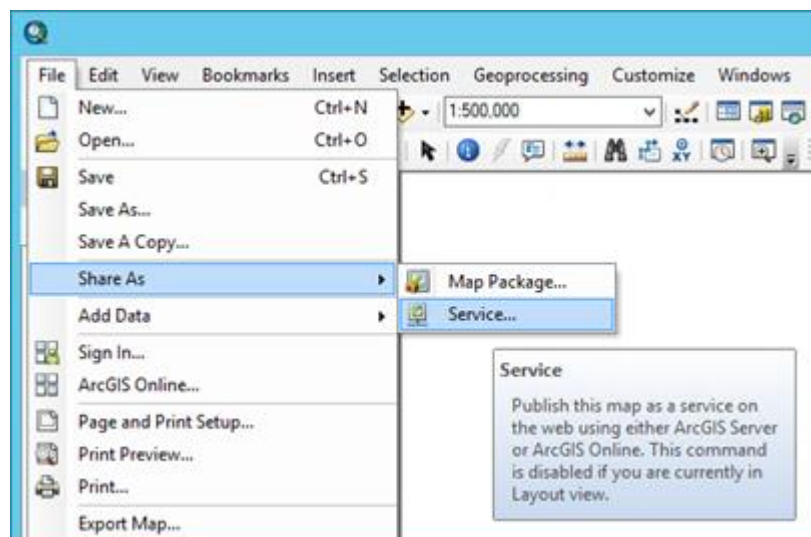
- f. Click **OK** to apply changes and close the **Layer Properties** dialog box.
 - g. Repeat this process (steps b through e) for all map layers and tables.
7. You will now open ArcMap and clear out the date/time filters for all LRS layer types (networks, events, and intersections). This ensures that when the map service is used by client apps, those apps will be able to set a custom date filter to a specific point in time, rather than being constrained by the *Current System Date* filter that is set by default on the LRS layers in ArcMap.
 - a. In the Location Referencing toolbar click on the *Set Date Filter* button.



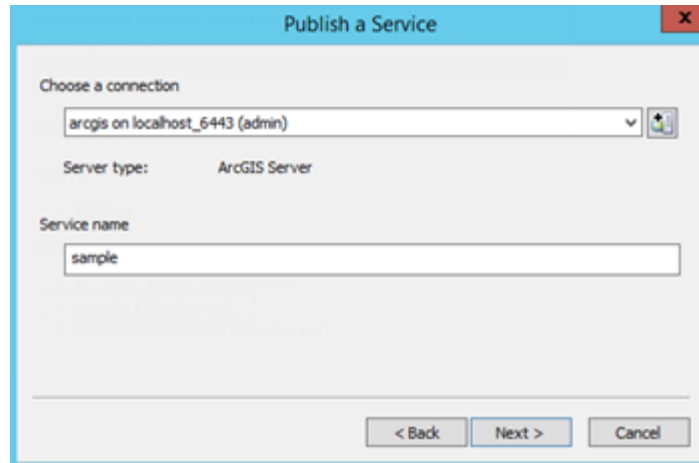
- b. In the **Set Date Filter** dialog box, click the *Clear definition filter for all LRS layers* check box and click **OK**.



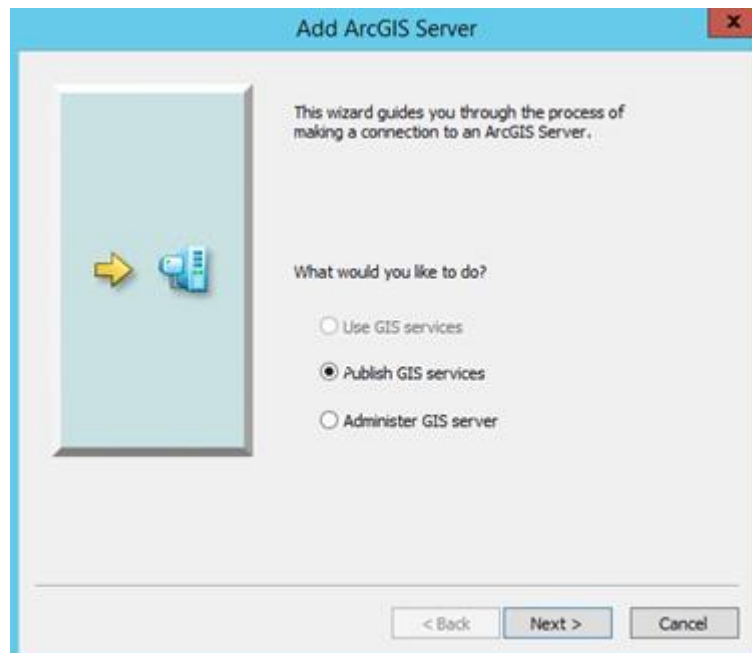
8. The map is now ready to be published as a map service. Click **File > Share As > Service**.



9. Click **Publish a service** and click **Next**.
10. If you do not have the ArcGIS Server registered, then *Create a connection to the ArcGIS Server instance on your testing machine by clicking on the plus + button in the upper-right corner of the dialog box*.



11. Click the *Publish GIS server* option in the **Add ArcGIS Server** dialog box, and click **Next**.



12. Enter the following connection information:
 - a. Server URL: <http://your-machine-name:6080/arcgis>
(example: <http://ps01411.esri.com:6080/arcgis>)
 - b. User Name: arcgis
 - c. Password: arcgis
13. Click **Finish**.

General

Server URL:
 ArcGIS Server: http://gisserver.domain.com:6080/arcgis

Server Type:

Staging Folder:

☒ Use ArcGIS Desktop's staging folder

Authentication

User Name:

Password:

☒ Save Username/Password

[About ArcGIS Server connections](#)

< Back Finish Cancel

14. Give your map service a name, such as *sample* and click **Next**.

Publish a Service

Choose a connection

Server type: ArcGIS Server

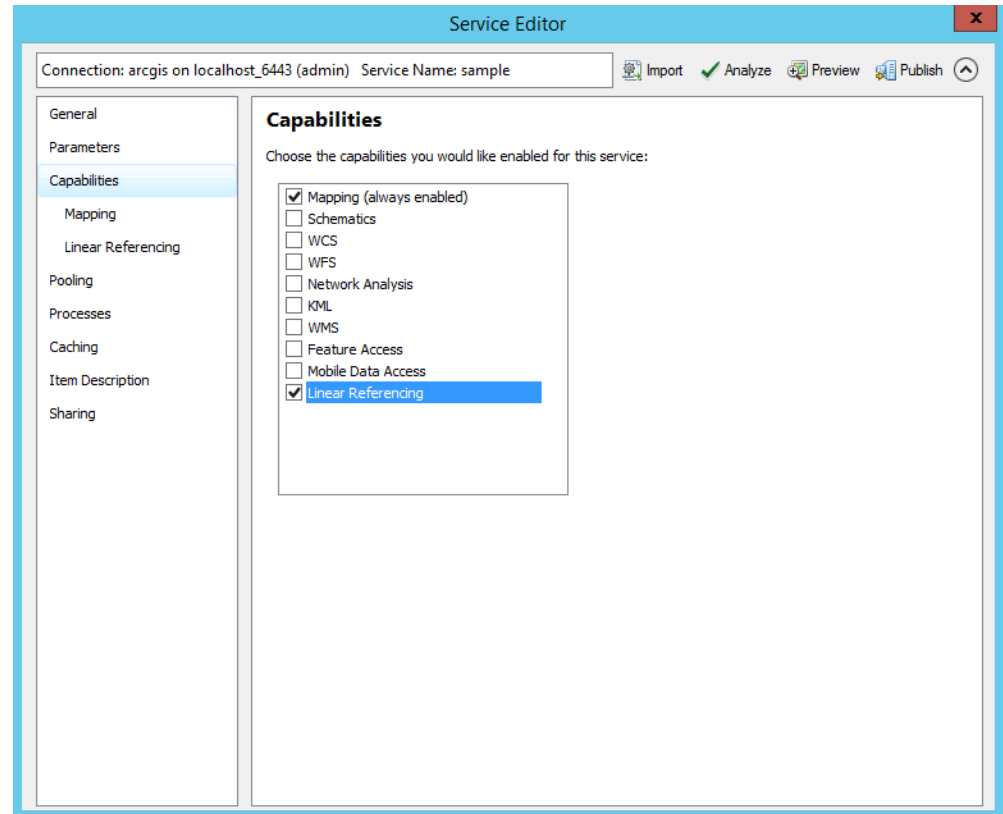
Service name

< Back Next > Cancel

15. Accept the default folder location and click **Continue**.

The **Service Editor** dialog box will present you with various options for configuring a map service.

16. Click **Capabilities** on the left pane.
17. Uncheck **KML**.
18. Check *Linear Referencing*.

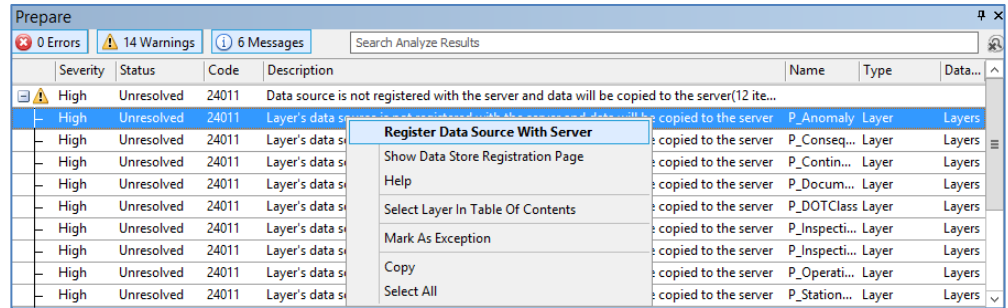


19. Click *Analyze* at the top of the dialog box.

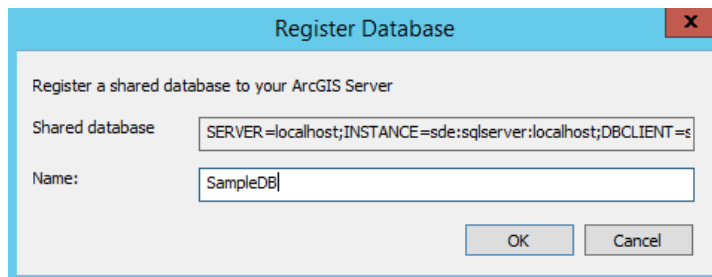
This checks the map layers for potential configuration issues that might affect the publishing process. Typically you will see a warning *Data source is not registered with the server and data will be copied to the server*.

Prepare						
0 Errors		14 Warnings	6 Messages	Search Analyze Results		
Severity	Status	Code	Description	Name	Type	Data...
High	Unresolved	24011	Data source is not registered with the server and data will be copied to the server(12 items)			
High	Unresolved	10066	Map is not time enabled and all data in time enabled layers will draw by default	Layers	Data Frame	Layers
Medium	Unresolved	10045	Map is being published with data copied to the server using data frame full extent	Layers	Data Frame	Layers
Low	Unresolved	30003	Layer draws at all scale ranges(6 items)			

- To resolve that warning, click the plus + button on the left side of the entry in the **Prepare** pane to expand the list of warning messages.
- There will be a separate warning message for each map layer. Right-click on one of the **Layer's data source is not registered ...** warnings and click *Register Data Source With Server*.



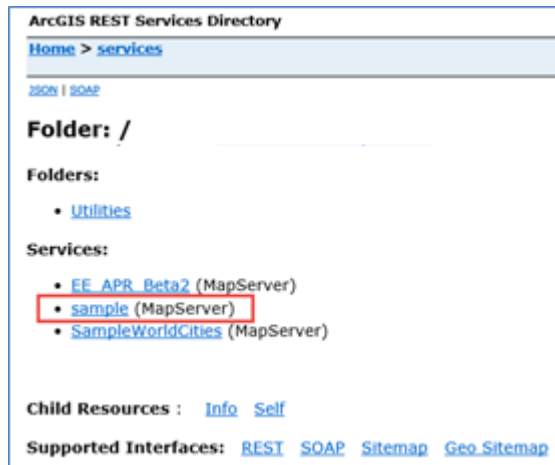
- c. Type a name for the database connection, such as *sampleDB*, and click **OK**.



20. Now that you've resolved that warning message, click *Analyze* again in the **Service Editor** dialog box.

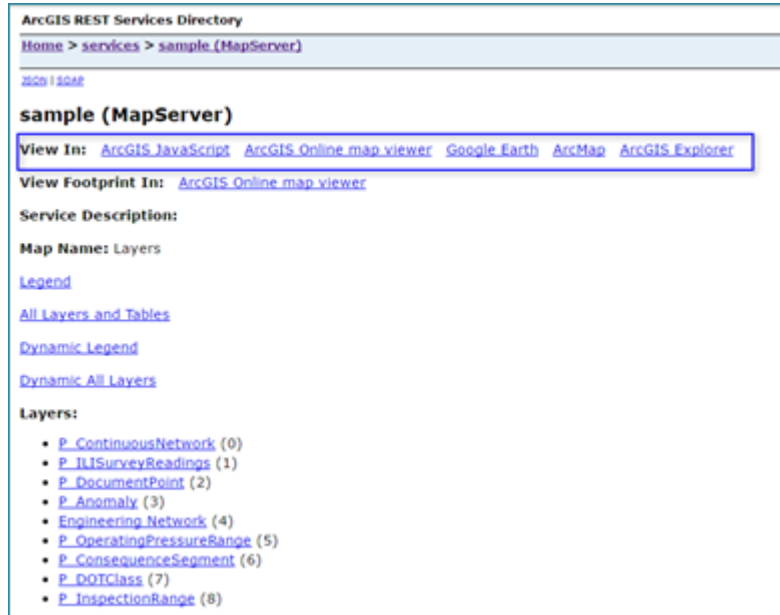
There should not be any errors or high-severity warnings that need to be resolved. The medium- and low-severity warnings can safely be ignored for the purpose of this exercise. You also should ignore the high-severity warning about the map not being time enabled.

21. Click *Publish* at the top-right of the **Service Editor** dialog box. Once the process completes, your map is now published as a map service.
22. Open a web browser like Chrome or Internet Explorer to *view your map service*.
 - a. Browse to the URL `http://<your-machine-name>/arcgis/rest`.
(example: `http://ps01411.esri.com/arcgis/rest`)
 - b. Verify that your service named *sample* is displayed in the list of services.
 - c. Click on its link to view the map service properties.



Near the top of the page is a list of *View In* links to visualize your map service in apps such as ArcGIS Online map viewer and ArcMap.

- d. Click on any of those links to verify that your map service is successfully published and ready for use.



Event Editor Deployment

Read more about installing Portal for ArcGIS: <https://goo.gl/UEzwpk>



This tutorial assumes that have web server i.e IIS on your machine or are working on Web server.

Objectives

- Deploy and configure the Event Editor web app. We are going to use Portal for ArcGIS as the identity manager.

Required Software

- Portal for ArcGIS
- Separate ArcGIS Web adapter (IIS) for the ArcGIS Server

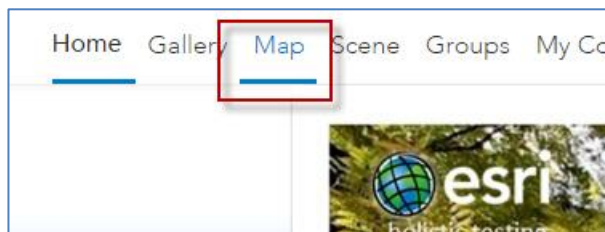
Methodology

1. Open Windows Explorer and browse to the installation folder for Pipeline Referencing for Server. Its default location is:
`C:\Program Files\ArcGIS\LocationReferencing\Server10.5`
2. Browse into the Web > PipelineReferencing folder and copy the *EventEditor* folder (Ctrl+C).
3. Browse to the IIS web server's content folder, which is typically `C:\inetpub\wwwroot` and paste the Event Editor folder (Ctrl+V).

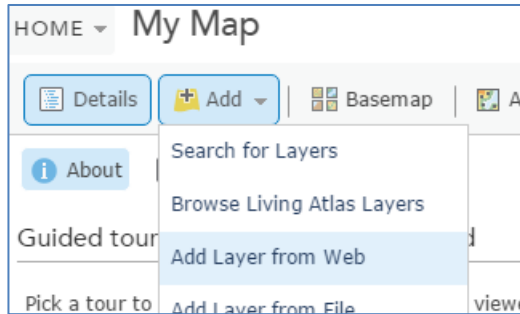
The Event Editor app is now deployed to your web server, meaning it can be accessed in a web browser via a URL such as `http://<your-machine-name>/EventEditor`.

The app must now be configured to use the map that you published in the previous exercise. This is done by creating a web map that includes a reference to your map service.

4. Create a web map with Portal for ArcGIS.
 - a. Open a web browser and go to your Portal for ArcGIS `http://<your-portal-machine>/<portal-web-adpater-name>/home`.
Important: Use http not https.
 - b. *Sign in* using the credentials that have been assigned to you.
 - c. Click *Map* on the top menu bar to start a new web map.

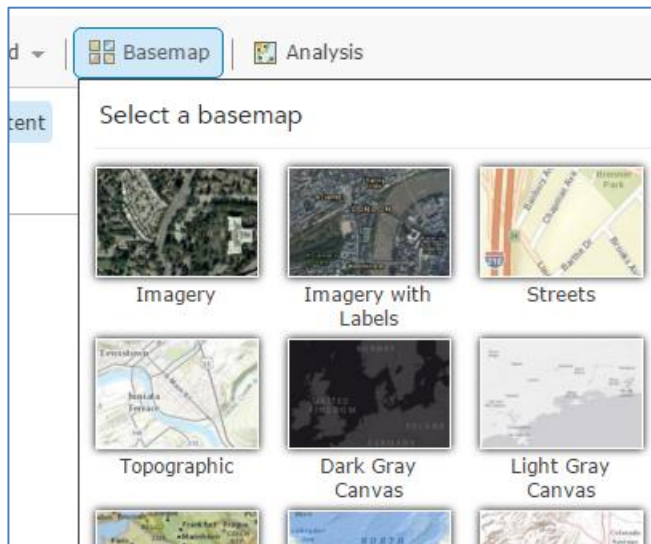


- d. Click *Add > Add Layer from Web*.



- e. Choose ArcGIS Server Web Service and *enter the URL* of your published map service. It should be the following format:
`http://<your-server-machine-name>/arcgis/rest/services/<sample>/MapServer`
 Ensure that you are using the correct names for your testing machine and your map service.

- f. Click *Add Layer*. The map should automatically zoom to display your sample LRS data.
- g. Leave the default Topographic as the the *basemap*.



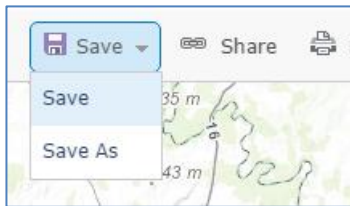
- h. Optionally add any additional data layers to the map that you think

You can optionally create a web map using a local file. Read more about web maps at <https://goo.gl/YJPh7c>



would aid people in viewing and editing your LRS event data.

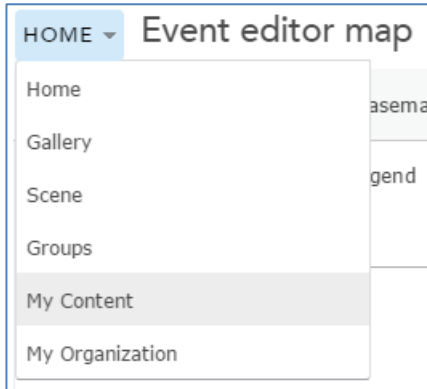
- i. When you are finished authoring your map, click the *Save* button and click *Save*.



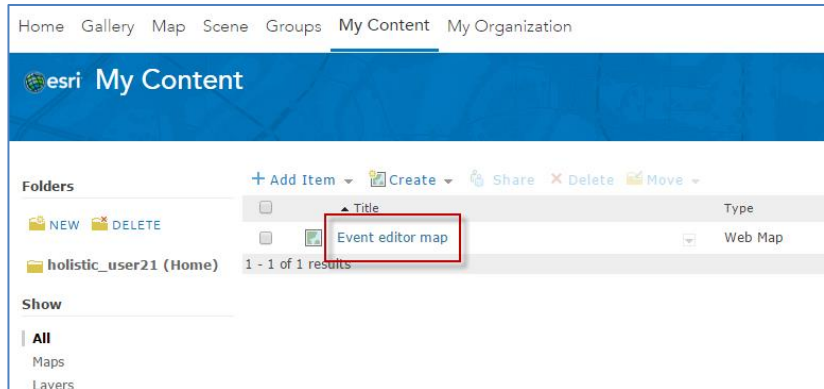
- j. Type a title, a tag, and a summary for your map.
- k. Click *Save Map*.

A screenshot of a 'Save Map' dialog box. It contains four input fields: 'Title' with the text 'Event Editor Map', 'Tags' with 'LRS' and a tag icon, 'Summary' with 'A sample map for editing LRS events', and 'Save in folder' with 'rlwarford'. At the bottom right are two buttons: 'SAVE MAP' and 'CANCEL'.

- l. Click Home on the top-left and click *My Content*.

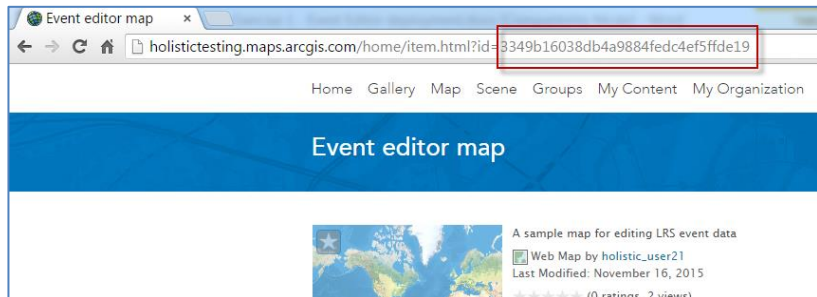


- m. Find your web map in the content list and click on its title to view its details.

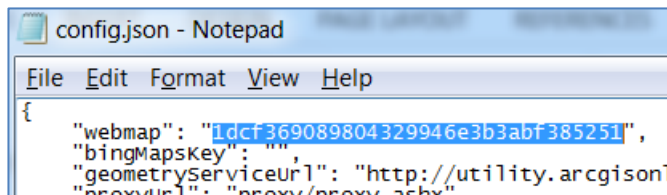


- n. In your web browser's address bar, look for the unique ID at the end of the URL.

This random-looking sequence of letters and numbers uniquely identifies your web map and allows apps like Event Editor to access it directly.



- o. Select the ID text in the URL (everything after the equals sign =) and copy it.
- p. Open Windows Explorer and browse to the Event Editor deployment folder: `C:\inetpub\wwwroot\EventEditor`.
- q. Open the file `config.json` in a text editor such as Notepad.
- Note:** If you do not see the file extension `.json` for the config file, type *File Extension* into the windows start bar and uncheck the option for **Hide extensions for known file types**.
- r. Go to the second line in the file, which starts with `webmap`. Select the `1dcf369089804329946e3b3abf385251` text within the quotes to the right of `"webmap"`, and delete that text.



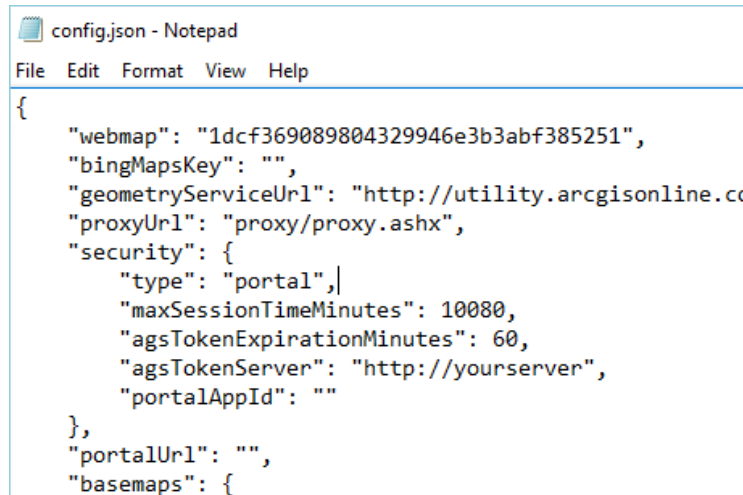
- s. Paste the unique ID that you copied from the web browser URL.

- t. *Save your edits* to config.json and keep the file open for next step.

There are multiple ways to secure the Event Editor, such as Integrated Windows authentication (IWA), OAuth using Portal for ArcGIS or ArcGIS Online, or Token based security using ArcGIS Server.

In this tutorial, we are going to use OAuth using Portal for ArcGIS to secure Event Editor.

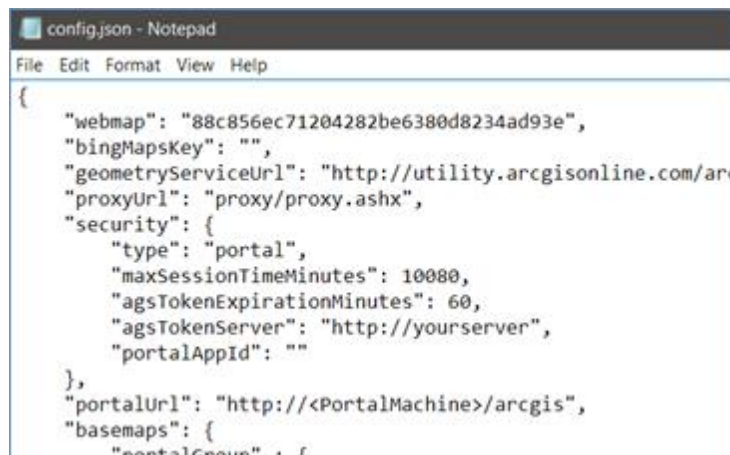
5. Secure Event Editor with Portal for ArcGIS.
 - a. Open the file *config.json* in a text editor such as Notepad if not opened already.
 - b. Go to security and set type to *portal*.



```
config.json - Notepad
File Edit Format View Help
{
  "webmap": "1dcf369089804329946e3b3abf385251",
  "bingMapsKey": "",
  "geometryServiceUrl": "http://utility.arcgisonline.com/arcgis/rest/services/GeometryEngine/GeometryService/MapServer/1",
  "proxyUrl": "proxy/proxy.ashx",
  "security": {
    "type": "portal",
    "maxSessionTimeMinutes": 10080,
    "agsTokenExpirationMinutes": 60,
    "agsTokenServer": "http://yourserver",
    "portalAppId": ""
  },
  "portalUrl": "",
  "basemaps": {
```

Read more about securing event editor: <https://goo.gl/ZlFX5k>

- c. Update portalurl to your portal which is typically `http://<your-portal-machine-name>/<portal-web-adpater-name>`.

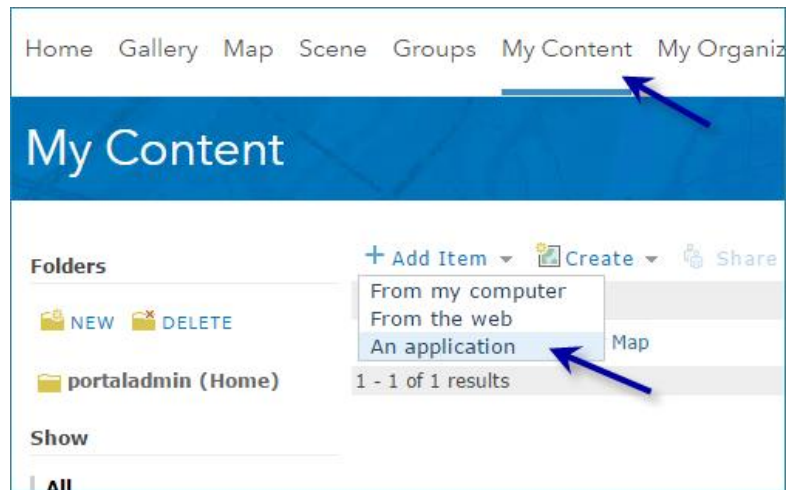


```
config.json - Notepad
File Edit Format View Help
{
  "webmap": "88c856ec71204282be6380d8234ad93e",
  "bingMapsKey": "",
  "geometryServiceUrl": "http://utility.arcgisonline.com/arcgis/rest/services/GeometryEngine/GeometryService/MapServer/1",
  "proxyUrl": "proxy/proxy.ashx",
  "security": {
    "type": "portal",
    "maxSessionTimeMinutes": 10080,
    "agsTokenExpirationMinutes": 60,
    "agsTokenServer": "http://yourserver",
    "portalAppId": ""
  },
  "portalUrl": "http://<PortalMachine>/arcgis",
  "basemaps": {
    "portalGroup": {
```

- d. *Save your edits* to config.json. Keep the file open for the next step.

6. Register the Event Editor app with Portal for ArcGIS.
 - a. Log in to your Portal for ArcGIS account.

- b. Click **My Content**.
- c. Click **Add Item** and choose *An application*.



- d. The **Application** dialog box appears.

Application ?

Add an item from your computer or reference an item on the Web.

Type: ☒ Web Mapping ☐ Mobile ☐ Desktop ☐ Application

☐ Application Extension (Operations Dashboard)

Purpose: API:

URL:

Title:

Tags:

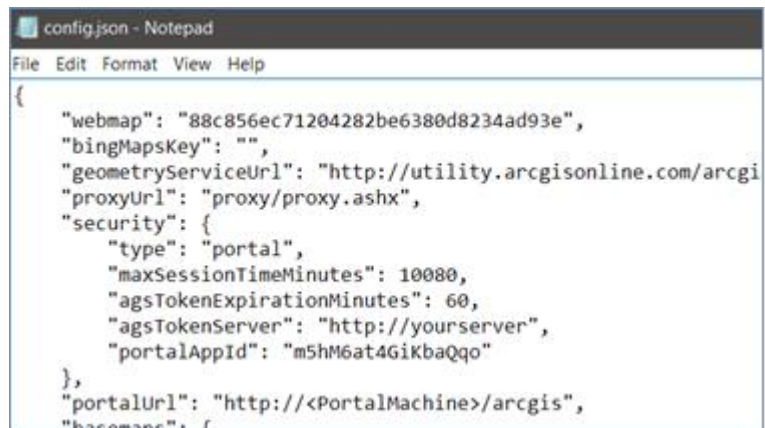
- e. Click **Web Mapping** as the type of item.
- f. Choose *Ready To Use* as the purpose of the app.
- g. Choose *JavaScript* as the API.
- h. Type the url of the application; for example: `http://<your-machine-name>/EventEditor`.
- i. Type *Event Editor* as the title.
- j. Enter tags in the form of words or short phrases that describe your item.
- k. Click **Add Item**.
- l. Click the **Settings** tab.
- m. Scroll down to the App Registration section and click *Register*.

App Registration

Register your app to generate an App ID. Use the App ID in your app to allow users to sign in to the platform (with OAuth 2.0), and to collect usage statistics.

- n. Choose *Browser* as the app type.
- o. Specify the Redirect URI, which should be the server hosting your Event Editor web application. For example, `http://<myServer>`
- p. Click **Add**.
- q. Click **Register**.

Once you have registered your app, you will be provided with an app ID.
- r. Copy the App ID that was provided.
- s. Open the file *config.json* in a text editor such as Notepad, if it is not opened already.
- t. Go to Security section and update the `portalAppId` attribute.

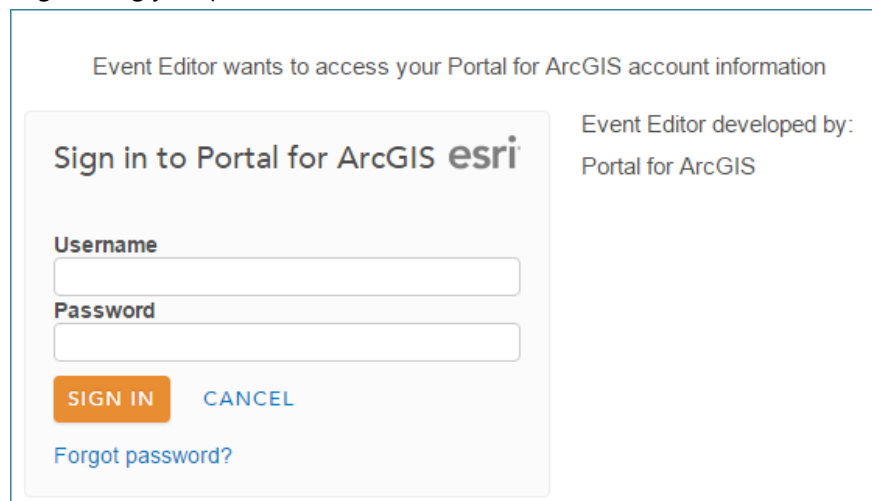


```

{
  "webmap": "88c856ec71204282be6380d8234ad93e",
  "bingMapsKey": "",
  "geometryServiceUrl": "http://utility.arcgisonline.com/arcgis",
  "proxyUrl": "proxy/proxy.ashx",
  "security": {
    "type": "portal",
    "maxSessionTimeMinutes": 10080,
    "agsTokenExpirationMinutes": 60,
    "agsTokenServer": "http://yourserver",
    "portalAppId": "m5hM6at4GikbaQqo"
  },
  "portalUrl": "http://<PortalMachine>/arcgis",
  "basemap": {

```

7. Now that you have deployed and configured Event Editor, it is ready for you to launch in a web browser. Open a browser and browse to the following URL, filling in the name of your testing machine.
`http://<your-machine-name>/EventEditor`
8. Log in using your portal credentials.

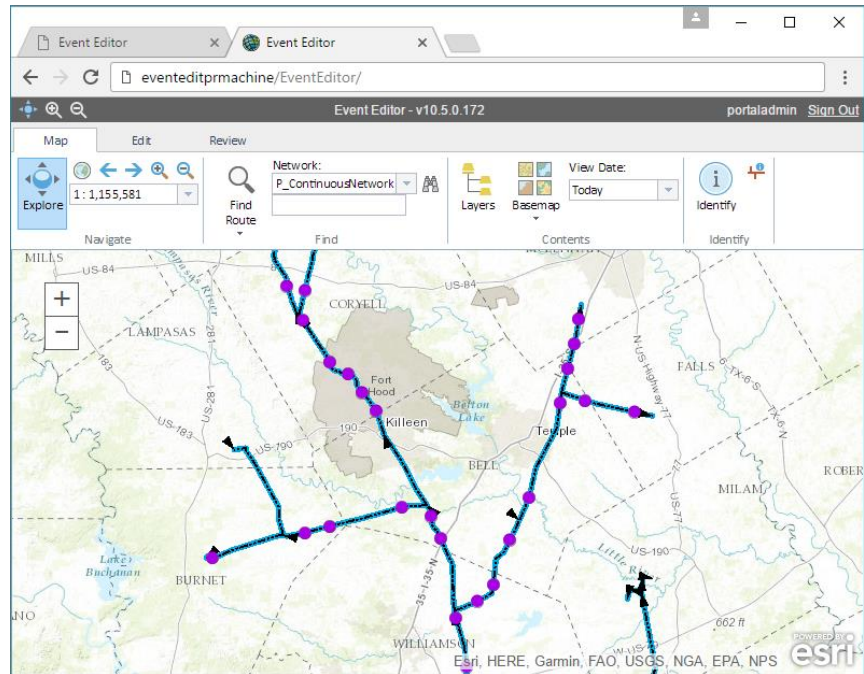


There are 2 levels of membership in Portal for ArcGIS. To edit data in Event Editor you need a Level 2 user.

After authentication, the app should load within a few seconds and the map should display your LRS data layers on top of the Basemap.

Read more about the Levels, see:

<https://goo.gl/mssVYC>



In later exercises, you will learn more about the features of Event Editor.

Adding Line Events

Event Editor

More Information:

Attribute Sets

<https://goo.gl/k3glEJ>

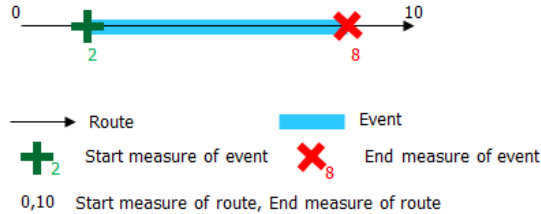


Attribute sets are used to create a set or group of event column fields, from one or more event layers, that you can use to add records in the **Add Linear Events** widget in Event Editor.

The administrator can create preconfigured attribute sets that can be accessed by any person using EE. This pre-configured attribute set cannot be modified by the others.

Objective

- Creating an attribute set
- Adding line events to a route



- You have received some Consequence Segment and Inspection range event records. Your objective is to use the Event Editor (EE) application to add these records to the respective event layers.
- First, we'll create an attribute set that caters to our specific events and then we'll add records to the event layers.

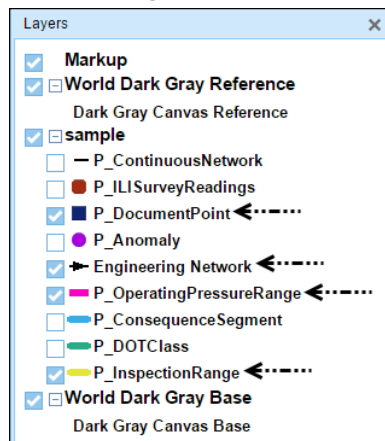
You can create new attribute sets that are stored in the web browser for local access or import attribute sets created by others.

Layers Needed

- Network
- Line event layers registered to a network

Methodology

1. Go to the Event Editor application using the following Url:
<http://<Your Machine Name>/EventEditor/>
2. Click the **Map** tab and click the **Layers** button to show the table of contents:

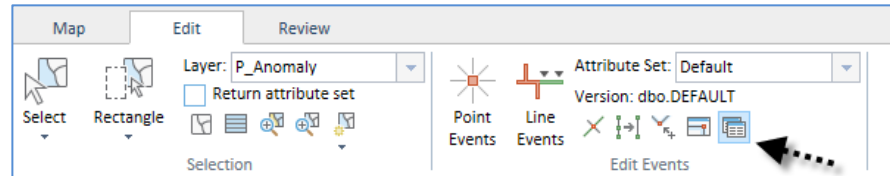


3. Make sure that the **P_DocumentPoint**, **EngineeringNetwork**, **P_OperatingPressureRange** and **P_InspectionRange** layers are checked, so that

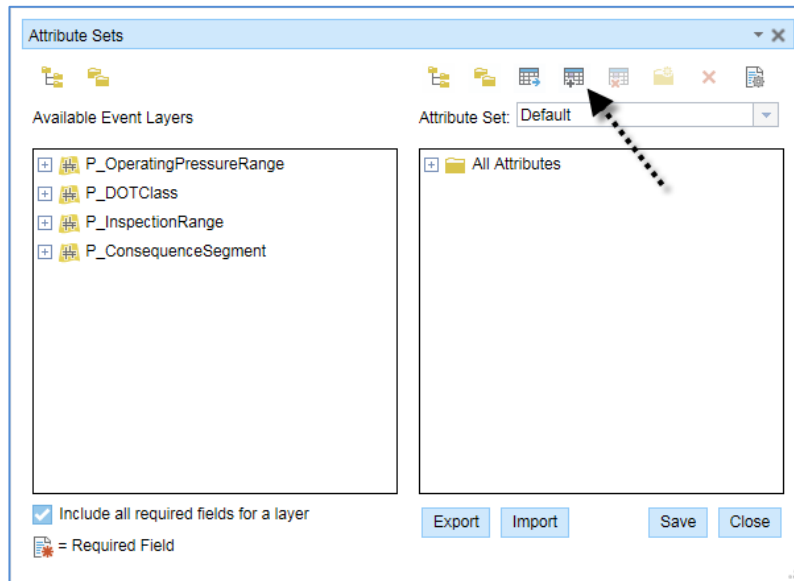
they are visible on the map.

You'll add the events to the P_OperatingPressureRange and P_InspectionRange layers that are registered to the Engineering Network and you'll use P_DocumentPoint event as a referent offset layer.

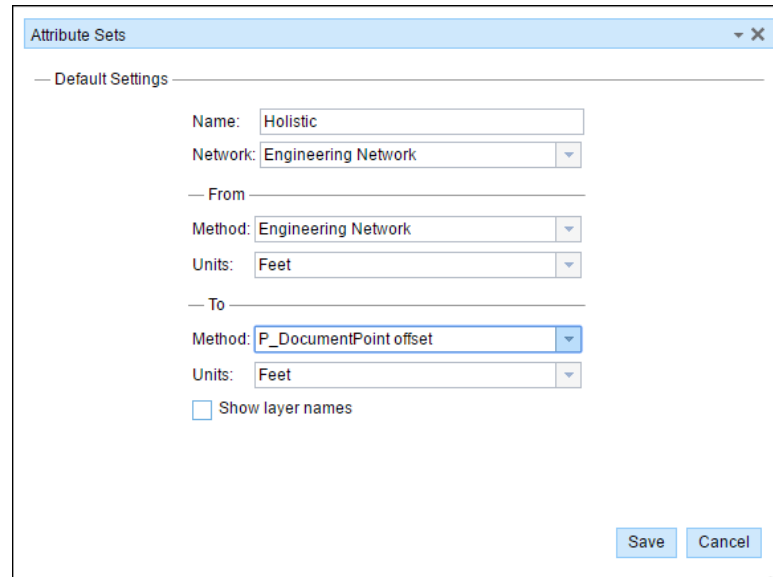
4. In the **Edit** tab, click the **Modify Attribute Sets** button.



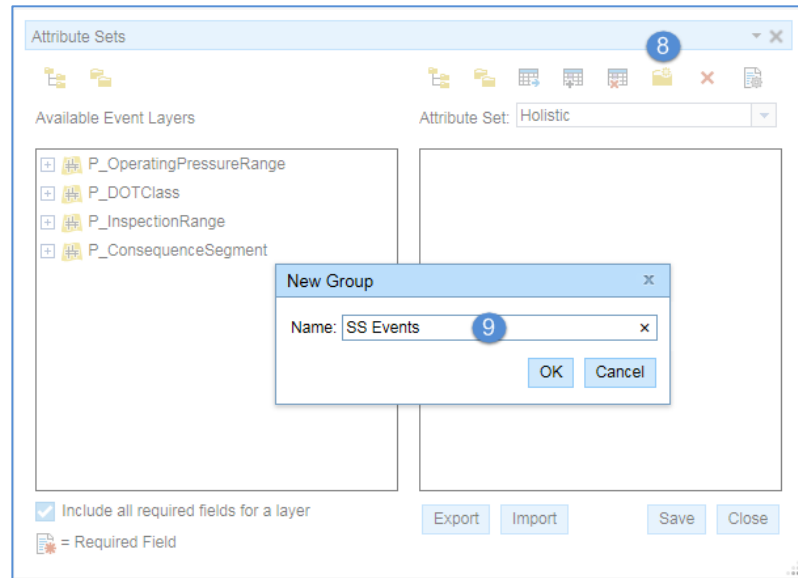
5. Click the **New Attribute Set** button.



6. Type the name for the attribute set: *Holistic* (or a name of your choice).



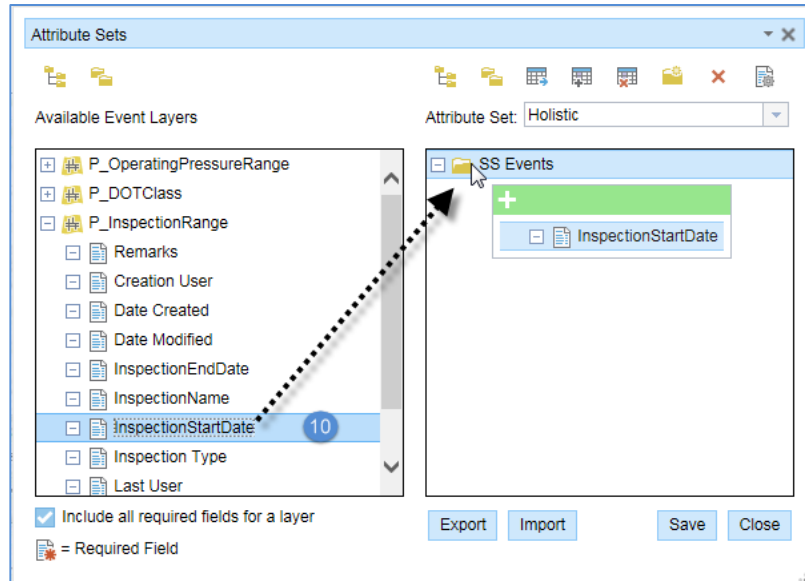
7. Leave the default **Network, From Method, From Units, To Method, To Units**. These defaults can be changed when adding the events using the **Add Linear Events** widget.
8. Click **Save**.
9. Click **New Group**.



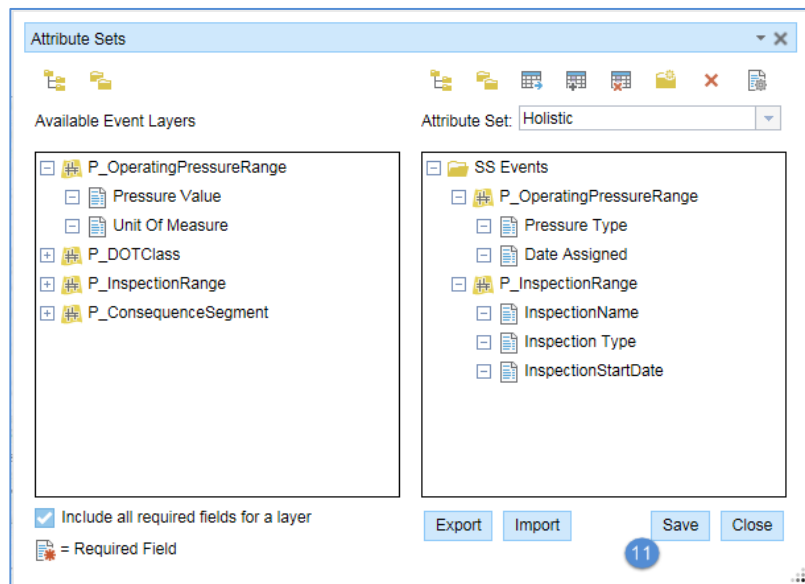
10. Type the name of the group: *SS Events*.
11. Drag and drop the individual fields that are shown in the graphic below: From left where all the fields in all the events are listed to the newly created group on the right.

This way, we'll limit the number of record input fields while using the **Add Linear Events** widget.

Alternatively, you can drag the event to the right side, this way all the fields within the event are available for editing.



12. Click **Save** and **Close**.

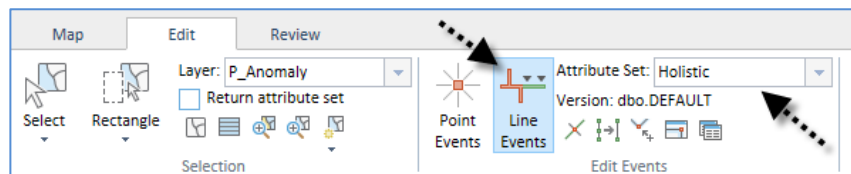


The new attribute set is created.

Now you'll add line events to routes using the newly created attribute set.

13. In the **Edit** tab, make sure that **Attribute Set** is set to **Holistic**.

14. Click on the **Line Events** button.



15. Make sure that **Network** is set to **Engineering Network**.

Adding line events

<https://goo.gl/gRHtdQ>



Event Editor also accepts measures in a network or LRM other than the one with which the linear event layer is associated. The new event will be associated to the routes (route IDs) from the LRS Network with which the event location intersects.

In cases where events are being modified on a route and you want to see the previous events

on the route at that location, don't use the **Add Linear Events** widget. Instead, edit events in the Event Selection Table or the Attribute Set Selection Table. If this method is used, you can see what was previously on the routes at the specified measures.

Only the routes that are part of the chosen line can be selected.

This network will serve as a source LRM for defining the input measures for the new linear events.

16. Type *NWS Line AB2* as the line name and click on the **Zoom to Line Extent** button. The line gets highlighted on the map in light blue color. The line consists of 5 routes and we'll add events on them.

It is important to note that in case the event spans routes, then you can only add events to routes that belong to the same line in a Station Series Network (Engineering Network in this case).

17. In the From section, choose *Engineering* as the method.
18. You'll add the **From Measure** of the event using the Route and Measure Method.

The screenshot shows the 'Add Linear Events' dialog box with the following fields and options:

- Network:** Engineering Network
- Line Name:** NWS Line AB2
- From**
 - Route Name:** R1_NWS Line AB2 (dropdown menu open showing: R1_NWS Line AB2, R2_NWS Line AB2, R3_NWS Line AB2, R4_NWS Line AB2, R5_NWS Line AB2)
 - Method:** Engineering Network
 - Measure:** Feet
- To**
 - Route Name:** (empty)
 - Method:** Engineering Network
 - Measure:** (empty)
- Dates**
 - Start Date:** 1/20/2017
 - End Date:** (empty)
- ☐ Retire overlaps
- ☐ Merge coincident events
- ☐ Prevent measures not on route
- Next >**

The methods for locating the measures are described below.

Method	Description
Route and Measure	The measure is located on the basis of the measure values from the chosen route.
Intersection offset	The measure is located at an offset distance from an intersection present at a chosen route.
Point offset	The measure is located at an offset distance from a point event located at a chosen route
Creating a starting station, then offset	A temporary engineering station is created on a route with station value. The measure is located at an offset distance (using a station value) from the station.
Identifying a starting station, then offset	A starting or base station is identified from the stationing points on the map. The start or end of the event is then located at an offset distance (using a station value) from the base station.
Stationing	The measure is located at an offset distance (using a station value) from an existing engineering station.
Stationing with equation points	The measure is located at an offset distance (using a station value) from an existing engineering station that has a station equation.
Length	Only available to locate the To Measure value. The measure is located at an offset distance from the From Measure location.

The From measure value will be located at the start of the first route in the line.

19. Click the **Route Name** drop-down arrow and choose route *R1_NWS Line AB2*.

Alternatively you can type the route's name or use the **Select a Route on the Map** tool to choose the route from the map.

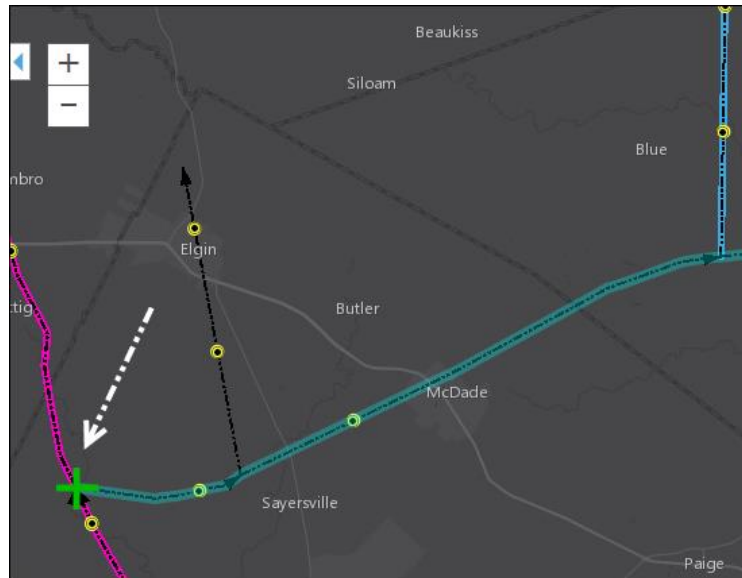
20. Provide the intended start location for the new linear event along the route by clicking the **Measure** drop-down arrow to choosing *Use the Route Start* as the **From Measure** value for the event.

The route's start measure is 0, hence the text box is populated with that value.

A green plus symbol appears at the selected location on the map.

Alternatively, you can type the value in the **Measure** text box or use the **Select From Measure on the Map** tool to choose the From Measure value along the route on the map.

You can use separate methods to locate the From and To measures of the events. Therefore, in the following example, the From Measure of the event is located by using an intersection offset. The To Measure is located by using a point offset.



21. For the **To** measure, make sure the **Method** is *P_DocumentPoint Offset*. We'll locate the To Measure using an offset distance from a Document Point event present in the line. For **Location**, click on the Document point located on Route R2_NWS Line AB2.

— To —

Method: *P_DocumentPoint offset*

Location: {9F60246A-8F4C-4353-81A2-C9CDDBD}

Offset: 70000 Feet

— Dates —

Start Date: 11/18/2015

End Date:

☐ Retire overlaps

☐ Merge coincident events

☐ Prevent measures not on route

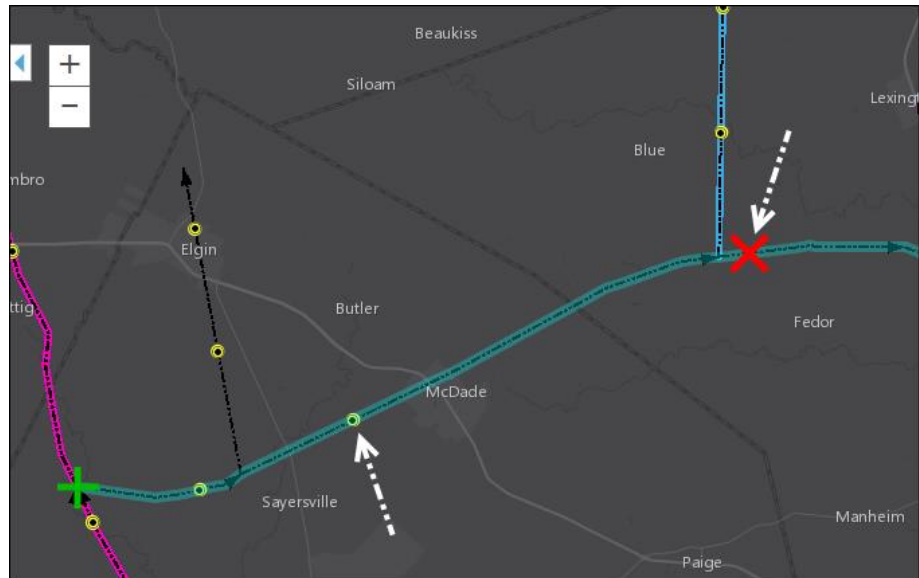
Next >

Retire overlaps: The system will adjust the measure and start and end dates of existing events in such a way that the new event does not cause an overlap with respect to time and measure values.

Merge coincident events: When all attribute values for a new event are exactly the same as an existing event, and if the new event is adjacent to or overlapping the existing event in terms of measure values, the new event is merged into the existing event and the measure range is expanded accordingly.

22. In the **Offset** text box, type 70000.

A red cross symbol appears at the an offset of 70,000 ft from the chosen point event.



The direction is an optional selection.

23. Choose *11/18/2015* as the Start Date.

The start date defaults to today's date, but you can choose a different date using the date picker.

The end date is optional, and if it is not provided, the event remains valid now and into the future.

24. Check the **Prevent measures not on route** check box.

This data validation option ensures that the input measure values for From Measure and To Measure values fall within the minimum and maximum range of measure values on the selected.

Since no events that belong to the P_OperatingPressureRange and P_InspectionRange event layers are present on this line, the **Merge coincident events** and **Retire overlaps** check boxes can remain unchecked.

25. Click **Next** to view the Attribute-Value table using the attribute set.

The event fields are shown under the attribute group named Holistic.

26. Enter the attribute information for the new event in the tables defined by attribute set. Populate the values as per your choice.

Add Linear Events

SS Events

☒	Layer	Attribute	Value
☒	P_OperatingPressureRange	Pressure Type	Operator Assigned
		Date Assigned	11/24/2015
☒	P_InspectionRange	InspectionName	Matt Murdock
		Inspection Type	Visual Survey
		InspectionStartDate	11/27/2015

☐ Show network names
☒ Show layer names
☒ Go to next measure upon save

< Back
Save

27. Click **Save**.

The events will be added to the map. Use the **Identify** tool to confirm that the events were created and they have the correct attributes.

After a linear event has been successfully created, you have two options to continue characterizing the route.

When you click **New Edit**, all the input entries in the dialog box are cleared, and the default values from the geodatabase are populated in the table.

Whereas when you click **Next Edit**, all the existing entries in the dialog box and the attribute set are retained for convenience and for quick editing of similar characteristics.

28. Try various methods for locating the From and To Measures of linear events.

Adding Point Events

Event Editor

More Information:

<https://goo.gl/1CKPr4>



Objective

- Adding point events to a route

Notes

- You have received some document point records from an inspection. Our objective is to use the Event Editor application to add these records to the event layer.



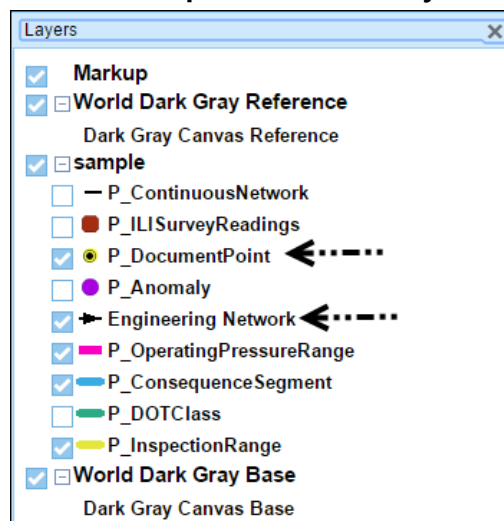
- You will add some point events in the Document Point event layer that is registered to the Engineering Network.

Layers Needed

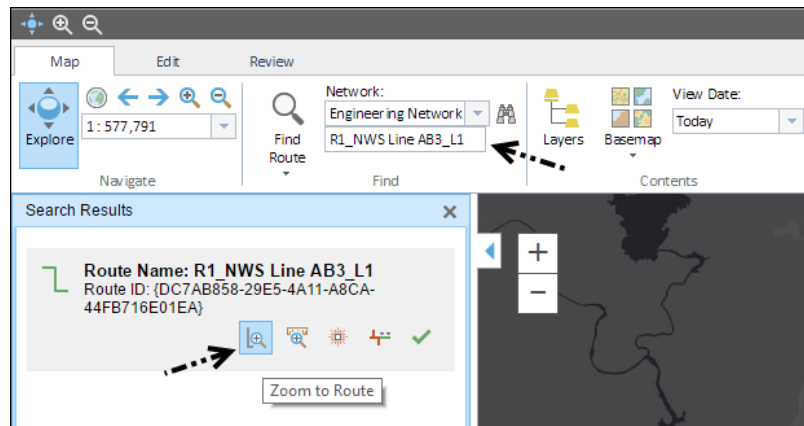
- Network
- Point event layer registered to a network

Methodology

1. Go to the Event Editor application using the following Url:
<http://<Your Machine Name>/EventEditor/>
2. Click on the **Map** tab and click the **Layers** button to show the table of contents.



3. Make sure that the Engineering Network and P_DocumentPoint layers are checked, so that they are visible on the map.
4. Type *R1_NWS Line AB3_L1* in the **Find Route** text box.



The point events will be added to this route.

5. The **Search Results** pane appears to the left. Hover the mouse over the item in the list that says: Route Name: R1_NWS Line AB3_L1 and click on **Zoom to Route**.

The route is now shown on the map.

6. Click the **Edit** tab and click on **Point Events**.

You will add a point event using the **Route and Measure** method first. In this method, the measure is located on the basis of the measure values from the chosen route. For that,

7. Click the **Event Layer** drop-down arrow and choose *P_DocumentPoint*.

The new event is located at 9800 ft on route R1_NWS Line AB3_L1.

8. Click the **Network** drop-down arrow and choose **Engineering Network** as the network that will serve as a source for providing the measure for the new event.
9. Type the route name *R1_NWS Line AB3_L1* in the **Route Name** text box.

The new event measure will be based on this route. Alternatively, use the **Select a**

Route on the Map tool to choose route *R1_NWS Line AB3_L1* from the map.
The selected route is highlighted on the map.

10. In the Location section, click the **Method** drop-down arrow and choose *Engineering Network*.

If you type the **Measure** value, you can select the unit for that value using the drop-down arrow. The **Measure** value will be converted into the LRS units before saving the newly added events. For example, the LRS is in miles and you have entered 528 feet as the **Measure** value. The newly added events will have a Measure value of 0.1 miles because 528 feet equals 0.1 miles.

11. Provide the intended location for the new point event along the route by typing 9800 in the **Measure** text box.

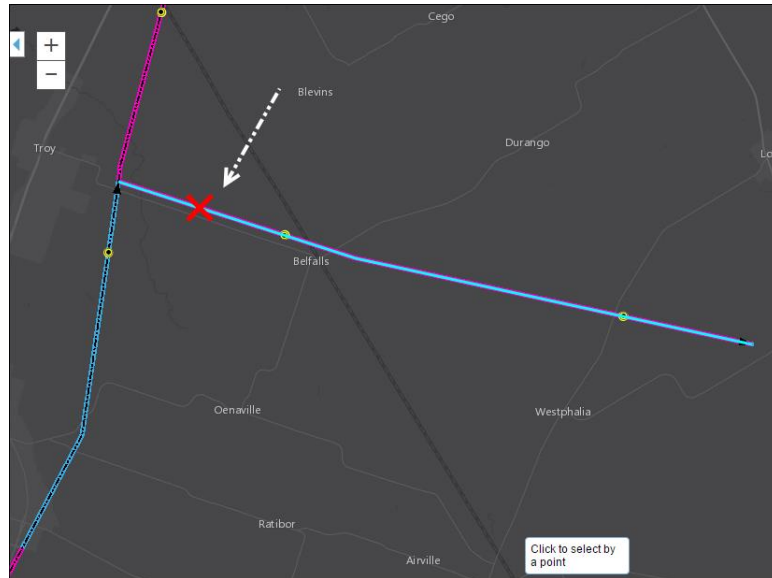
A Red Cross symbol appears at the selected location on the map. The new event will be associated with the route from the LRS Network that the event location intersects. Alternatively, you can use the **Select From Measure on the Map** tool to choose the From Measure value along the route on the map.

12. Make sure that *Feet* are selected as the units.
13. Click the **Start Date** drop-down arrow and choose *1/20/2017*.

The start date defaults to today's date, but you can choose a different date using the date picker. The end date is optional, and if it is not provided, the event remains valid now and into the future.

14. Check the **Prevent measures not on route** check box.

This option ensures that the input measure value falls within the minimum and maximum range of measure values on the selected route.



15. Click **Next** to view the Attribute-Value table.

This table contains all of the attributes of the event layer.

Add Point Events ✕

Attribute	Value
Created By	10/15/2016
Date Created	1/9/2017
Date Updated	1/23/2017
Updated By	Don Draper
Document Type	Adobe Acrobat (.pdf) ▼
Document Description	Adobe Acrobat (.pdf) Autocad Drawing (.dwg) Bitmap (.bmp) GIF (.gif) HTML (.htm) JPEG (.jpg) Microsoft Excel (.xls) Microsoft Word (.doc) Microstation Drawing (dgn)

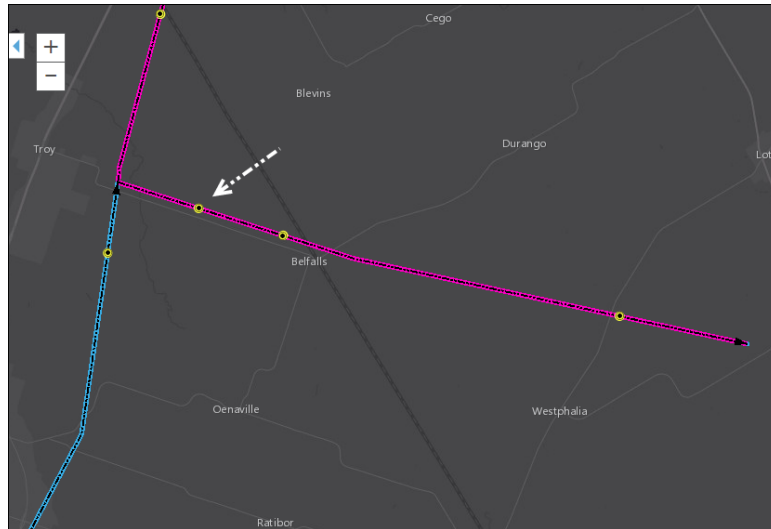
☐ Show network name

< Back
Save

16. Fill out all the attribute information for the new event in this table.

17. Click **Save**.

The event will be added to the map.



Here are the different methods available for adding point events:

Method	Description
Route and Measure	The measure is located based on the measure values from the selected route.
Intersection offset	The measure is located at an offset distance from an intersection present at a selected route.
Point offset	The measure is located at an offset distance from a point event located at a selected route.
Creating a starting station, then offset	A temporary engineering station is created on a route with station value. The measure is located at an offset distance (using a station value) from the station.
Identifying a starting station, then offset	A starting or base station is identified from the stationing points on the map. The start or end of the event is then located at an offset distance (using a station value) from the base station.
Stationing	The measure is located at an offset distance (using a station value) from an existing engineering station.
Stationing with equation points	The measure is located at an offset distance (using a station value) from an existing engineering station that has a station equation.
Coordinates	The event is located using x,y coordinates. If the coordinate location does not fall on the route, then the nearest location on the route is chosen.

Selecting and Editing Events

Event Editor

More information:

<https://goo.gl/OX9aEM>



Objective

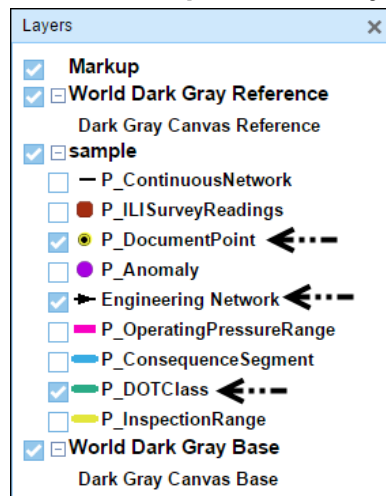
- Selecting events using Select by Route
- Editing events using attribute tables

Layers Needed

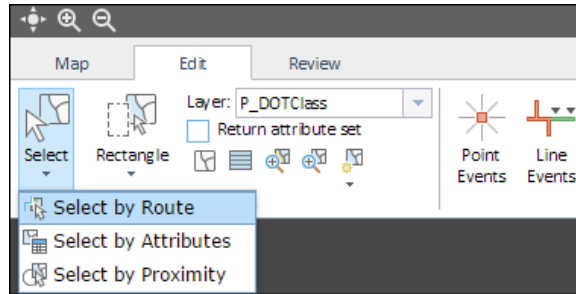
- Network
- Line and point event layers registered to a network

Methodology

1. Go to the Event Editor application using the following Url:
<http://<Your Computer Name>/EventEditor/>
2. Click on the **Map** tab and the **Layers** button to show the table of contents.



3. Make sure that *P_DocumentPoint*, *Engineering Network* and *P_DOTClass* layers are checked, so that they are visible on the map.
Now you'll select events from *P_DotClass* using the route name.
You'll use the **Select by Route** widget that allows you to select events by specifying their proximity to an associated route. The events can be edited and you can browse to them once they are selected.
4. Click the **Edit** tab and in the Selection group, click the **Select** drop-down arrow to choose the **Select by Route** tool.



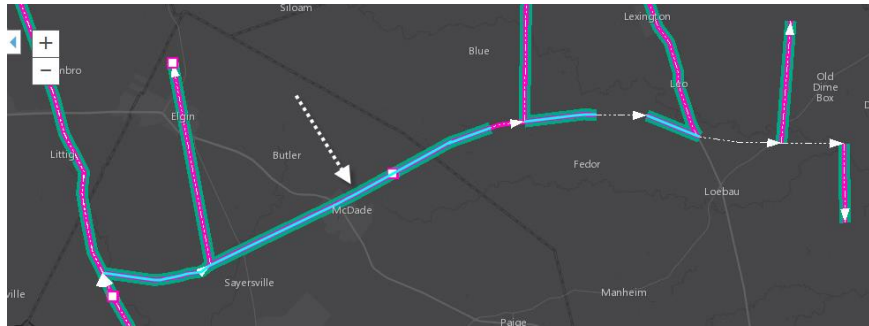
5. Click the Layer drop-down arrow and choose *P_DOTClass* event layer.
This is the event layer from which you will select events from.
6. Click the **Network** drop-down arrow and choose *Engineering Network*.

 A screenshot of the 'Select by Route' dialog box. It has a title bar with 'Select by Route' and a close button. Inside, there are several fields:

- Network:** A dropdown menu with 'Engineering Network' selected.
- Line Name:** A text box containing 'NWS Line AB2'.
- From Route Name:** A dropdown menu with 'R1_NWS Line AB2' selected.
- From Measure (feet):** A text box that is empty.
- To Route Name:** A dropdown menu with 'R5_NWS Line AB2' selected.
- To Measure (feet):** A text box that is empty.

 At the bottom right, there are two buttons: 'Select' and 'Close'.

7. Type *NWS Line AB2* as the **Line Name**.
8. Type *R1_NWS Line AB2* as the From Route Name and click on the zoom button.
Alternatively, you can use the drop-down list.
9. Type *R5_NWS Line AB2* as the To Route Name.
10. Leave the **From Measure** and **To Measure** text boxes blank so that the events get selected from the start to the end of the route.
Alternatively, you can select events that fall within the from measure and to measure of your choice on the route.
11. Click **Select**.
The events are highlighted on the map.



The event attribute table shows the selected events from P_DOTClass.

Class Type	Class Source	Class Length	Corridor Width	Date Calculated	EventID
Class 2	<null>	<null>	<null>	<null>	{C5E74D6E-5C7E-4F29-BA05-5134E856B879}
Class 1	<null>	<null>	<null>	<null>	{00D7E7F4-C2F5-403B-BCC1-A8C8882D4EFE}
Class 2	<null>	<null>	<null>	<null>	{43DC8444-F32D-4735-8709-5EDF2391CF3A}
Class 1	<null>	<null>	<null>	<null>	{BBF51D90-1463-4C1E-8D87-9714E2BDD26E}
Class 2	<null>	<null>	<null>	<null>	{FD161AB3-C0B1-4C5B-9980-B3A31011BB64}
Class 2	<null>	<null>	<null>	<null>	{2D22B016-15BC-4961-990E-00B96C7CBB94}

Page 1 of 1 | 1 | Record 1 to 6 | Total 6 Records

Event Attributes x

Now you'll edit the records from the attribute table. The aim is to make all class type attributes equal to Class1.

1. Click the **Table Properties** button.



2. Click the **Saving** tab, and click the following options:

Table Properties

Columns

Navigation

Saving

☐ Retire edited events and create new events with the current view date by default
Note: You can change the date in the Save Options dialog. To prompt the Save options, please select the appropriate checkbox below.
☒ Merge coincident events with the same attributes that are edited
☐ Always prompt me about above options when saving

Save

Close

You can check this option if the edits to event records represent changes to the events at a certain time (for P_DOTClass, in the Class Type field, changing it from Class1 to Class2 on 10/10/2010). In that case, check the **Retire edited events and create new events effective from the selected date** check box for the date the old event should be retired and the new event should begin.

- a. Uncheck **Retire edited events and create new events with the current**

view date by default: Let's assume that some of the P_DOTClass type attributes are entered incorrectly and this is an error correction exercise. Therefore, the event record does not need to be retired and time sliced since the changes are correcting a mistake.

- b. Check **Merge Coincident events with the same attributes that are edited:** If multiple events that are edited are coincident in measure and attributes, and you want to combine them into a single event record.

3. Click **Save**.

4. All the white cells in the attribute table are editable, whereas grey cells cannot be edited. Double-click on a cell where Class Type = Class2 and select *Class1* using the coded-value domain drop-down arrow.

The screenshot shows the P_DOTClass attribute table with the following data:

User	Class Type	Class Source	Class Length	Corridor Width
<6639	Class 1	<null>	<null>	<null>
<6639	Class 1	<null>	<null>	<null>
<6639	Class 2	<null>	<null>	<null>
<6639	<null>	<null>	<null>	<null>
<6639	Class 1	<null>	<null>	<null>
<6639	Class 2	<null>	<null>	<null>
<6639	Class 3	<null>	<null>	<null>
<6639	Class 4	<null>	<null>	<null>

A dropdown menu is open for the 'Class Type' column of the third row, showing options: Class 2, <null>, Class 1, Class 2, Class 3, and Class 4. The 'Class 1' option is highlighted.

The cell changes to yellow in color. This yellow-colored cell shows that it has been edited in this edit session but the edits have not been saved.

The screenshot shows the P_DOTClass attribute table with the following data:

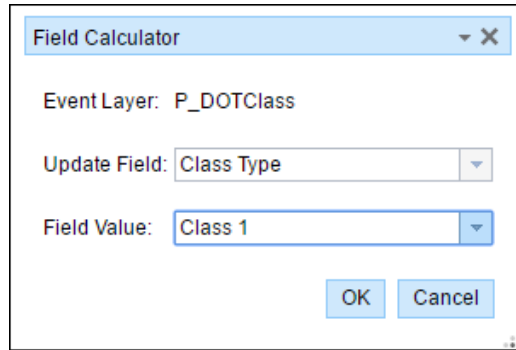
User	Class Type	Class Source	Class Length	Corridor Width
<6639	Class 1	<null>	<null>	<null>
<6639	Class 1	<null>	<null>	<null>
<6639	Class 1	<null>	<null>	<null>
<6639	Class 2	<null>	<null>	<null>
<6639	Class 2	<null>	<null>	<null>
<6639	Class 2	<null>	<null>	<null>

The 'Class Type' cell for the third row is highlighted in yellow.

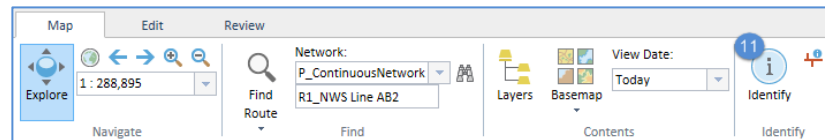
5. You can also bulk edit the attributes in a field using the field calculator:



6. Click the **Update Field** drop-down arrow and choose *Class Type*.



7. Click the **Field Value** drop-down arrow and choose *Class1*.
8. Click **OK**.
All the newly edited fields turn yellow.
9. Try the various options available in the attribute table's menu such as *Export to CSV*.
10. Save the edits by clicking **Save**.
11. Use the **Identify** tool to verify the edits.

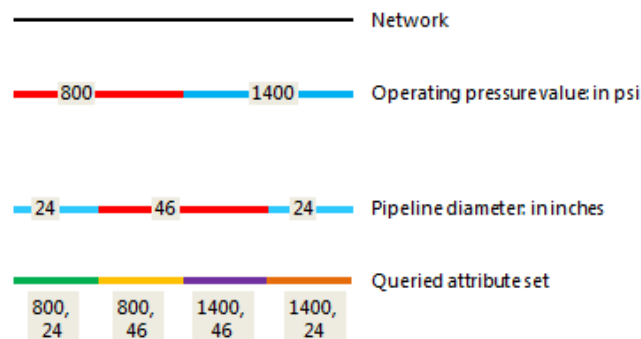


12. Try selecting events by proximity, attribute and geometry options.

Next, you'll select events that belong to an attribute set we created earlier for the Add Line Events Exercise.

The **Return Attribute Set** option in the Event Editor allows you to return a selection result as an attribute set, where each layer of the attribute set is dynamically segmented together into one record set.

Consider the following example:



Using the **Return Attribute Set** option on a network layer will return records separated at any measure along that network where any of the preselected attribute set events change.

More Information:

<https://goo.gl/7Lph2a>



On a point event layer, the **Return Attribute Set** option returns the attributes for the entire selected attribute set at each point event.

On a line event layer, the **Return Attribute Set** option returns separate records at any measure along the event where any of the preselected attribute set events change.

1. Create a new Attribute Set named *Set1* using the following inputs.

Attribute Sets

— Default Settings —

Name: Set1

Network: Engineering Network

— From —

Method: Engineering Network

Units: Feet

— To —

Method: Engineering Network

Units: Feet

☐ Show layer names

Save Cancel

2. Click **Save**.
3. Drag and drop both *P_InspectionRange* and *P_ConsequenceSegment* to the group on the right and click **Save**.

Attribute Sets

Available Event Layers

Attribute Set: Set1

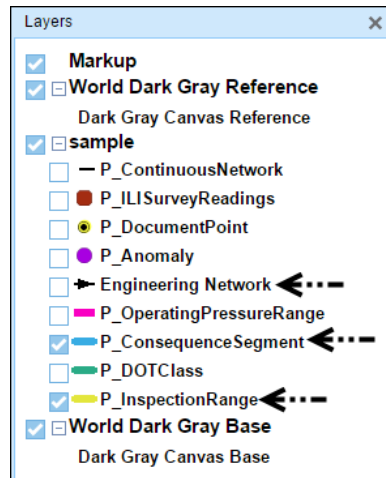
Group1

Include all required fields for a layer

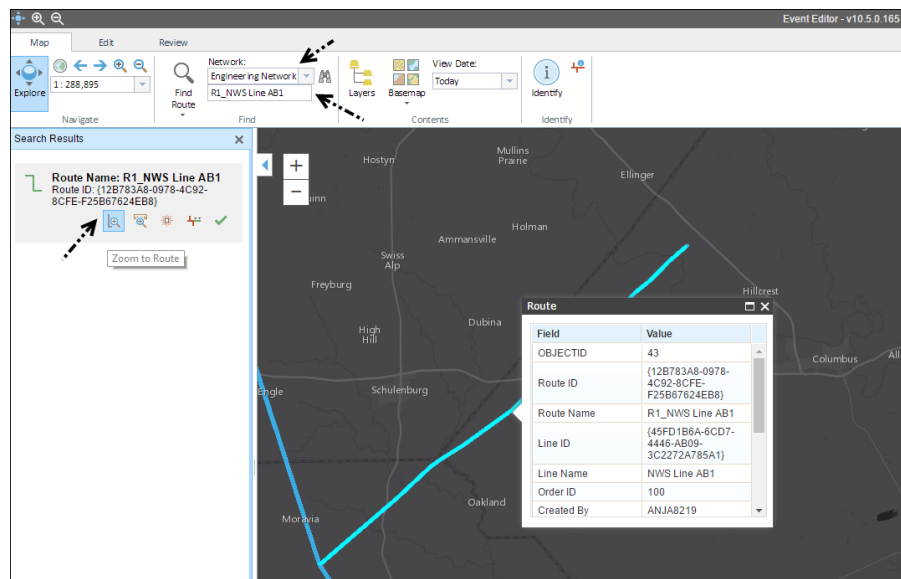
Required Field

Export Import Save Close

4. Make only the following layers visible in the map:

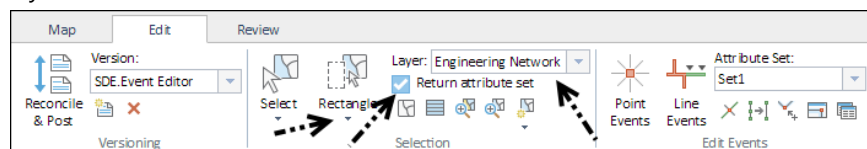


5. In the **Map** tab, search for route: *R1_NWS Line AB1* belonging to *Engineering Network* and zoom to that route.

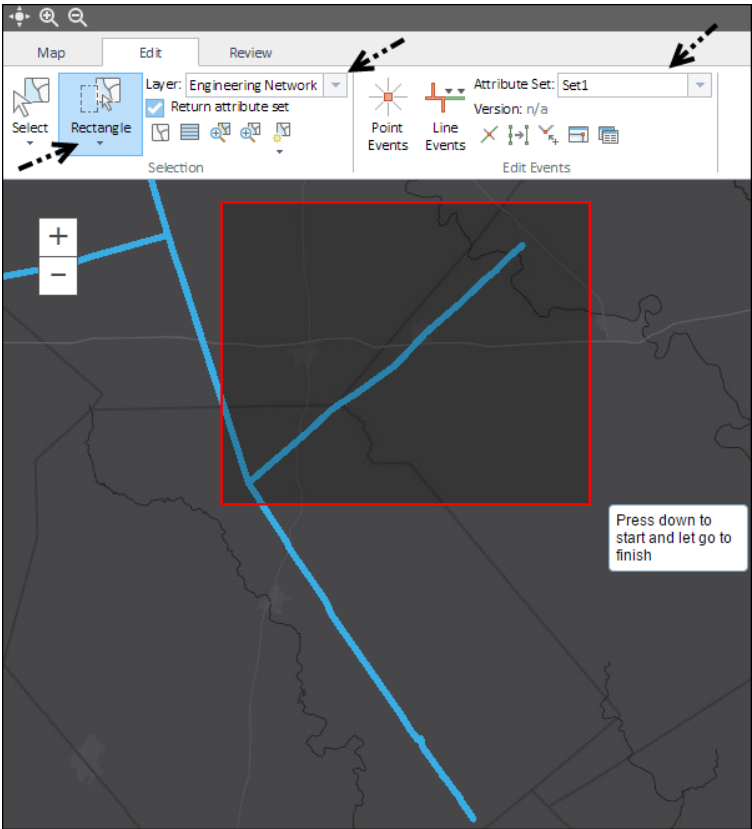


You are going to dynamically segment the events from the attribute set for this route.

6. Now, you'll choose the route. In the **Edit** tab, choose *Engineering Network* as the layer.



7. Check the **Return Attribute Set** check box.
8. Use any of the geometry selection tools (e.g. Rectangle) to select *R1_NWS Line AB1*.
You can select any other route of your choice for this exercise. Just make sure that the selected route contains events from both the event layers.
The *Set1* attribute set table opens.



In this example, 5 rows were returned. Each row contains information from both P_ConsequenceSegments events and P_InspectionRange events.

Each of the rows has a range of measure values.

Set1				
Line Name	Order ID	Route Name	From Measure	To Measure
NWS Line AB1	100	R1_NWS Line AB1	0	25366.033
NWS Line AB1	100	R1_NWS Line AB1	25366.033	50732.065
NWS Line AB1	100	R1_NWS Line AB1	50732.065	76098.097
NWS Line AB1	100	R1_NWS Line AB1	76098.097	101464.129
NWS Line AB1	100	R1_NWS Line AB1	101464.129	126830.162

Each row contains the attributes for the P_ConsequenceSegment event across the range of measure values.

Set1         

P_ConsequenceSegment.Status	P_ConsequenceSegment.SYSTEMTYPE	P_ConsequenceSegment.Type	P_InspectionRange.Remarks
Active	Transmission	Engineering Assessment	Absolute
Active	Transmission	Engineering Assessment	Proportional
Active	Transmission	Engineering Assessment	Absolute
Active	Transmission	Engineering Assessment	Absolute
Active	Transmission	Engineering Assessment	Absolute

As noted earlier, the white fields are editable.

Splitting and Merging Events

Event Editor

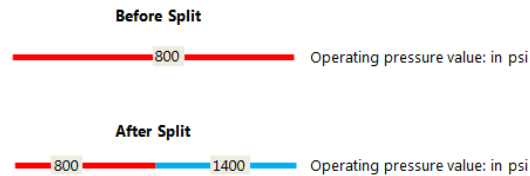
More Information:

<https://goo.gl/jSd0Wz>



Objective

- Splitting a linear event



Layers Needed

- Network
- Line event layer registered to the network

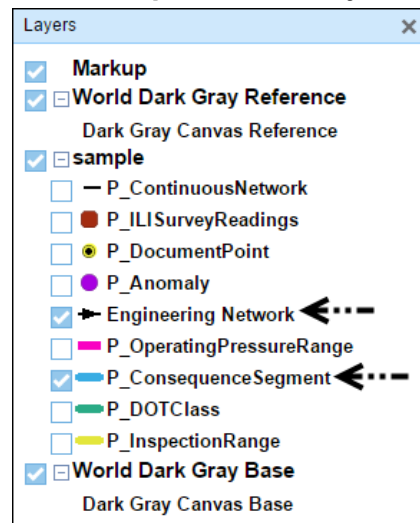
Methodology

1. Go to the Event Editor application using the following Url:

<http://<Your Computer Name>/EventEditor/>

First you'll split an event. The **Split Event** tool is used to split a line event into two adjoining events. You are allowed to edit the attributes of the split events prior to selecting the location to split.

2. Click the **Map** tab and click **Layers** to show the table of contents:

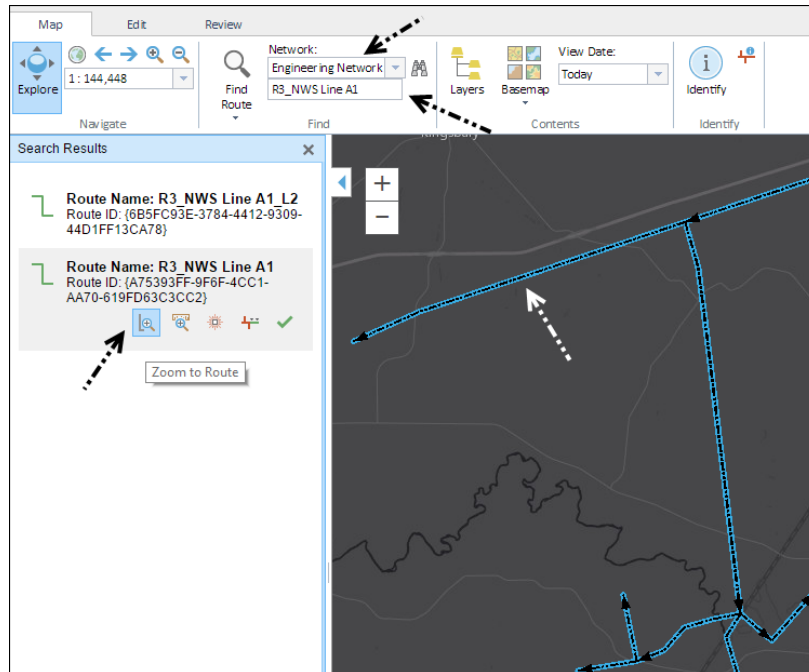


Make sure that only *Engineering Network* and *P_ConsequenceSegment* layers are checked, so that they are visible on the map.

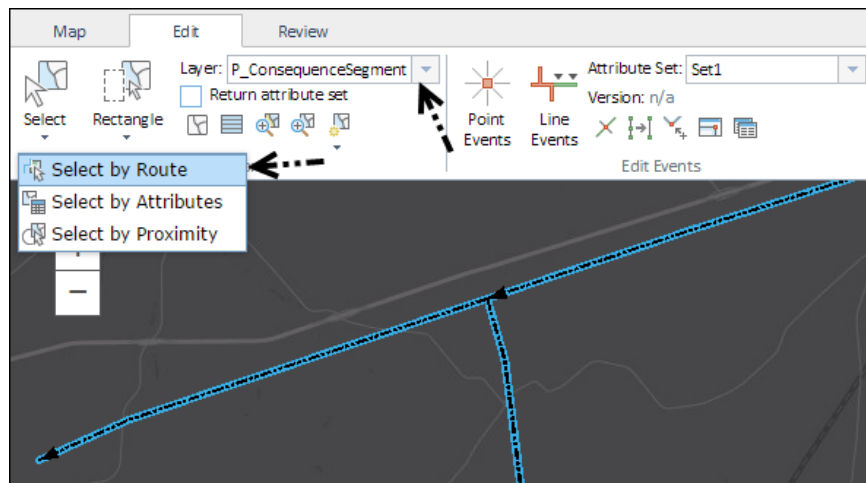
Now you'll select events from *P_ConsequenceSegment* using route name.

You'll use the **Select Events by Route** widget that allows you to select events by specifying their proximity to an associated route.

3. Click the **Map** tab, and use the **Find Route** tool to locate route *R3_NWS Line A1*:



4. Click the **Edit** tab.
5. Click the **Layer** drop-down arrow and choose the *P_ConsequenceSegment* event layer.
This is the event layer from which you will select events from.
6. Make Sure that the **Return Attribute Set** option is **unchecked**.
7. In the Selection group, click the **Select** drop-down arrow to choose the **Select by Route** tool.



8. Choose *Engineering Network* as the source network in the **Select by Route** dialog box.

Select by Route

Network
Engineering Network

Line Name
NWS Line A1

From Route Name
R3_NWS Line A1

From Measure (feet)

To Route Name
R3_NWS Line A1

To Measure (feet)

Select Close

- Choose route *R3_NWS Line A1* using the route picker in the **From Route Name** parameter.

The **Line Name** will be auto populated based on route selection.

- Leave the **From Measure** and **To Measure** text boxes blank so that the events are selected from the start to the end of the route.

- Click **Select**.

Two events are highlighted on route *R3_NWS Line A1*. Pick the top most event in the Event Table so just one event is selected in the map.

The screenshot shows the Event Editor interface. The map displays a route with two events highlighted. The event table below the map shows the following data:

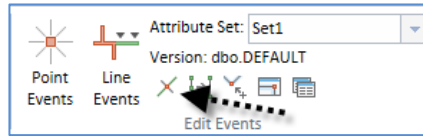
CONSEQUENCEAREA_GlobalID	METHOD	Outside Diameter	Consequence Area Type	SYSTEMTYPE	EventID
{48D4AE0C-9B65-4596-9656-F71A9661C16F}	0	<null>	Medium	Transmission	{48D4AE0C-9B65-4596-9656-F71A9661C16F}
{534B2A23-3217-460C-B610-06F308EE0518}	2	<null>	High	Transmission	{CC7A725F-ECD1-4ECC-A4B8-E835A9B56563}

The event attribute table shows the selected event from *P_ConsequenceSegment*. Notice that the event's from measure and to measure values are 233413.402 and 266783.705 respectively.

EventID	From Date	To Date	From Route Name	From Measure	To Route Name	To Measure
{48D4AE0C-9B65-4596-9656-F71A9661C16F}	1/1/2000	<null>	R3_NWS Line A1	233413.402	R3_NWS Line A1	266783.705
{CC7A725F-ECD1-4ECC-A4B8-E835A9B56563}	1/1/2000	<null>	R2_NWS Line A1	200087.7	R3_NWS Line A1	233413.402

You'll split this event at the measure 250,000 and update the attributes of the split events.

12. Click the **Split Events** tool in the **Edit** tab.



13. Click the **Event Layer** drop-down arrow and choose *P_ConsequenceSegment*.

Split Events

— Split Location —

Event Layer
P_ConsequenceSegment

Network
Engineering Network

Route Name
R3_NWS Line A1

Measure (feet)
250000

Event ID
{48D4AE0C-9B65-4596-9656-F71A9661C16F}

— Split Result —

Start Date
11/17/2015

End Date

Attribute	Event 1	Event 2
Status	Active	Active
BIHO Structure Count	12	
Calculated Length		
Date Calculated	9/27/2002	9/27/2002
MAOP		
Potential Impact Radius		
PIR Factor		
Type	Engineering Assessment	Engineering Assessment
GlobalID	{BA479F7C-4EE6-49A2-9467-EBFA537B2D08}	{BA479F7C-4EE6-49A2-9467-EBFA537B2D08}

Save

More Information:

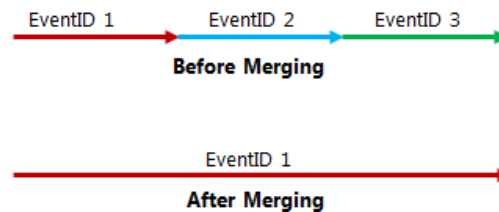
<https://goo.gl/f2SFJU>



14. Type *R3_NWS Line A1* in the **Route Name** text box or choose the route on the map using the picker tool.
15. Type *250,000* in the **Measure** text box.
The event will be split into two events on either side of this measure. The location where the split will occur is shown in the map with a red x.
16. Click the Start Date drop-down arrow choose *11/17/15*.
The split events are displayed in the **Split Result** table.
17. You can edit the fields in white. The grey fields are not editable.
18. Click **Save** to split the records.
19. Confirm the split by selecting the events by route. This time you'll find three records for *P_ConsequenceSegment* event on route *R3_NWS Line A1*. Two of the 3 records will correspond to the split events.

Objective

- Merging linear events



Layers Needed

- Network
- Line event layer registered to the network

Methodology

- You can merge two or more line events using the **Merge Events** tool.
- The events to be merged should be present on routes that belong to the same line.
- The tool merges multiple adjoining events into an existing target event. All the input events, except the target event, retire.
- You can edit the attributes of the merged layer prior to committing the merge.

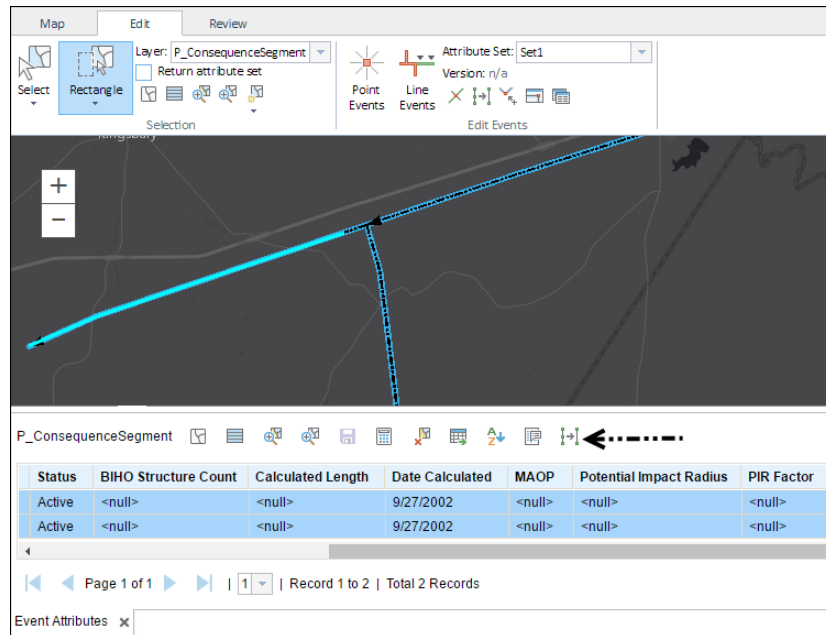
Merging of events can be achieved using two different methods:

- a. By using the Merge Events tool present in the Edit tab: Used with spatial selection of events
- b. Using the event attribute table: Used when the events are already selected and shown in the attribute table

For this exercise, you'll use the attribute table method.

If two(or more) events are getting merged and the From Measure of the starting event and the To Measure of the ending event have referent offset values, then the resulting merged event will retain the referent offset values as its From Measure and To Measure.

1. Select the two events you just finished splitting from the *P_ConsequenceSegment* event using the attribute selection method such as **Select by Geometry** (rectangle). The events are highlighted on the map and their records are shown in the attribute table. Make sure that the records remain selected in the attribute table.



2. Click the **Merge Events** button  on the attribute table toolbar. The **Merge Events** dialog box appears and the selected rows in the attribute table turn green. All the records highlighted in green will be merged to the target event.

In the case you have multiple records in the table and want to merge only a few of them,

select those records within the table and click on the **Merge Events** button. The selected records will be highlighted in green color.

Merge Events

Network: Engineering Network
From Route Name: R3_NWS Line A1
From Measure (feet)
233413.402
To Route Name: R3_NWS Line A1
To Measure (feet)
266783.705
Target Event
{48D4AE0C-9B65-4596-9656-F71A9661C16F}
{48D4AE0C-9B65-4596-9656-F71A9661C16F}
72bd24a0-e1b4-11e6-867d-dacbf587cb8
End Date

Attribute	Value
Status	Active
BIHO Structure Count	
Calculated Length	
Date Calculated	9/27/2002
MAOP	
Potential Impact Radius	
PIR Factor	
Type	Engineering Assessment

☐ Retire overlaps

Save

The green colored rows symbolize that those rows are participating in the merge operation.

The **Merge Events** dialog box shows the proposed values of the merged event.

- Click the **Target Events** drop-down arrow and choose one of the two selected events.

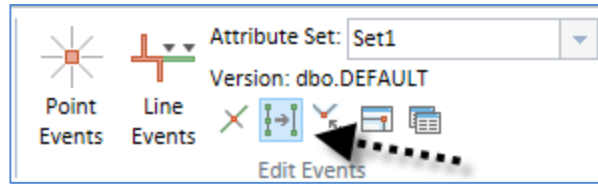
You can change the **From Measure**, **To Measure**, **Start Date** and **End Date** values. The start date defaults to today's date.

- The characteristic attributes are present in the table. You can edit them. They are assigned the attributes from the **Target Event** by default.
- Click **Save**.

The events get merged.

- Confirm the merge by selecting the event using the **Select by Rectangle** tool.

Alternatively, you can use the **Merge Events** tool available in the Edit Events section in the **Edit** tab to perform the merge events operation.



When using this tool for the merge operation, you will need to draw a rectangle to select the events in the map.

Geodatabase Versioning

Event editor

More Information:

<https://goo.gl/1I5wHi>



Objective

- Configure your Event Editor to expose the versioning related functionality.

Methodology

1. Find out the directory of your Event Editor.
Typically it is : C:\inetpub\wwwroot\EventEditor
2. Go to that directory and open the *config.json* file in the text editor of your choice, such as NotePad.
3. Search for the tag "versioning".
4. By default all the child tags are set to false.

```
"versioning": {  
  "allowReconcileAndPost": false,  
  "allowChangeVersions": false,  
  "allowCreateVersions": false,  
  "allowDeleteVersions": false  
}
```

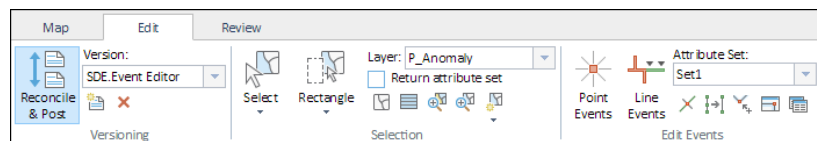
5. Enable reconcile and post functionality, by updating the following config to true:

```
"allowReconcileAndPost": true,
```

Keep the remaining config as false

```
"allowChangeVersions": false,  
"allowCreateVersions": false,  
"allowDeleteVersions": false
```

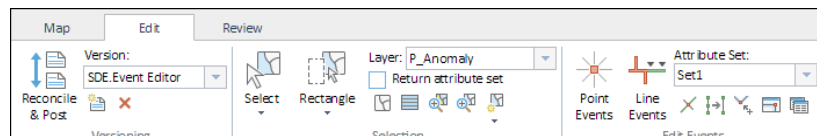
6. Save the config file.
7. Open Event Editor and click the **Edit** tab. You will see the **Reconcile and Post** tool.



8. Now enable remaining functionality, by updating following configs to true.

```
"allowChangeVersions": true,  
"allowCreateVersions": true,  
"allowDeleteVersions": true
```

9. Reload Event Editor and click the **Edit** tab. You will see all the **Versioning** related tools.



Geodatabase Versioning

Event editor

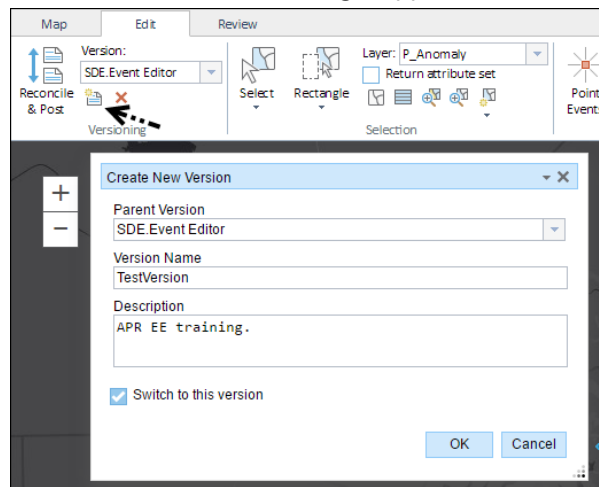
In this example it is assumed that your map service publishing version is called 'Event Editor'

Objective

- Editing events in Event Editor with versioning enabled.

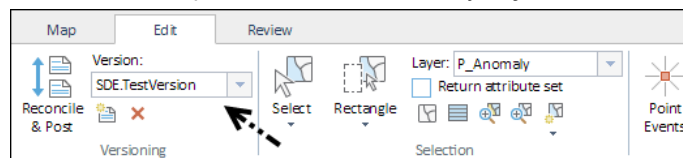
Methodology

1. Open the Event Editor app that you used in the previous exercise and click the **Edit** tab.
2. Click the **Create New Version** button  on the Versioning ribbon group. The **Create New Version** widget appears.

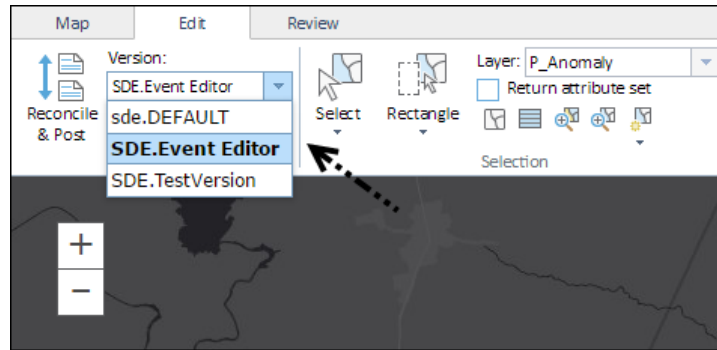


3. Click the **Parent Version** drop-down arrow and choose *SDE.EventEditor*.
4. Type *TestVersion* in the **Version Name** text box.
5. Optionally type the description.
6. Click **OK**.

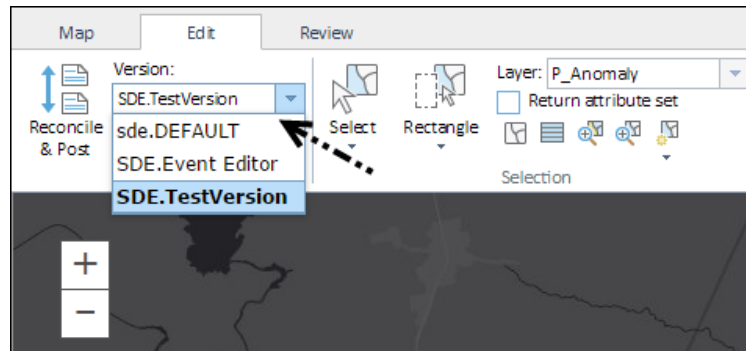
Event Editor will point to the version that you just created.



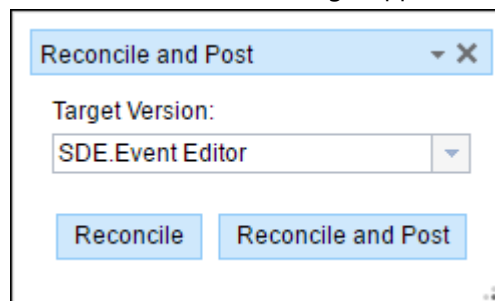
7. Now create a new event using the **Add Line Event** or **Add Point Event** or edit/delete existing events using the attribute table.
8. Click the **Version** drop-down arrow and change the version to the parent version of the *TestVersion* which is Event Editor version.



9. Verify that your edit made in step 7 is not visible in the Event Editor version.
10. Click the **Version** drop-down arrow and change the version to the TestVersion.



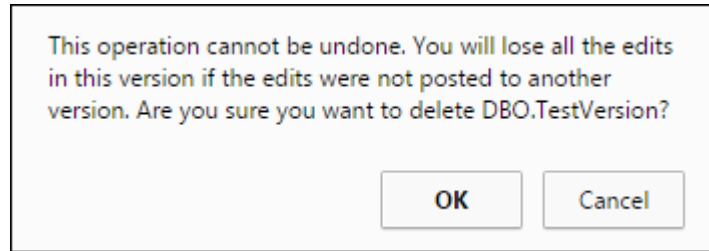
11. Click the **Reconcile and Post** button  on Versioning ribbon group.
The **Reconcile and Post** widget appears.



12. Make sure your target version is set to Event Editor and click **Reconcile and Post**
13. Click the **Version** drop-down and change the version to the parent version, which is the *Event Editor* version.
The edit you made in step 7 should be visible in the parent version.
14. Click the **Version** drop-down and change the version to the *TestVersion*.
Since your edits have been posted to parent version, it is now safe to delete the *TestVersion* version.
15. To delete the version, click on **Delete Selected Version**  on Versioning

ribbon group.

16. Click **OK** in the confirmation dialog box.



The *TestVersion* is no longer present in the **Version** menu.