LD16521-L

Integrate Vehicle Tracking into Your Workflow

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Professional Software Solutions (ProSoft)

Learning Objectives

- Understand Vehicle Tracking & the Offerings
- Create Swept Path Analysis
- Design Parking Lots that Work!
- Create Detailed Round-a-Bout Options

Description

Autodesk Vehicle Tracking is much more than just swept path analysis. Join us in this hands-on lab to find out for yourself how Vehicle Tracking can improve your project decision making. This software allows even the beginner designer to make educated decisions concerning their project. After taking this hands-on lab, you will feel much more comfortable taking your new skills back to the office and showing how Autodesk Vehicle Tracking can be used in many ways.

Your AU Expert

Shawn has held several positions in the industry giving him exceptional experience in surveying, GIS, and design engineering. He has also gained incredible knowledge of the AutoCAD® Civil 3D® implementation process while working in CAD management for commercial and residential projects in Utah, Arizona, Nevada, and Idaho. Shawn has been a part of major Civil 3D implementations for several Dept. of Transportation's as well as many of the top 50 Civil Engineering firms in 2016. Shawn continuously speaks at multiple user groups across the country as well as 2016 being his 7th year to speak at AU.

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Contents

Understand Vehicle Tracking & the Offerings

Autodesk Vehicle Tracking is a very powerful tool with a broad range of features. Not only does it do your typical swept path analysis, but there are great parking layout tools and a robust roundabout design module. Engineers, designers, and planners can evaluate vehicle movements on transportation or site design projects.

Use analysis and simulation tools that integrate with AutoCAD and Bentley MicroStation software to predictably evaluate the movements of steered vehicles, light rail vehicles, and aircraft, and to design parking lots and intersections. Vehicle Tracking software integrates with the following:

- AutoCAD
- AutoCAD Civil 3D
- AutoCAD Architecture
- AutoCAD Plant 3D
- AutoCAD Map 3D
- AutoCAD Utility Design
- MicroStation V8i (selectseries 1, selectseries 2, and selectseries 3)

Topics to be covered in this session include:

- Understanding the User Interface
- Working with Swept Path Analysis
  - File Name - **SweptPath.dwg**
- Creating Parking Design
  - File Name - **ParkingLot.dwg**
- Creating Roundabout and Junction Design
 - File Name - **Round-a-Bout.dwg**

Understanding the User Interface

Once installed, vehicle tracking shows up as a new tab in your ribbon. There are 6 panels along that ribbon that we will quickly explore.
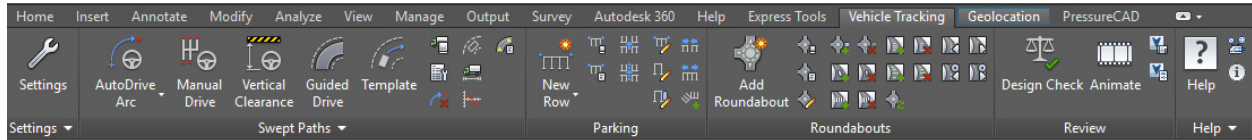

Settings Panel

There are two types of settings; system and drawing. **System settings** apply to all drawings and are saved on the computer. **Drawing settings** apply within a drawing and are saved with the drawing. If you select the down arrow next to Settings, you will see the options to select which settings to adjust.
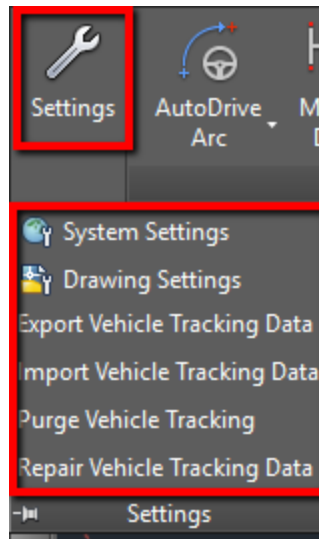
The Settings Wizard is designed to help users configure Vehicle Tracking correctly. The wizard does not allow you to edit all settings, but on every page, there is an Advanced button that takes you to the appropriate page of the Settings dialog for more detailed settings.

Also on every page is a Finish button. This applies any changes made so far for the current session only. If you want to make the changes apply to future sessions, then click Next until you get to the Finish page.

1. To open the Settings Wizard, do one of the following:
    a. Select Vehicle Tracking menu ➤ Settings
    b. Click Vehicle Tracking toolbar ➤ Settings
    c. Type **AECCVEHICLETRACKINGSETTINGS** on the command line.
2. Adjust settings as required, and then click Next to move to the next Settings Wizard page.
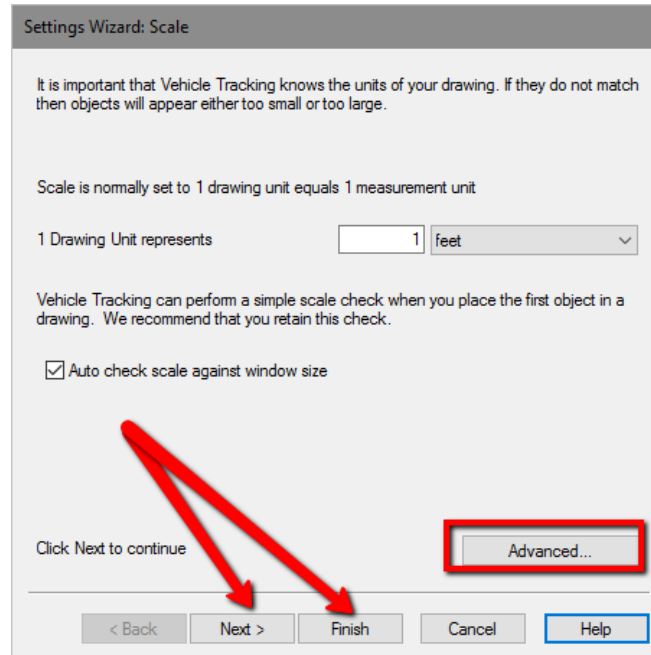
Swept Paths Panel

The majority of you will stick to this panel.
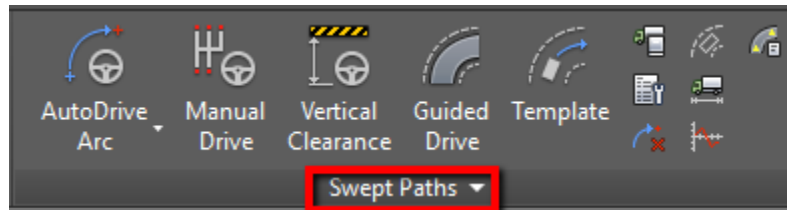
Here you can choose from the following:

AutoDrive

AutoDrive operates in two modes: Arc and Bearing. Both are controlled from a floating dialog that allows the user to adjust various parameters.

In Arc mode Autodesk Vehicle Tracking calculates a path, consisting of circular arcs, through target points specified by the user. In doing so it automatically generates any transitions necessary between segments.

In Bearing mode, Vehicle Tracking turns the vehicle as quickly as possible, subject to the allowable lock rate, until the steered wheels are on a bearing through the target point, and then continues on that bearing until the selected path point reaches the target.

Manual Drive

Manual Drive allows you to control the vehicle interactively, much like a real vehicle, albeit with a different viewpoint and controls.

Vertical Clearance

Checks for impacts both above and below the vehicle. This drive mode allows you to model the vertical movement envelope of a vehicle, which enables you to check for grounding of the vehicle or overhead impacts with other structures. The vehicle is assumed to have all wheels in contact with the road at all times. In the case of multiple axles this means that there may be some vertical movement of individual axles. This movement approximates to the behavior of the vehicle's suspension.

Guided Drive

The Guided Drive mode is used for trams and other light rail vehicles in which the vehicle's position is entirely dictated by the rail layout.

There are several other commands on the Swept Paths Panel, including:

1. **Vehicle Library Explorer** - Vehicle Tracking is provided with a number of vehicles that can be used immediately, with predefined dimensions and characteristics.
2. **Report Wizard** - Can be used to create or edit either your default reports or reports associated with existing paths. The wizard does not allow you to edit all settings but on every page, there is an Advanced button that takes you to the Reports dialog where more settings are available.
3. **Insert Profile** – Shows a profile view of your vehicle

Parking Panel

The Parking panel is where you will find all your tools/settings when laying out a parking lot. Autodesk Vehicle Tracking defines a parking area as a collection of parking rows each of which consists of individual bays.

Each row is created in accordance with a standard. In most cases rows within a parking area use the same basic standard.


Roundabouts Panel

The Roundabouts panel takes the Civil 3D roundabout tool to a whole new level. In fact, with the 2017 version of Civil 3D, the Roundabout tool has been enhanced to the standards of the Vehicle Tracking Roundabout tools.

Autodesk Vehicle Tracking creates roundabouts that blend with existing or planned roads. The point on each incoming road, or arm, at which the roundabout model starts is called the blend point. So, if you have four roads leading into your roundabout you will have four blend points.

Once placed, every aspect of your roundabout model, including the location of the blend points, can edited using either grips or using the properties dialog.
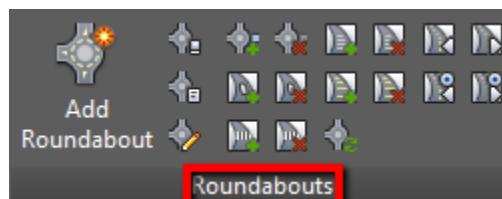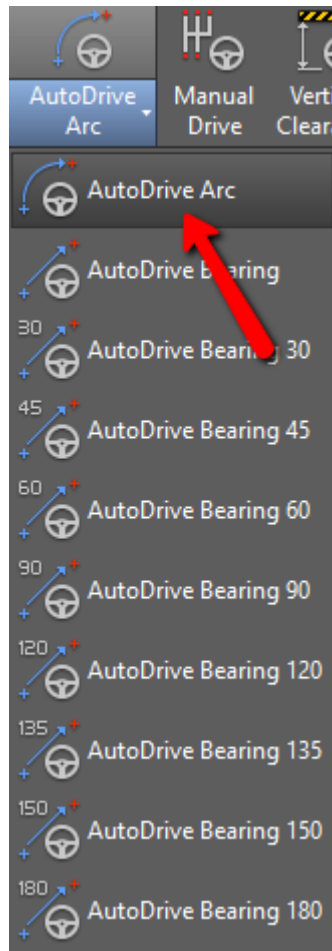
So now that we have taken a quick look through the interface, let's get started with our first task!

Task 1 - Create Swept Path Analysis

Open SweptPath.dwg

1. From the Swept Path Panel, select the AutoDrive Arc command.

2. This will do an initial load of the Vehicle Library. In the vehicle library, you can search for a certain vehicle, or scroll through the list of vehicles until you find what you are looking for. Scroll down to **US DESIGN VEHICLES** and expand the list, expand **STATE-WIDE (AASHTO)**, expand **AASHTO 2011 (US Customary)**, then select **P – Passenger Car**.
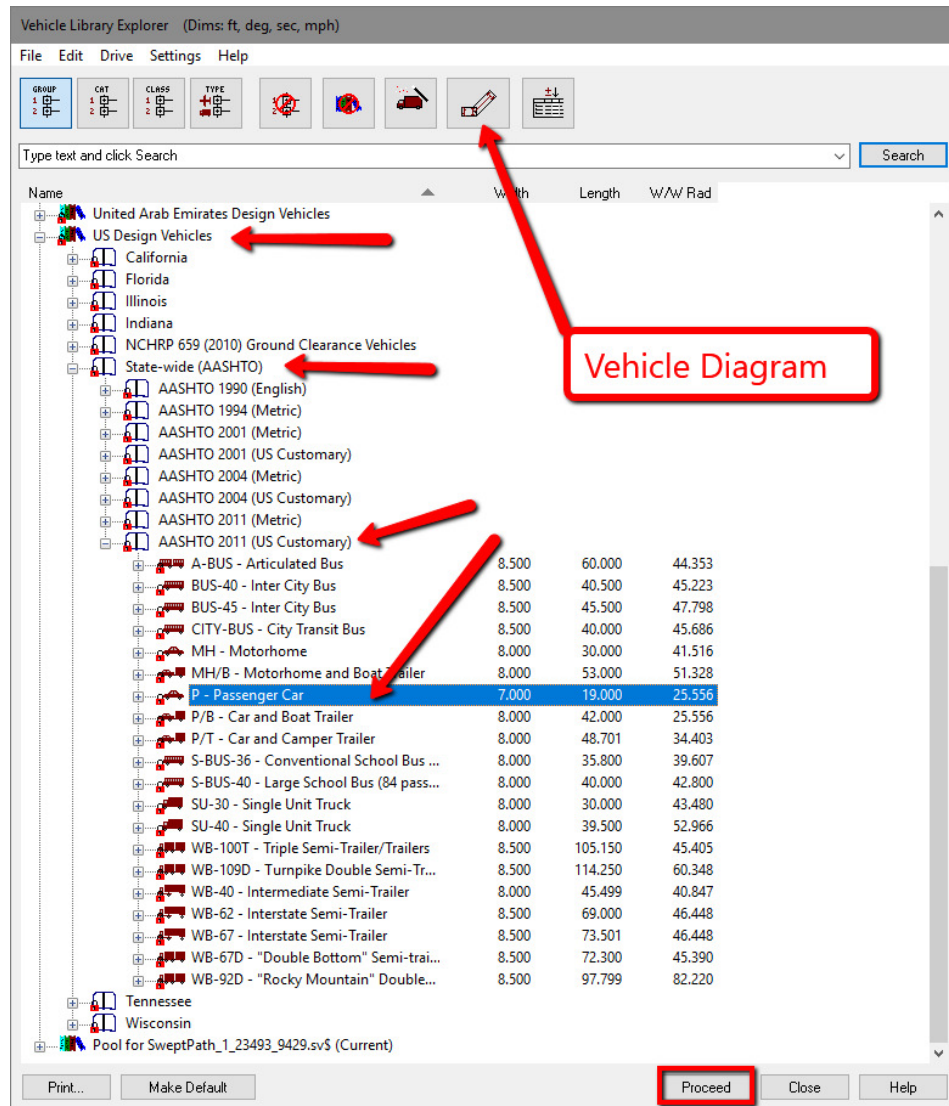
3. Select **VEHICLE DIAGRAM** from the Vehicle Library Explorer.
    a. This dialog shows a scale picture of the current vehicle. Initially the picture is centered on the geometric center of the vehicle but you can change the focus by simply clicking on the picture. The principal dimensions are listed below the diagram.
4. Close the Vehicle Diagram.
5. Select **PROCEED**.
    a. You may get a Default Vehicle dialog box. Select NO.
6. From the **DRAWING SETTINGS** dialog box, select OK.
7. You're first select is to select the starting point and rotation of your vehicle. We will begin along the North entrance off of 800 South Street. Select a point just West of the intersection, and align with the road as shown below.

Place & Align
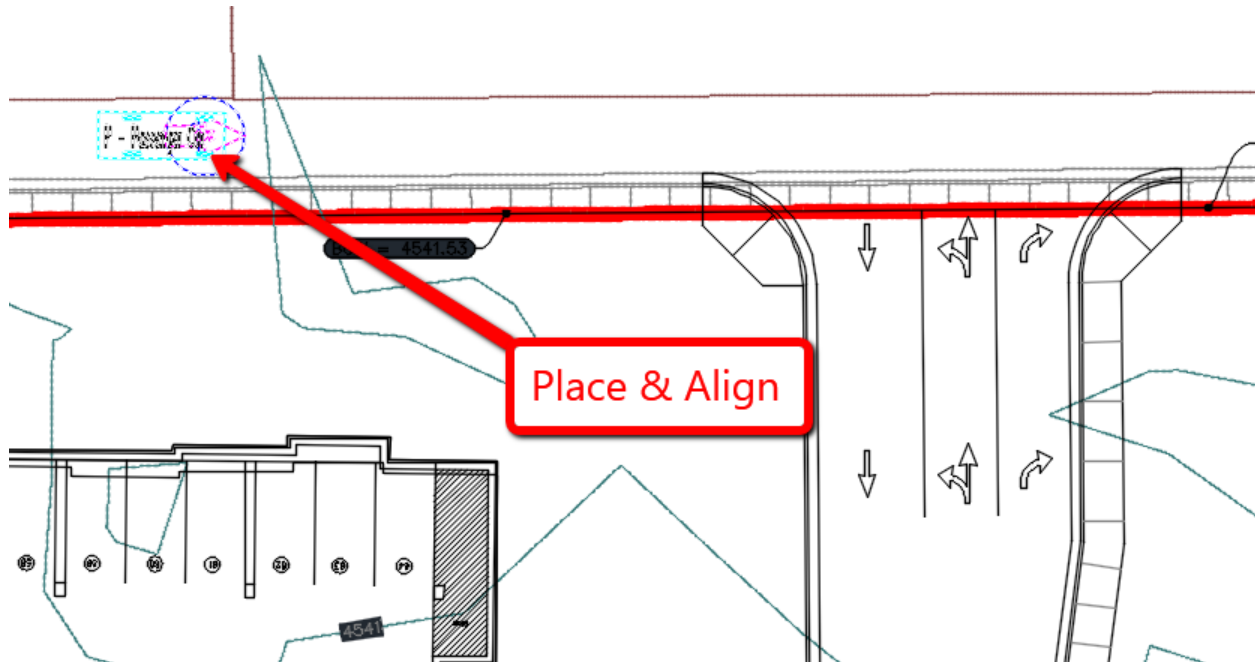
8. The Position Vehicle Dialog Box will appear.
a. The vehicle orientation can be adjusted interactively until you start to drive. Once you have started to drive you can adjust the initial orientation using the Path tools.
9. Select **PROCEED**.
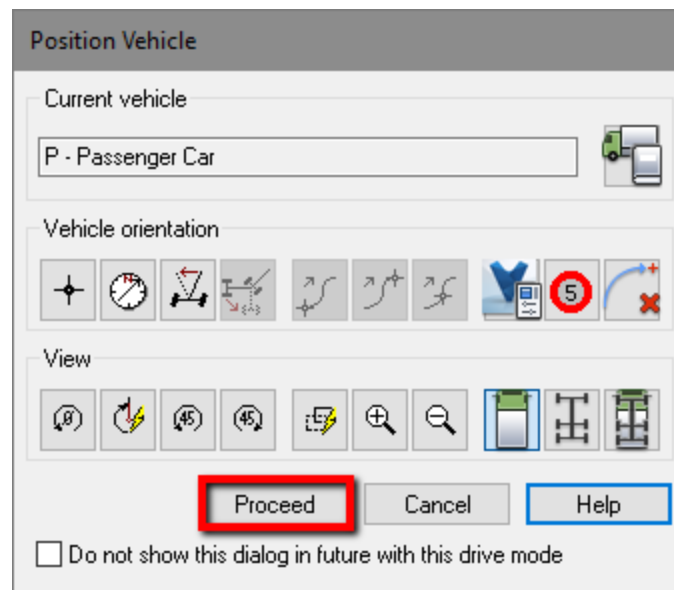
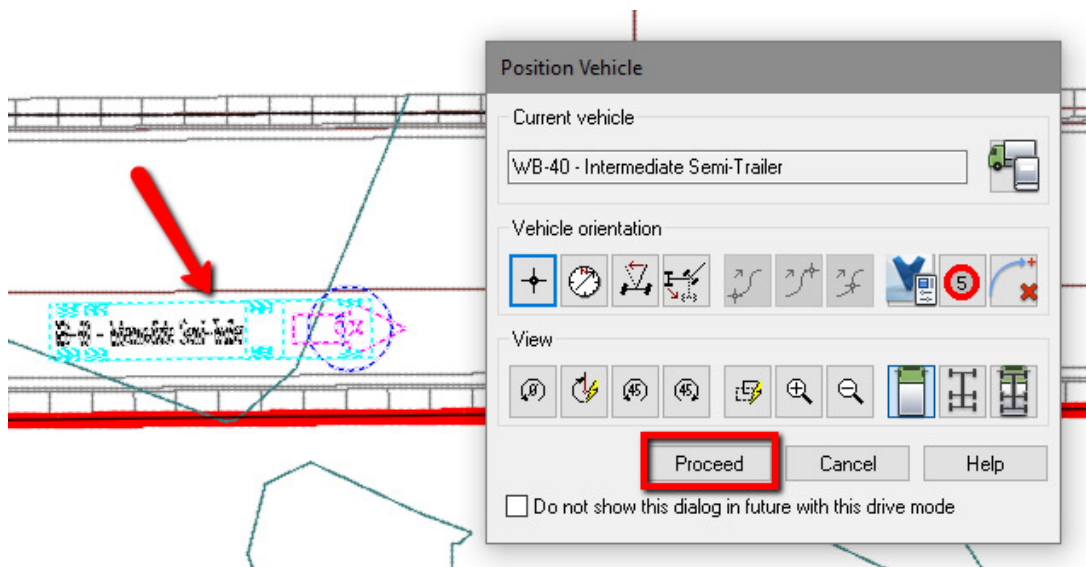10. Select 6 more points approx. where shown below.
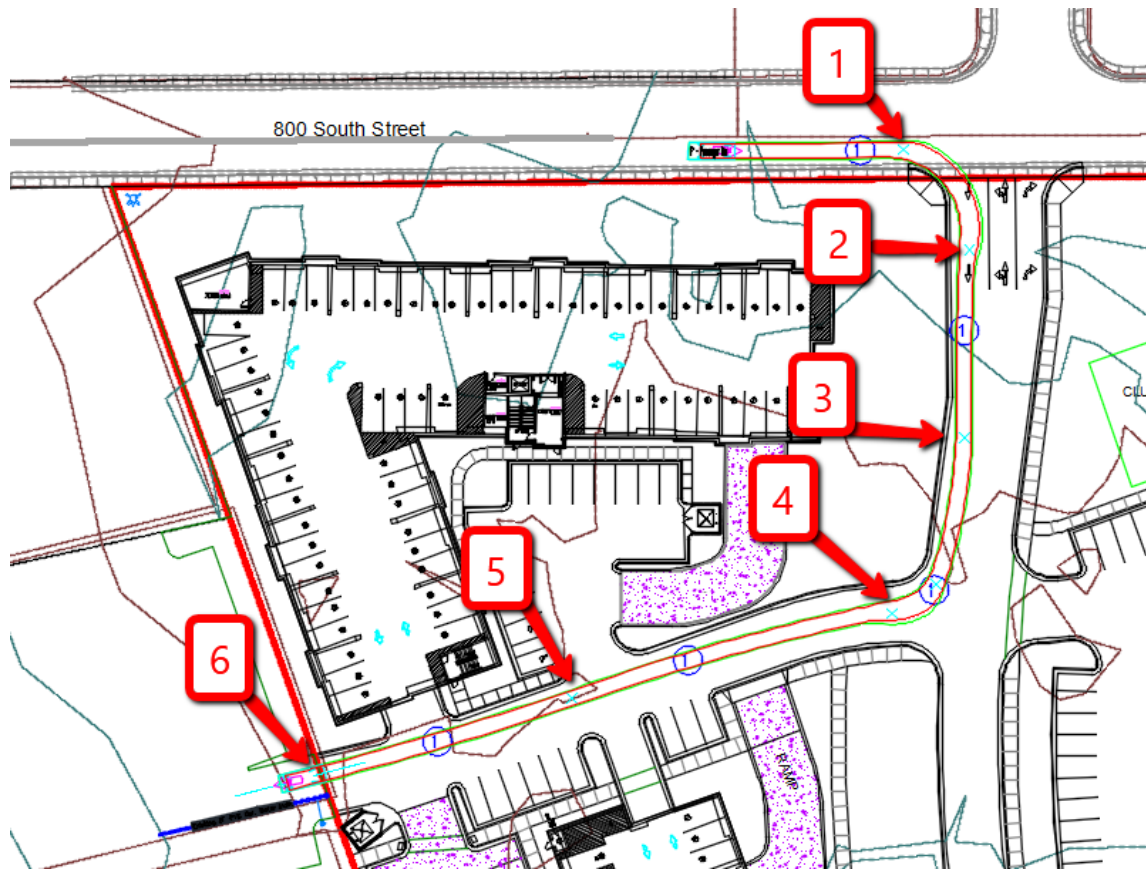
11. Select OK.

You have now placed your first path!! Now try another option.

For this option, we will choose a larger vehicle, use the **PICK ALIGNMENT** option to drive a truck through the site, reverse it and drive it out of the site!
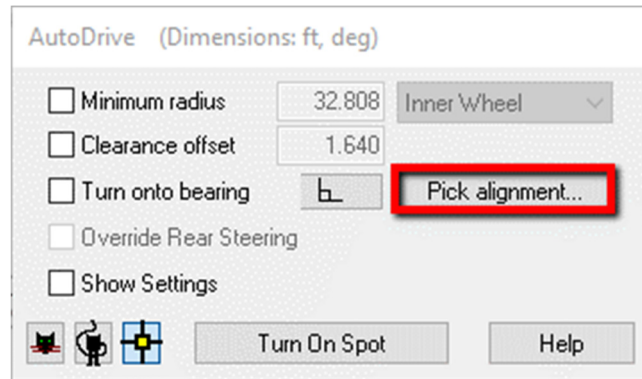
1. Remove your existing path. Select your existing path and choose delete from your keyboard.
2. Select the AutoDrive Arc command.
3. If you scroll down to the bottom of the dialog box, you will notice a POOL of vehicles that has previously been used. This is very helpful when running multiple paths.
4. From the search bar at the top of the dialog box, type in WB-40, and select SEARCH
   a. You will see that the options have been narrowed down to only that containing a WB-40 class vehicle.
5. Select WB-40 and select **PROCEED**.
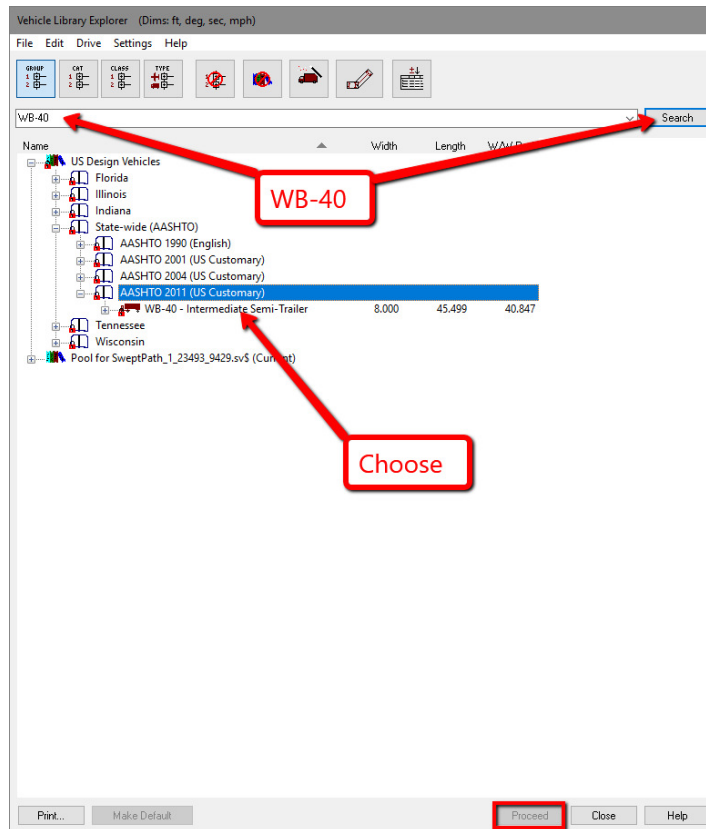
6. Place and align the vehicle as we did before, then select **PROCEED**.

7. This time, let's select the **PICK ALIGNMENT** option from the AutoDrive dialog box.

AutoDrive   (Dimensions: ft, deg)

☐ Minimum radius   32.808   Inner Wheel ⌄
☐ Clearance offset   1.640
☐ Turn onto bearing   ⌐   Pick alignment...
☐ Override Rear Steering
☐ Show Settings

[icons]   Turn On Spot   Help

8. You are prompted to select a **DATUM OBJECT**. From the intersection, select one of the AutoCAD lines representing the road striping.

Select Line
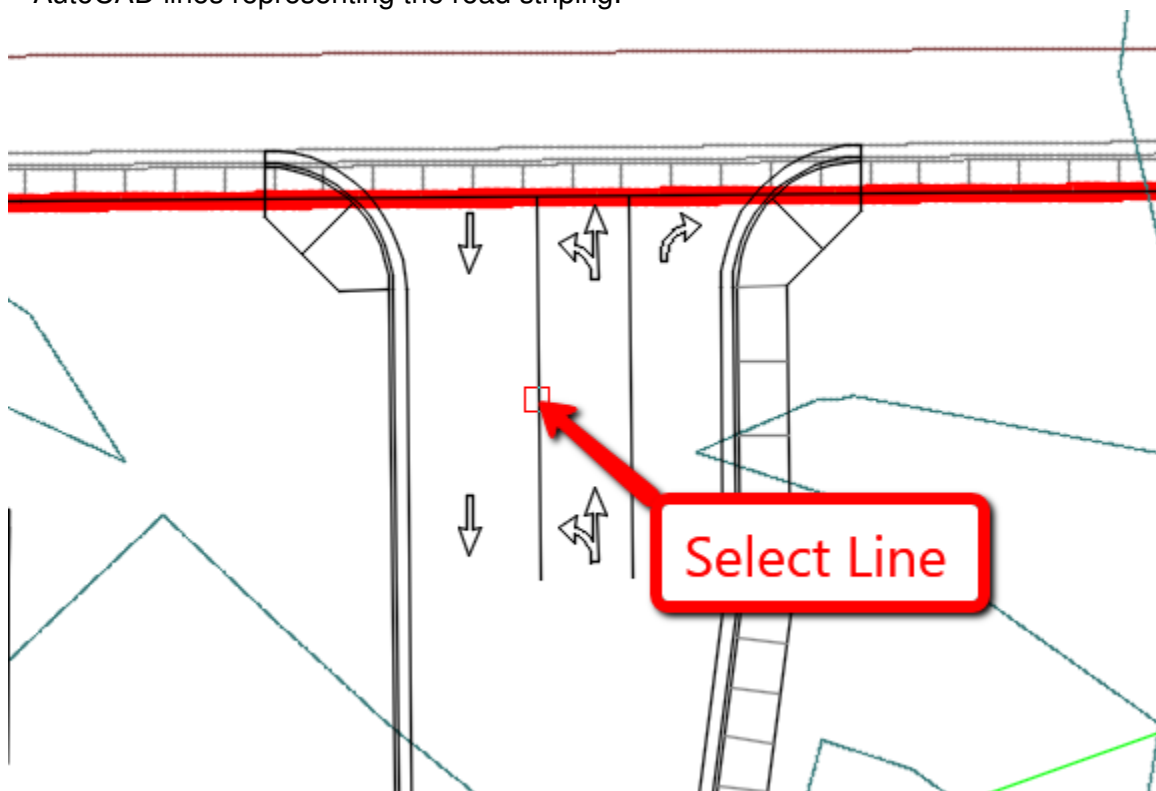
9. This will keep the vehicle parallel to the line we chose. While still in the command, select the **PICK ALIGNMENT** option again, and select the following line.
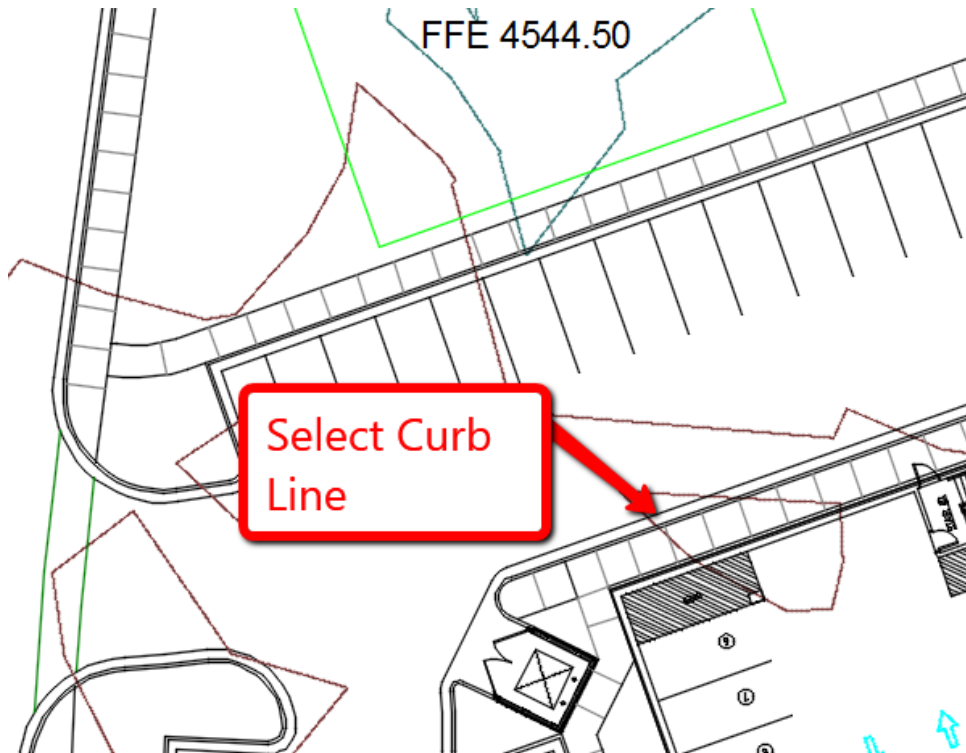
10. Select somewhere near the end of the parking stalls along the East side.
11. Select **PICK ALIGNMENT** once again, and select the following line.
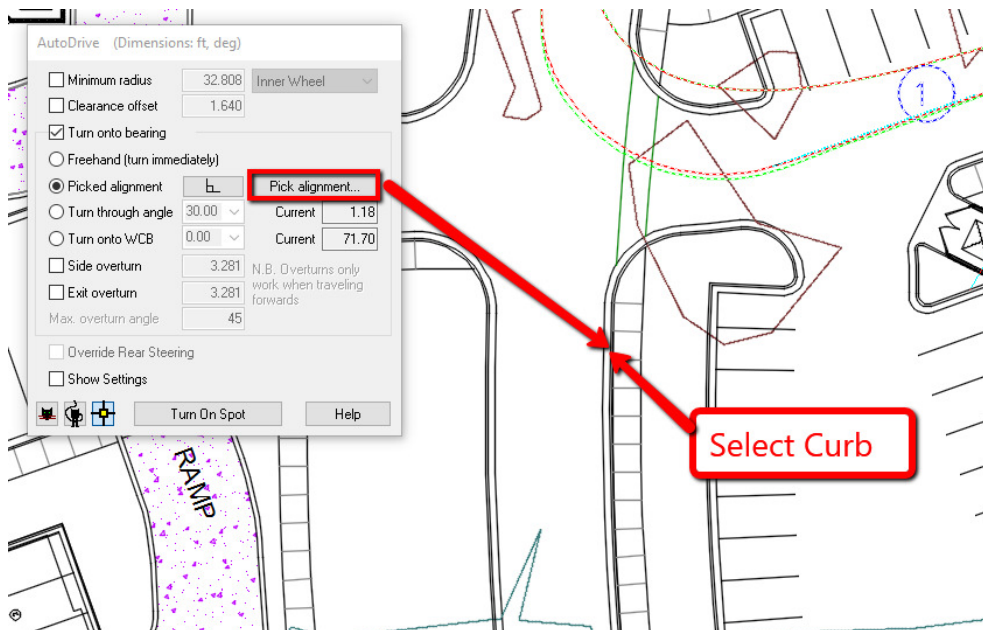
12. Notice as you drag your cursor backward (to the West), you begin driving in reverse! Back the vehicle out, and select a point as shown below.
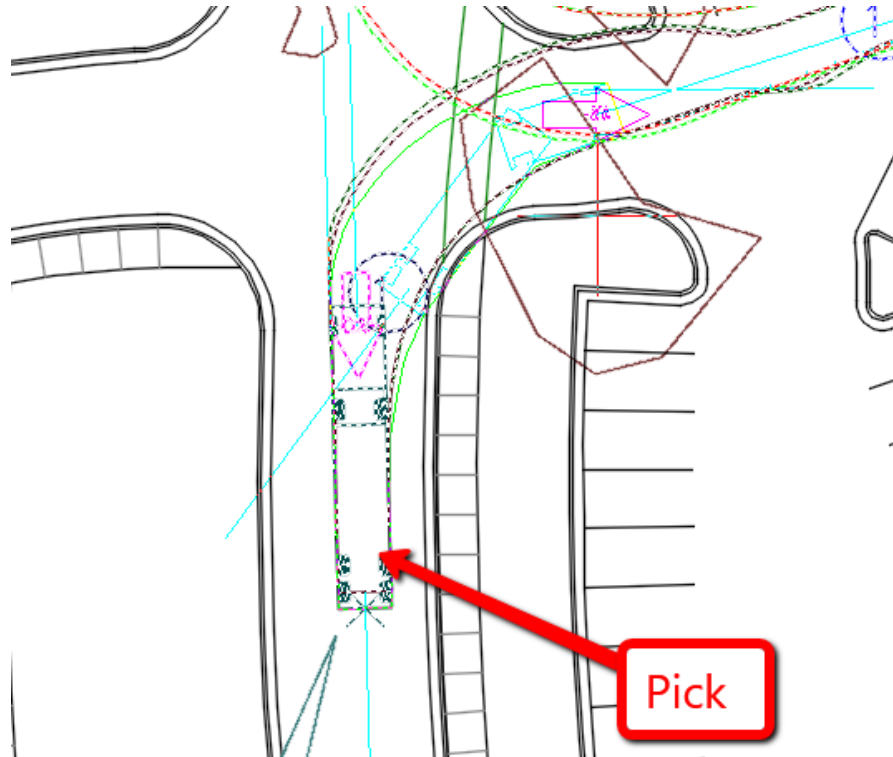
13. Now drive it out of the site using any of the command we have covered.

We will now review some grip editing techniques.

Grip Editing Mode

All paths, except those created using Guided Drive, are stored as a series of target points through which the vehicle is required to drive. The Dynamic Edit functionality incorporated in Autodesk Vehicle Tracking allows you to move the target points of a path, dynamically updating the path to reflect changes in position. Grip editing mode allows you to make all path adjustments interactively simply by picking and dragging grips.

If you edit the path in such a way that the vehicle cannot get from a given point to the next target, the remainder of the path will draw as a single line (red by default).

Select your path. Notice all the different grips. Some of the more useful grips are noted below:

      a.   **Move Path** – Adjusting the vehicle's start position has the effect of moving the entire path.

      b.   **Adjust Side Overturn** – Allows the driver to take a wider turn (veer left before turn right)

      c.   **Insert Target Point** – Allows you to insert a new target point within an existing path

      d.   **Adjust Exit Overturn** – Allows the driver to come out of the turn a bit wider.
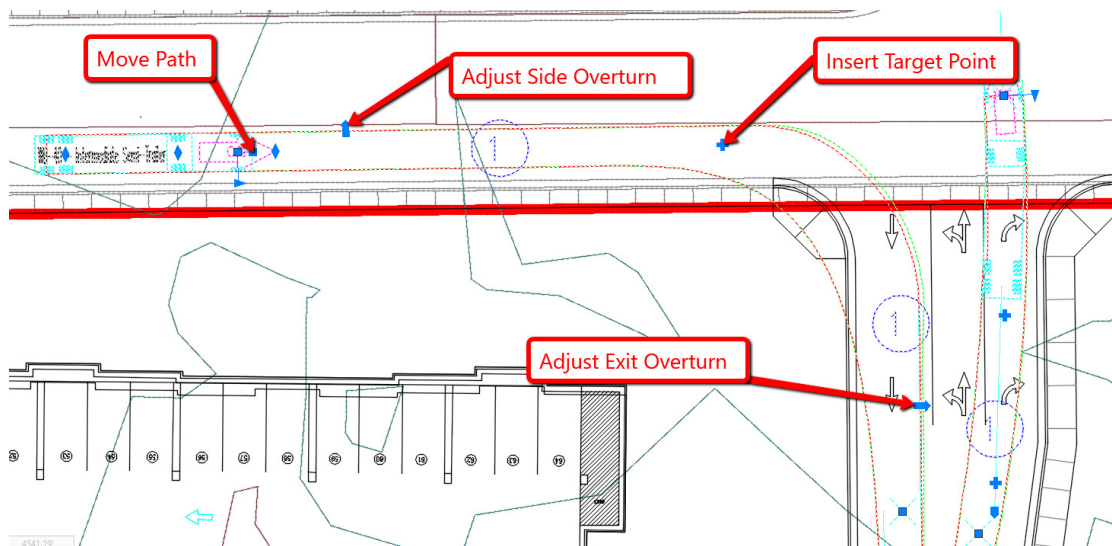
You will see that we have probably clipped the curb & gutter and need to adjust our vehicle path.

1. Select the path. At our starting point, choose the Move Path option, and move it just a few feet north towards the center of the road.
2. Select the Adjust Side Overturn grip and move your cursor towards the North as shown.
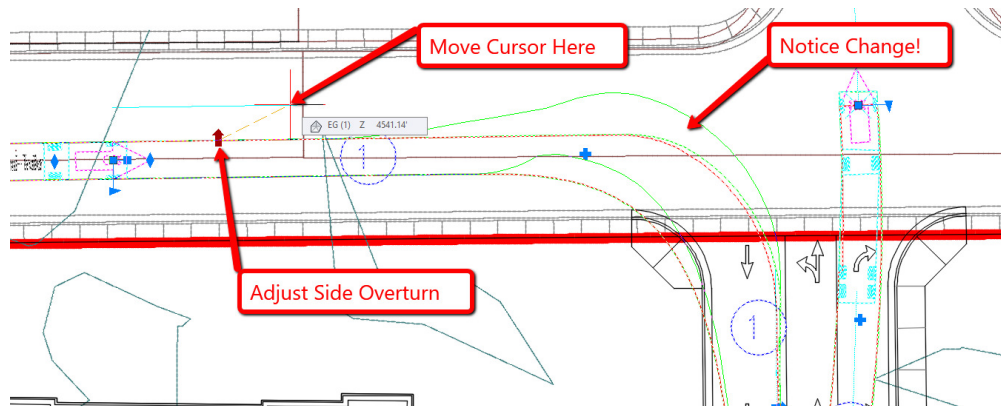
3. Select the Adjust Exist Overturn grip, and move it until your vehicle avoids the curbing completely.
4. Explore some of the other grips throughout the path!

Now let's try one more on your own! Here are some quick steps.

Using the Passenger Car, do the following:
1. Drive the passenger car from 800 South Street into the entrance.
2. Make a right turn, and another right into the underground parking.
3. Park in a stall along the north.
4. Reverse out of the stall
5. Exit the parking lot to the west (Empty Field)
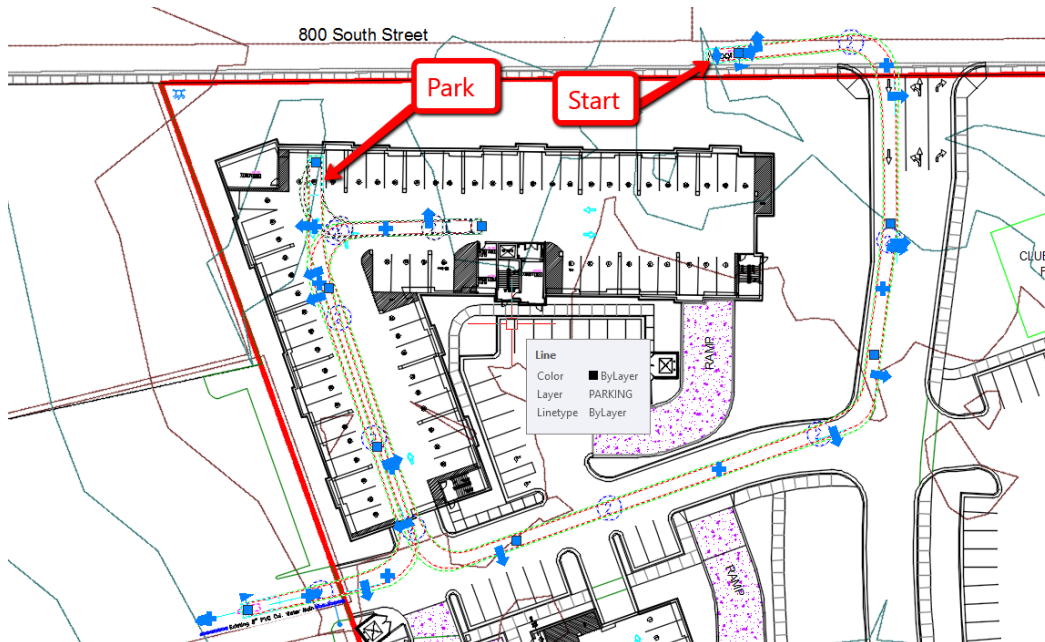
Animate

1. If you have more than one vehicle path on your screen, go ahead and freeze all but one (any one).
2. Select **ANIMATE** from the Vehicle Tracking REVIEW Panel.
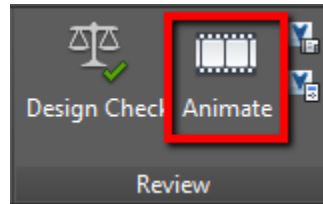
3. The Vehicle Tracking Animation dialog box will appear. Select **ADVANCED** from the bottom right.
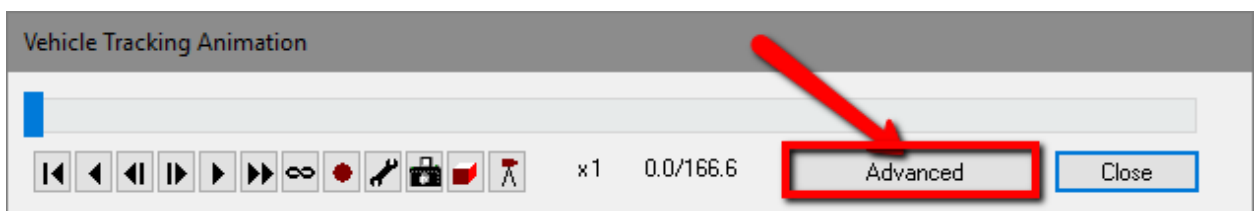
4. The Advanced expansion of the dialog box shows you what your current path to be animated is. Here you can also add a second path to the same animation. Select the PLAY icon, and Fast Forward until your speed is set to 8x.
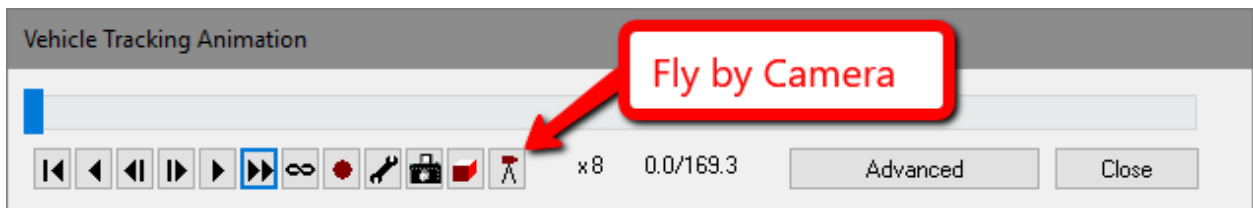

5. Now let's view it in 3D! Select the Animate in 3D icon

6. Cool right??!! Now select the **FLY BY CAMERA** icon.

7. You will see multiple controls pop up. Select PLAY!
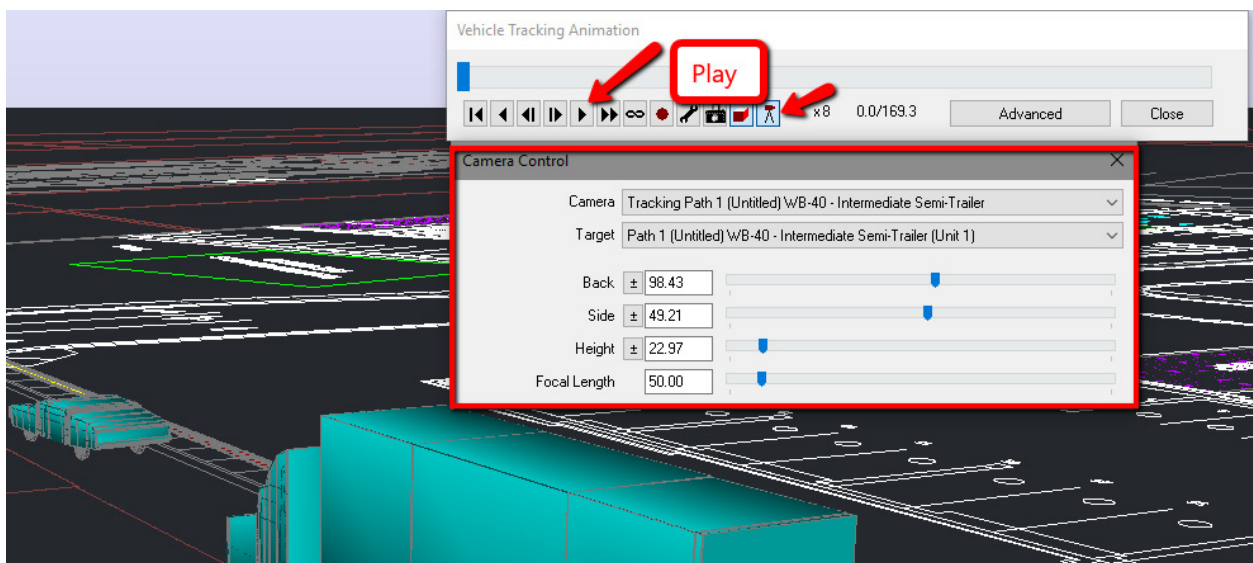
8. Once completed, select the RECORD icon

The record option records everything in the selected area so it is recommended that you switch off screen savers and do not use other applications while recording.

Note: Recording an animation can take some time depending upon the speed of your computer and the length and complexity of the animation.
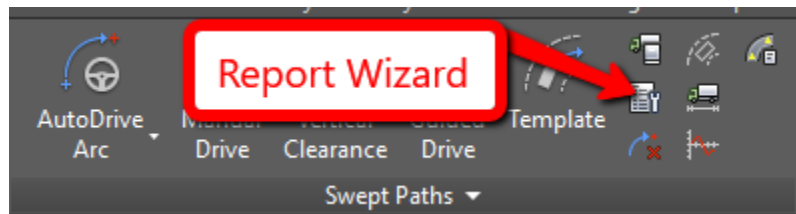
Reports

The Report Wizard can be used to create or edit either your default reports or reports associated with existing paths.

The wizard does not allow you to edit all settings but on every page, there is an **ADVANCED** button that takes you to the Reports dialog where more settings are available.

Each page also has a **FINISH** button, which applies any changes made so far for the current session only. If you want to make the changes apply to future sessions, click **NEXT** until you get to the Finish page.

1. Select the **REPORT WIZARD** icon from the Swept Paths panel

2. The Report Wizard dialog box will appear. On the first screen, you have the following options:
    a. Select a current Report to edit
   b. Create a **NEW REPORT**
    c. Access **ADVANCED** options
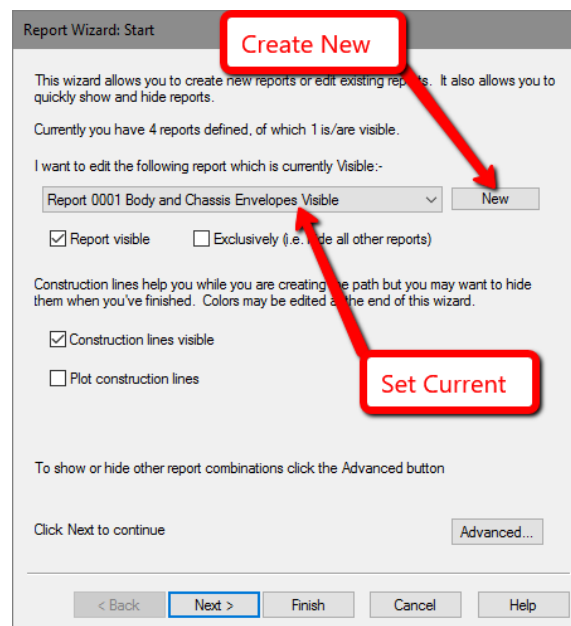
3. Select NEW
4. Name the new Report anything you want…..I chose "**New-Report_Herring**".
5. Select OK

6. Select NEXT
7. On the Body Outline Tab, match the following parameters
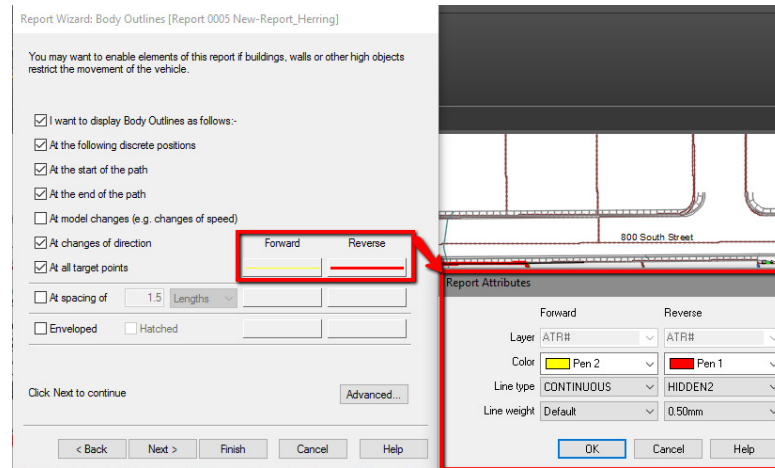
8. Select NEXT
9. For the Chassis Outlines, check ON the Hatched option. Select NEXT.
10. For the Load Outlines, deselect the display Load Outlines at the top. Select NEXT.
11. Turn off all displays of the Pantagraph. Select NEXT until you get to the Safety Zone screen.
12. Deselect the "At the following discrete positions"
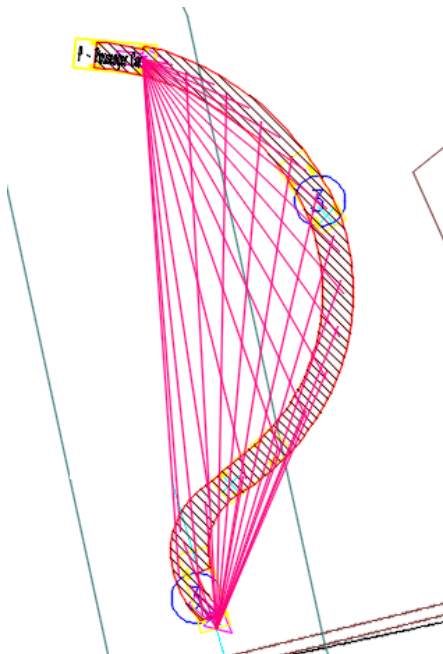13. Set the spacing to 50'.
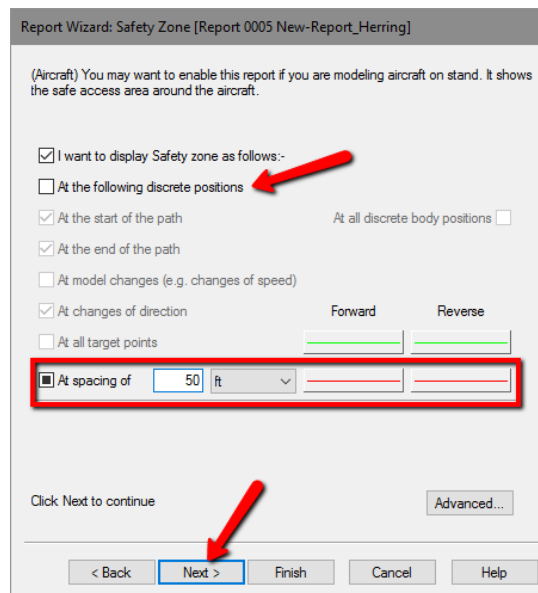
14. Select NEXT until you get to the Visibility Sightlines screen. Match the parameters below.
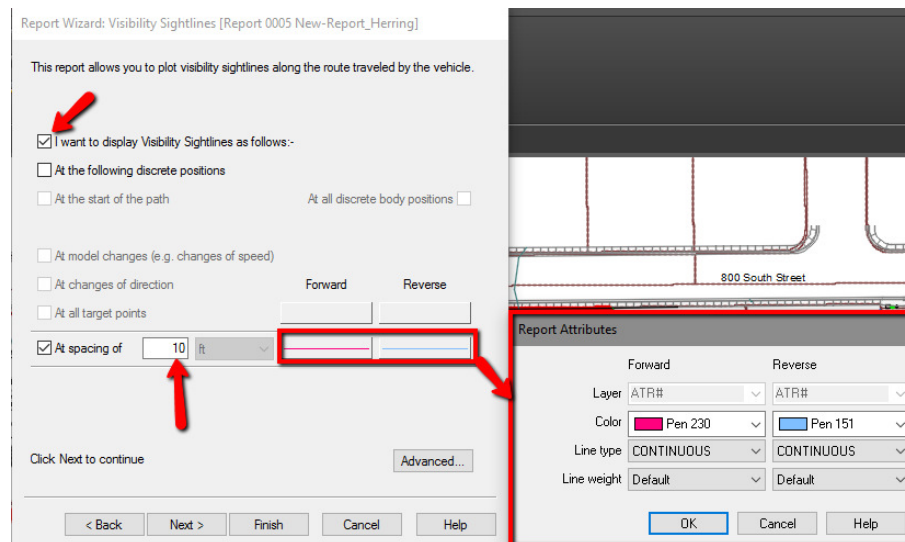
15. Select FINISH (Or further review all options by selecting NEXT).
16. Draw a quick path and you will see the change.

Misc. - Properties Command

The **VehicleTrackingProperties** command lets you look at the details of any Vehicle Tracking entity in your drawing.

Select **PROPERTIES** from the Vehicle Tracking drop down menu or click the Properties button on the Vehicle Tracking Review toolbar.

If you are editing a path, refer to Path Properties for more details.

If you are editing a parking row, refer To Edit Parking Rows for more details.

Misc - Design Check

The Design Check tool lets you check your Autodesk Vehicle Tracking roundabouts for basic errors.

It can be used equally well by engineers at design stage to check their own work and later by checking authorities. Changes to the design check results are saved with the drawing.

Misc - The Template Wizard

The Template Wizard allows you to generate turn templates for any of the hundreds of supplied vehicles, and for user-defined vehicles.

The Template Generator uses fixed report settings (color, linetype, etc.) that the user cannot change.

About Vertical Clearance

Checks for impacts both above and below the vehicle.

This drive mode allows you to model the vertical movement envelope of a vehicle, which enables you to check for grounding of the vehicle or overhead impacts with other structures. The vehicle is assumed to have all wheels in contact with the road at all times. In the case of multiple axles this means that there may be some vertical movement of individual axles. This movement approximates to the behavior of the vehicle's suspension.

Task 2 - Design Parking Lots that Work!

Parking layout can be one of the more tedious tasks in site design. Vehicle Tracking does make this much less painful. Vehicle Tracking defines a parking area as a collection of parking rows each of which consists of individual bays.

Lay out vehicle parking areas in minutes instead of hours. Quickly and accurately place rows, custom bays, and access roads. The parking rows are intelligent objects based on design standards available for more than 15 countries. Use the grips to easily edit the standards and streamline the evaluation of design alternatives.

Open ParkingLot.dwg

This project consists of an existing parking lot, with existing building facilities. Our goal here is to plan a future parking lot expansion on the East side as shown below.
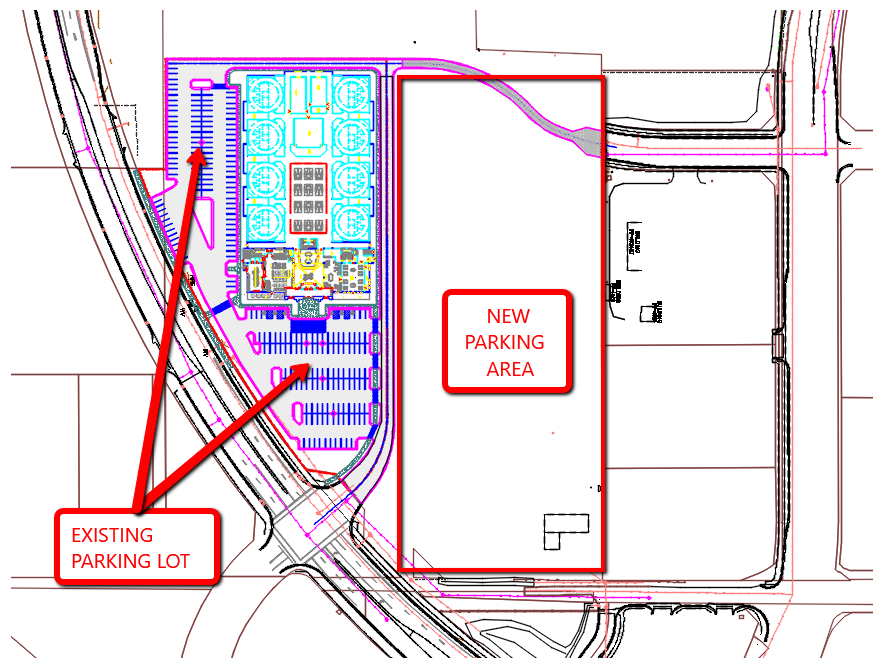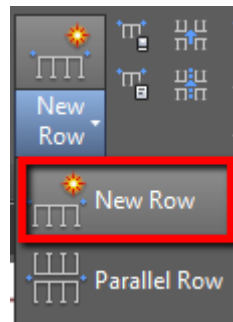

1. Let's layout a simple parking row along the West side. The image below shows you the options within the Vehicle Tracking Parking Panel.
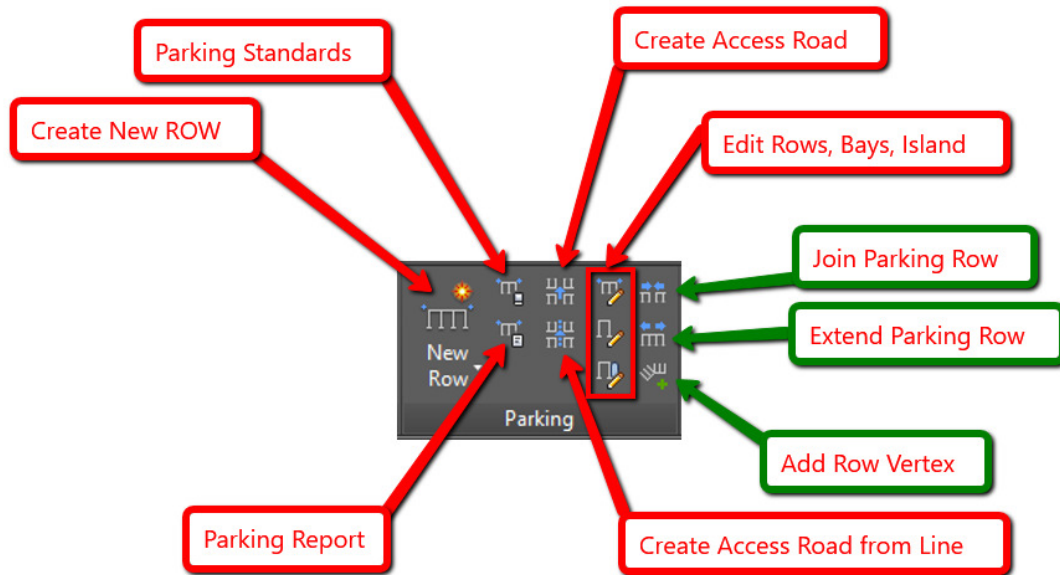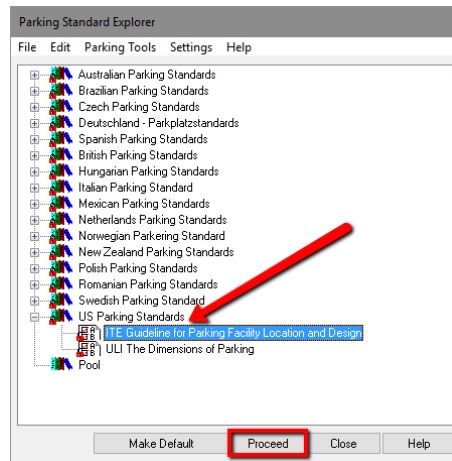
2. Select the **NEW ROW** dropdown, and choose NEW ROW

3. The Parking Standard Explorer dialog box will appear. Expand the US PARKING STANDARDS, and select ITE Guidelines.
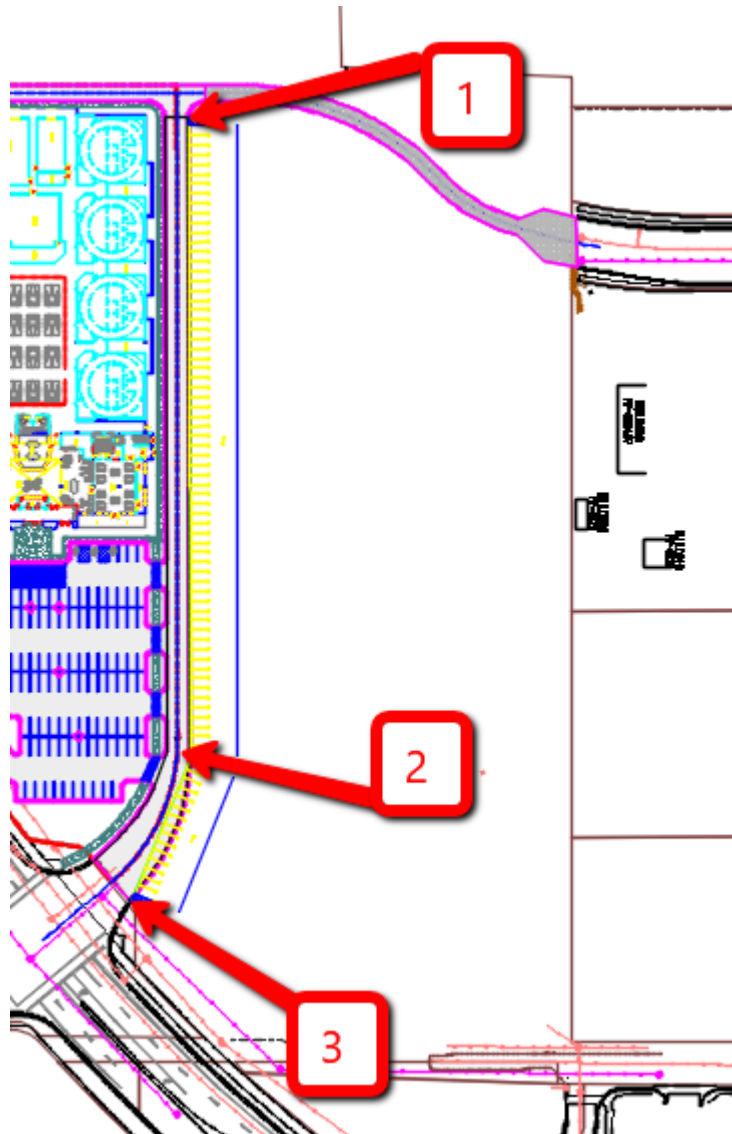
4. Select PROCEED and select OK from the name dialog box.
5. Select OK if presented with the Drawing Settings dialog box.
6. The Parking Row Properties dialog box will appear. In the title area, name it West Side.
7. We would like this row to be only one sided, along the left side only, so set your parameters as shown below.
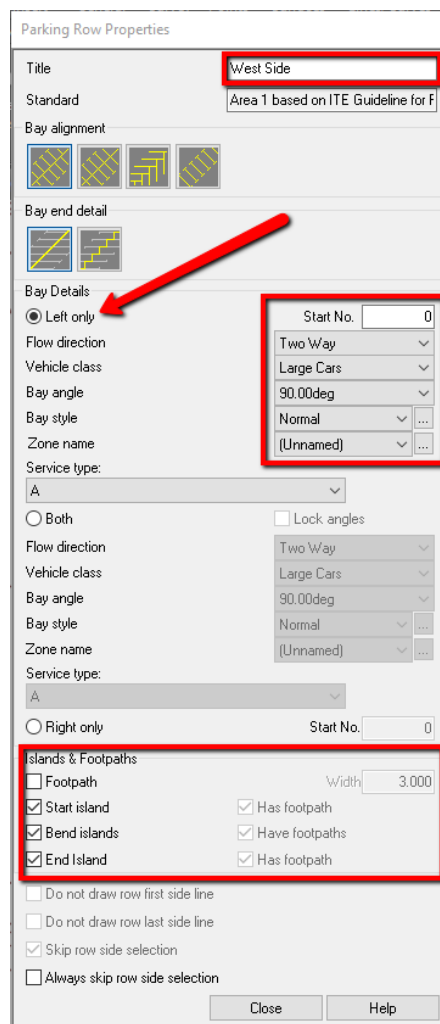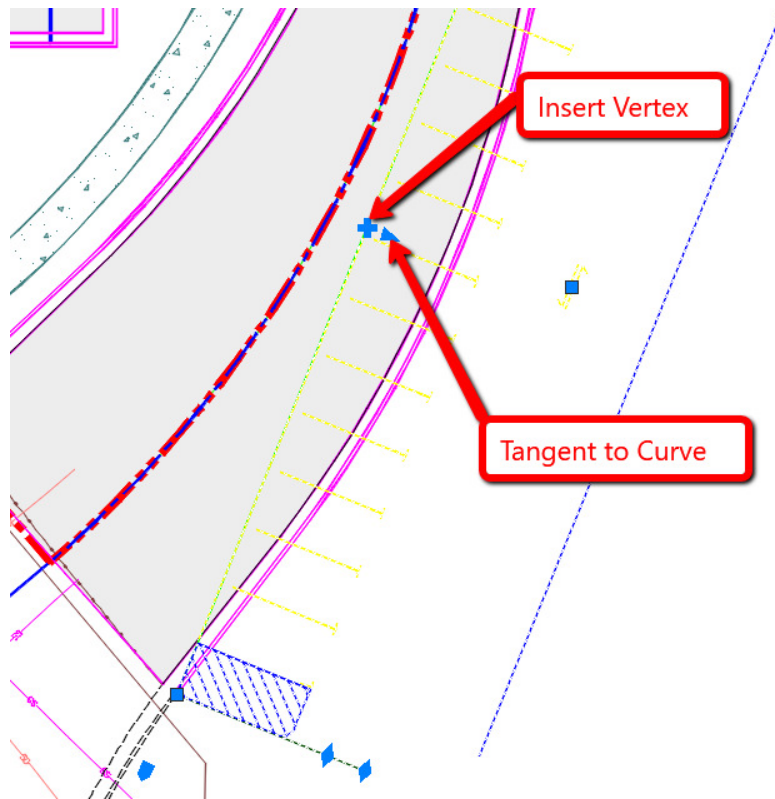
8. Do not select CLOSE. Select the 3 points as shown below.

9. You will notice that between points 2 and 3, we should have a curve and not a tangent. Select the row of parking and the grips will appear.
   a. Use the triangle shaped grip to turn the tangent into a curve
   b. Select the midpoint of the arc along the curbing
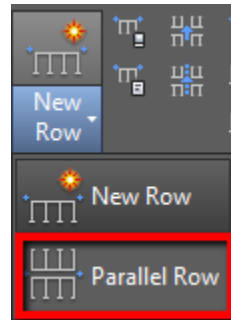
Insert Vertex

Tangent to Curve

10. You have now created your first row of parking stalls!
11. Use the same tool to layout the North stalls, as well as the grips to add in the curve. Choose the layout in the order shown below.
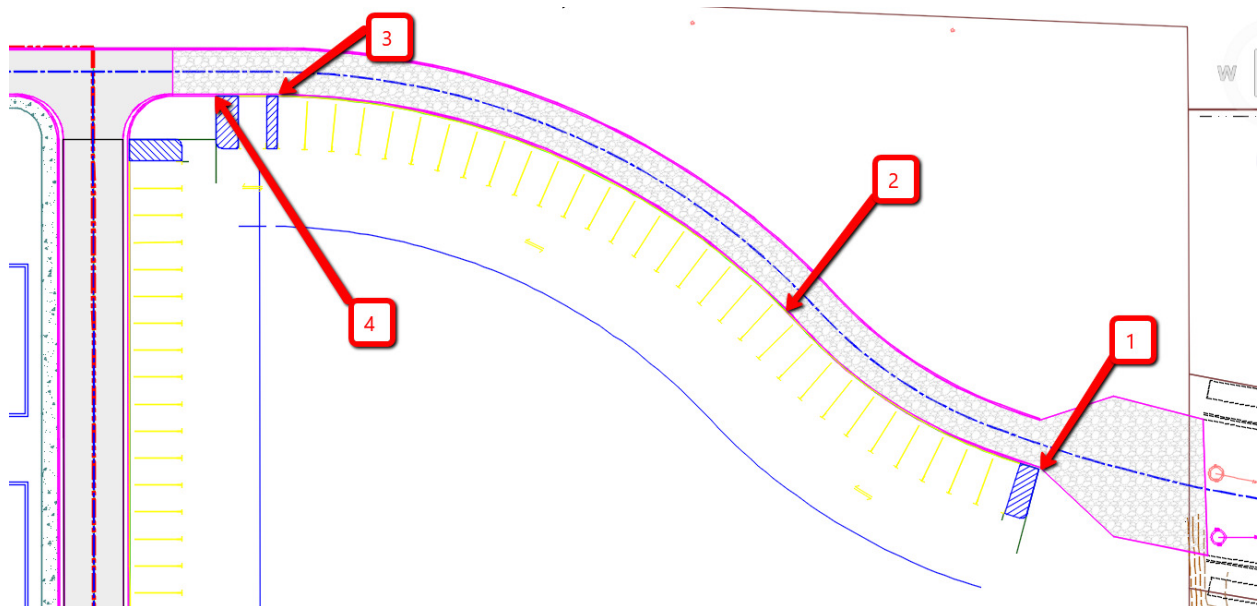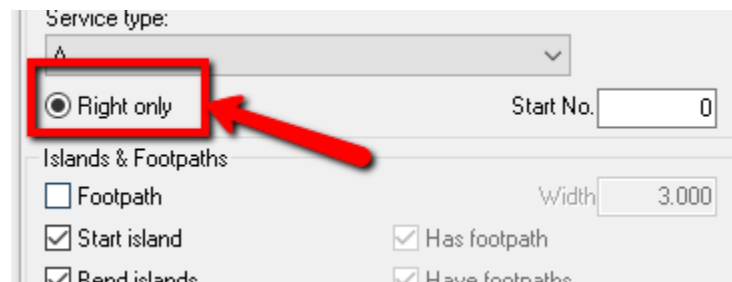
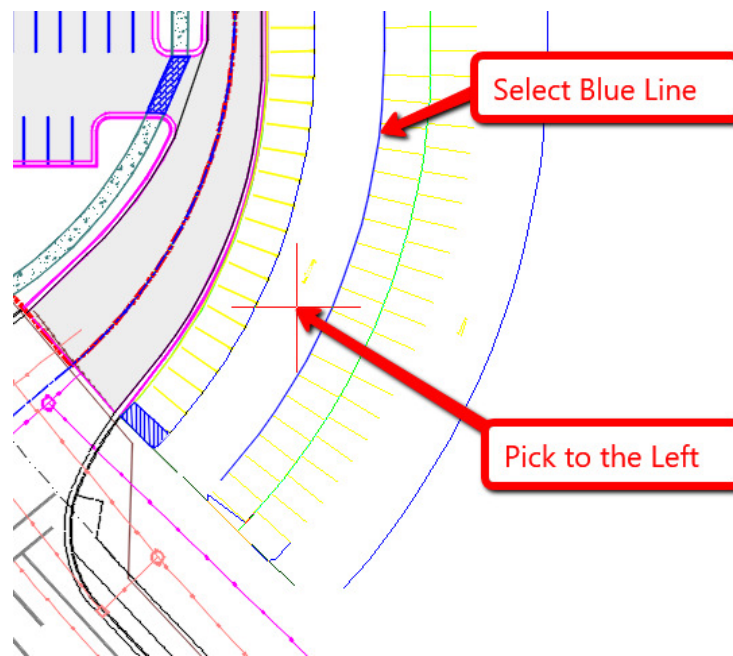12. From the New Row dropdown, select **PARALLEL ROW**

13. Select **ITE Guidelines**, select **PROCEED** and **OK**.
14. From the Parking Row Properties, select **RIGHT ONLY**

15. You are prompted in the command line to Select objects, select the BLUE line created when we placed our first parking row and then select anywhere to the LEFT side of that blue line.
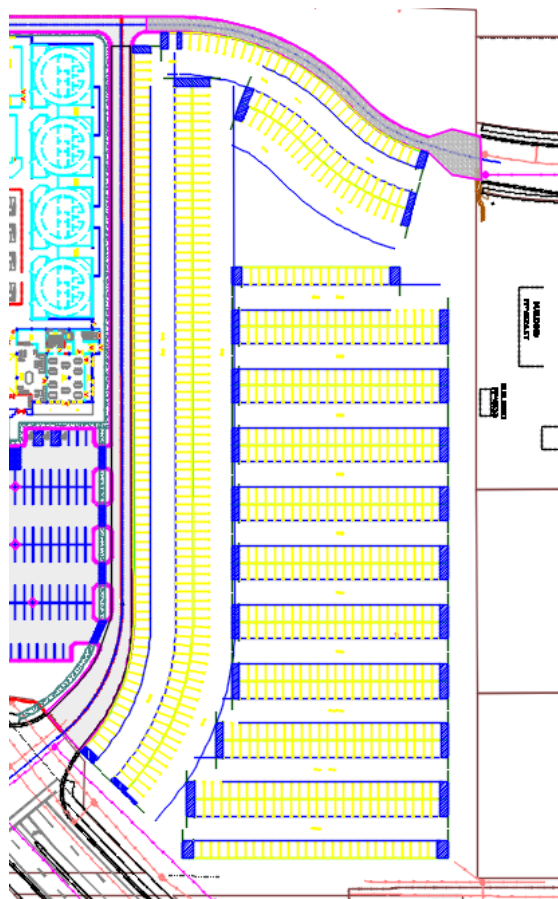
16. Do the same to the row along the North side.
17. Let's now layout several rows from the South to the North as shown below.
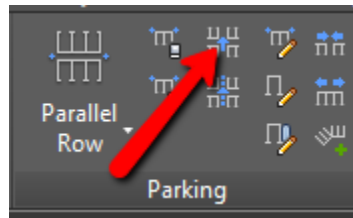18. Row 1, straight line, West to East.
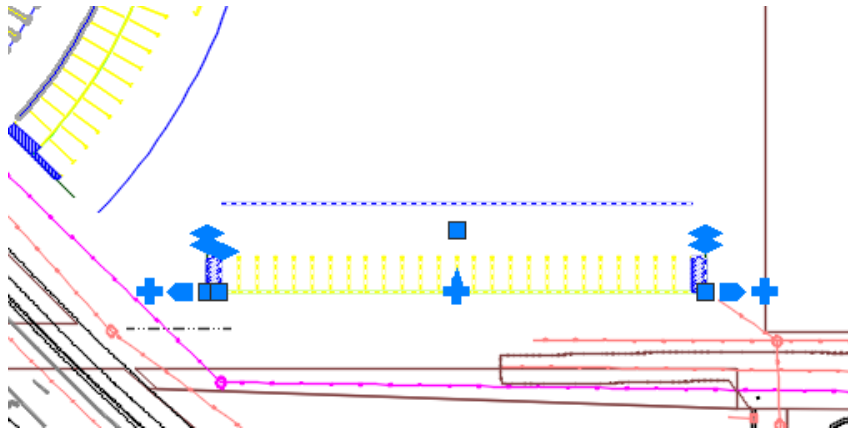
19. Create Parallel Rows all the way up to the North end, as shown below. Just get close as shown……this won't be built tomorrow!!
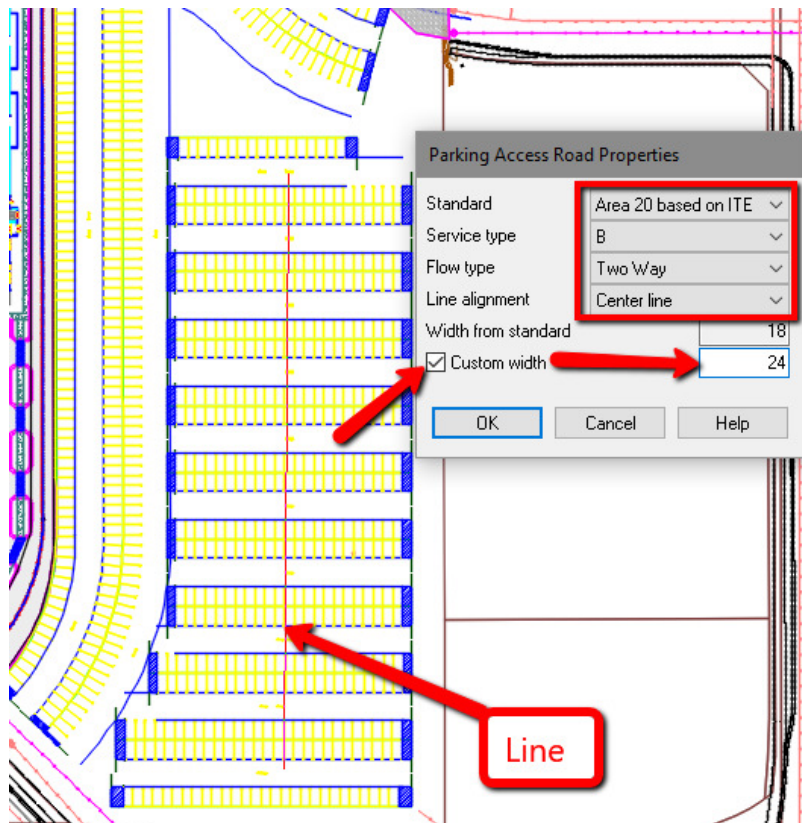

20. Next, create an access road approx. down the middle of our parking layout.

21. Select the **CREATE ACCESS ROAD** icon.

22. Once you draw your line down the center, the Parking Area Road Properties Dialog box will appear. Match the parameters as shown below.

23. Select OK.
24. We now have a finished layout!! Let's explore a few of the style/standard tools.
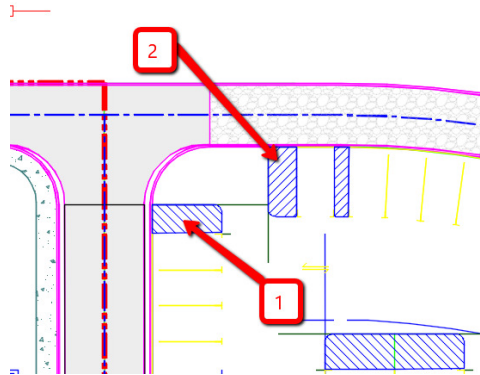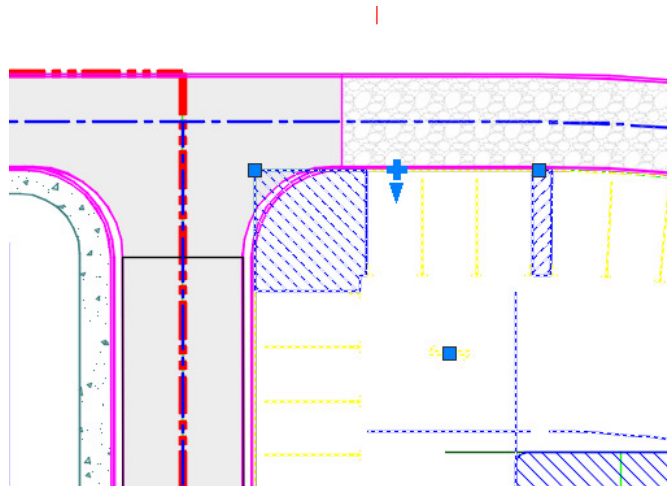
Join Parking

1. Select the **JOIN PARKING** icon from the ribbon.

2. In the upper left of our new parking area, select the stall on the left, then the stall on the north.

3. The two stalls will automatically clean up and join with an island!

Editing Row

The simple editing tools within the parking layout options can be very useful. You can quickly check to see if angled parking may yield a higher number of stalls, or make simple changes to the style/size of all rows. Run reports as outlined below to see how many stalls fit!

1. Select Edit Parking Row

2. Select any row of parking. I chose the first row that we placed along the West side.
3. The Parking Row Properties Dialog box appears. Here we can make several simple and dynamic edits. Change the parameters as shown below, then select APPLY to see your changes as you go.
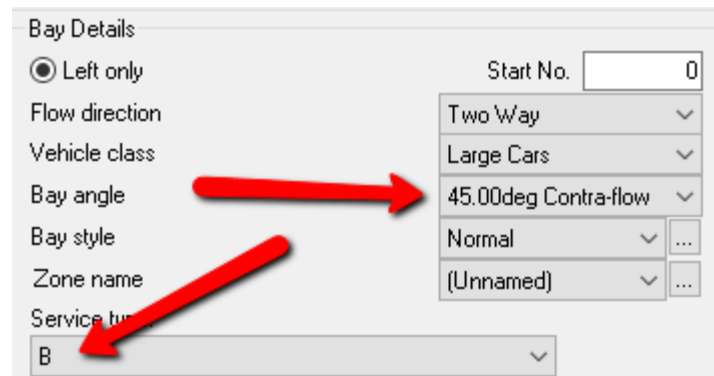
4. Select EDIT ANOTHER from the bottom of the dialog box. You can choose to continue any edits as needed.

Editing Bay

Individual parking bays within a row may vary from the default bay type for the row. However, every bay must be of a defined type for reporting purposes. Thus, for example, if you wanted one bay within a row to have a wheel stop, you would first have to define that bay type and then set the bay to that type.

Let's add some ADA Accessible handicap stalls to a few areas of our parking lot.

1. Choose EDIT PARKING BAY from the ribbon

2. Select any row of parking to edit, I chose one of the interior blocks of parking. Select that row.
3. You will see blue "nodes" throughout the row of parking you chose, as you hover over a bay, it will turn to red. Red indicates a bay that will be edited once it is selected. Select one of the bays next to a parking island.
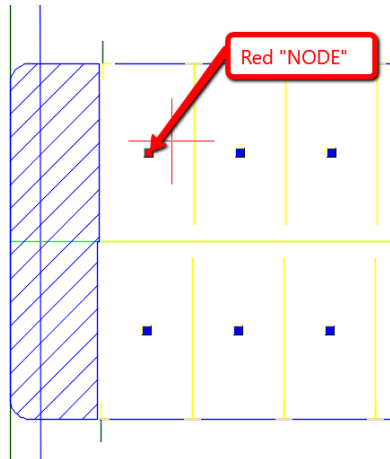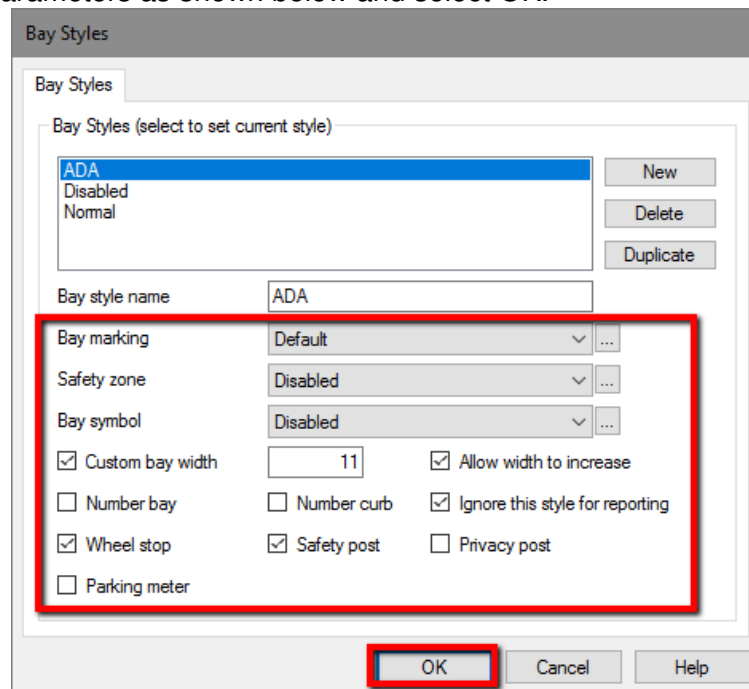

4. Once selected, the Parking Bay Properties dialog box will appear. Select the ellipsis icon next to the Bay Type dropdown.
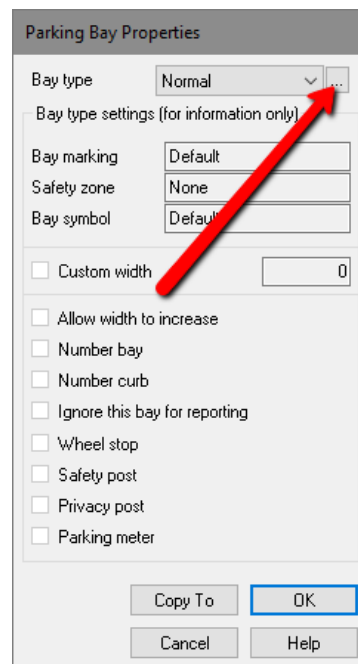
5. This will launch the Bay Styles dialog box. Select **NEW**.
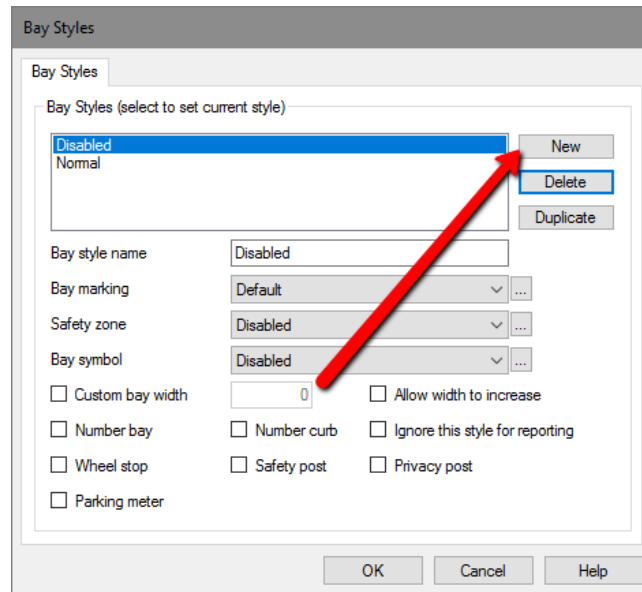
6. A new style will be displayed in the list. Select the new style from the list and name the new style "ADA".
7. Change all parameters as shown below and select OK.

8. Select OK again to see the changes added to your row, and the remainder of the row adjusted! Pick a few more location to add the ADA stalls.

Editing Island

Parking islands are placed at the ends of each row of bays and at each change of direction of the row. End islands and bend islands may have different default properties and thereafter any island may be edited such that it becomes unique.

Parking Report

The Parking Report is a dynamically updated bay count by any or all of the following: parking standard, bay style, service type, vehicle class and / or parking zone.

1. Select the **PARKING REPORT** icon from the ribbon.

2. This will launch the report; you can choose to **CUSTOMIZE** if needed or **EXPORT** to a file.

Standard	Bay type	Vehicle ...	Service ...	Zone	Count	%
Area 1 b...	Normal	Large C...	A	(Unnimed)	81	11.55
Area 2 b...	Normal	Large C...	A	(Unnimed)	59	8.42
Area 3 b...	Normal	Large C...	A	(Unnimed)	36	5.14
Area 4 b...	Normal	Large C...	A	(Unnimed)	238	33.95
Area 6 b...	Normal	Large C...	A	(Unnimed)	42	5.99
Area 11 ...	Normal	Large C...	A	(Unnimed)	65	9.27
Area 14 ...	Normal	Large C...	A	(Unnimed)	36	5.14
Area 14 ...	Normal	Large C...	B	(Unnimed)	72	10.27
Total Stalls					701	100.00%

Task 3 - Create Detailed Round-a-Bout Options

Autodesk Vehicle Tracking creates roundabouts that blend with existing or planned roads. The point on each incoming road, or arm, at which the roundabout model starts is called the blend point. So, if you have four roads leading into your roundabout you will have four blend points.

Once placed, every aspect of your roundabout model, including the location of the blend points, can edited using either grips or using the properties dialog.

The default geometry of your roundabout is determined by the standard that you select. The standards that we supply are locked to prevent accidental (or intentional) changes but you can create your own and these can be password protected.

The standard defines limits for each geometric value. Values may also be unlimited. As you adjust your roundabout model, Autodesk Vehicle Tracking checks the geometry against these limits and displays an immediate warning if a value goes outside the specified range. These warnings are also used by the Design Check tool and here you are able to enter a justification for the transgression.

The appearance of the roundabout, line colors, styles, thicknesses, etc. is controlled by styles. A single style comprises the attributes of all the elements of the roundabout model such as curbs, pedestrian crossings and so on.

In addition to the ability to auto-generate the parameters required for traffic analysis, the software also includes a built in bi-directional dynamic link to TRL's ARCADY software, allowing for real-time feedback on traffic analysis as the roundabout geometry updates.

==Here is a quick exercise on creating a round-a-bout in Civil 3D, using Autodesk vehicle Tracking. These tools were so cool, that AutoCAD Civil 3D 2017 has the same options built in natively. Please email me for a more detailed workflow document if you need further explanation of all tools.==
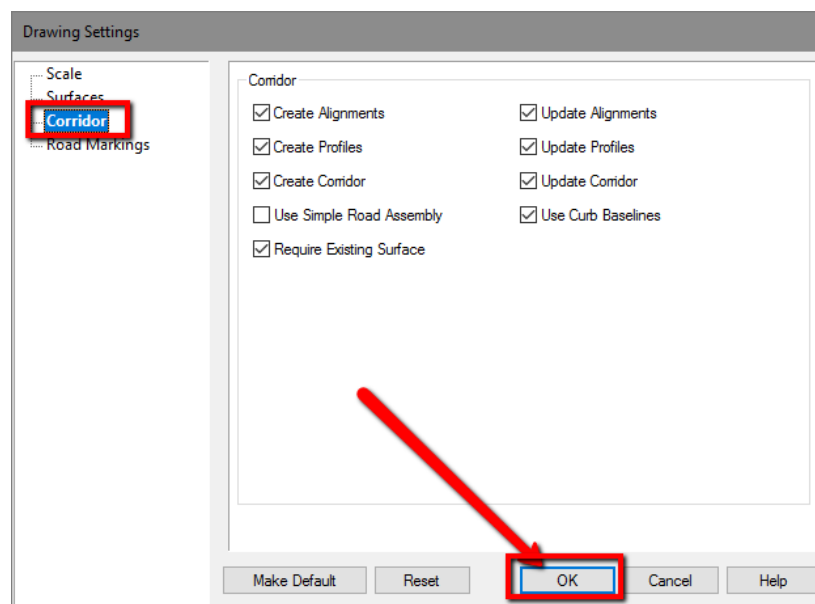
Open Round-a-Bout.dwg

1. Select ADD ROUNDABOUT from the Roundabouts panel on the ribbon.
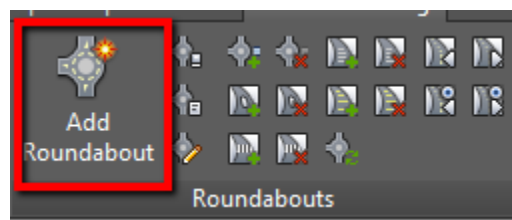
2. This will launch the Roundabout Standard Explorer. This looks and acts very similar to the swept path analysis tools. Select the FHWA 2010: Rural Single Lane from within the US Junction Design Standards options, and under the 2010 Guide.
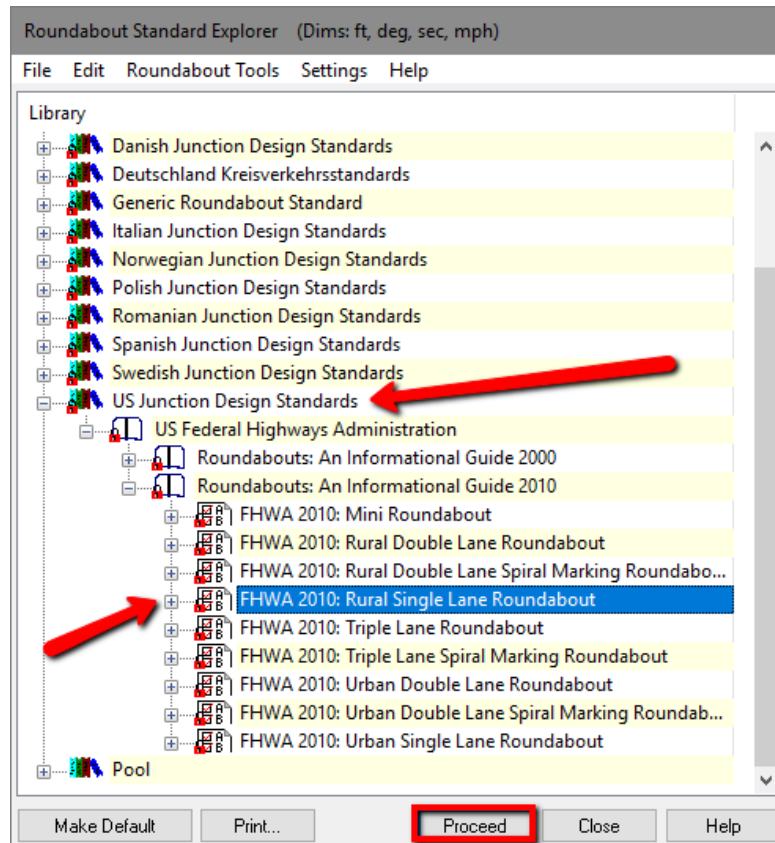
3. Select **PROCEED**. (Select YES if any error occurs)
4. From the Drawing Settings dialog box, select the **CORRIDOR** option, and turn on the following:

5. Select OK.
6. From the New Roundabout Details dialog box, change the parameters as shown below.
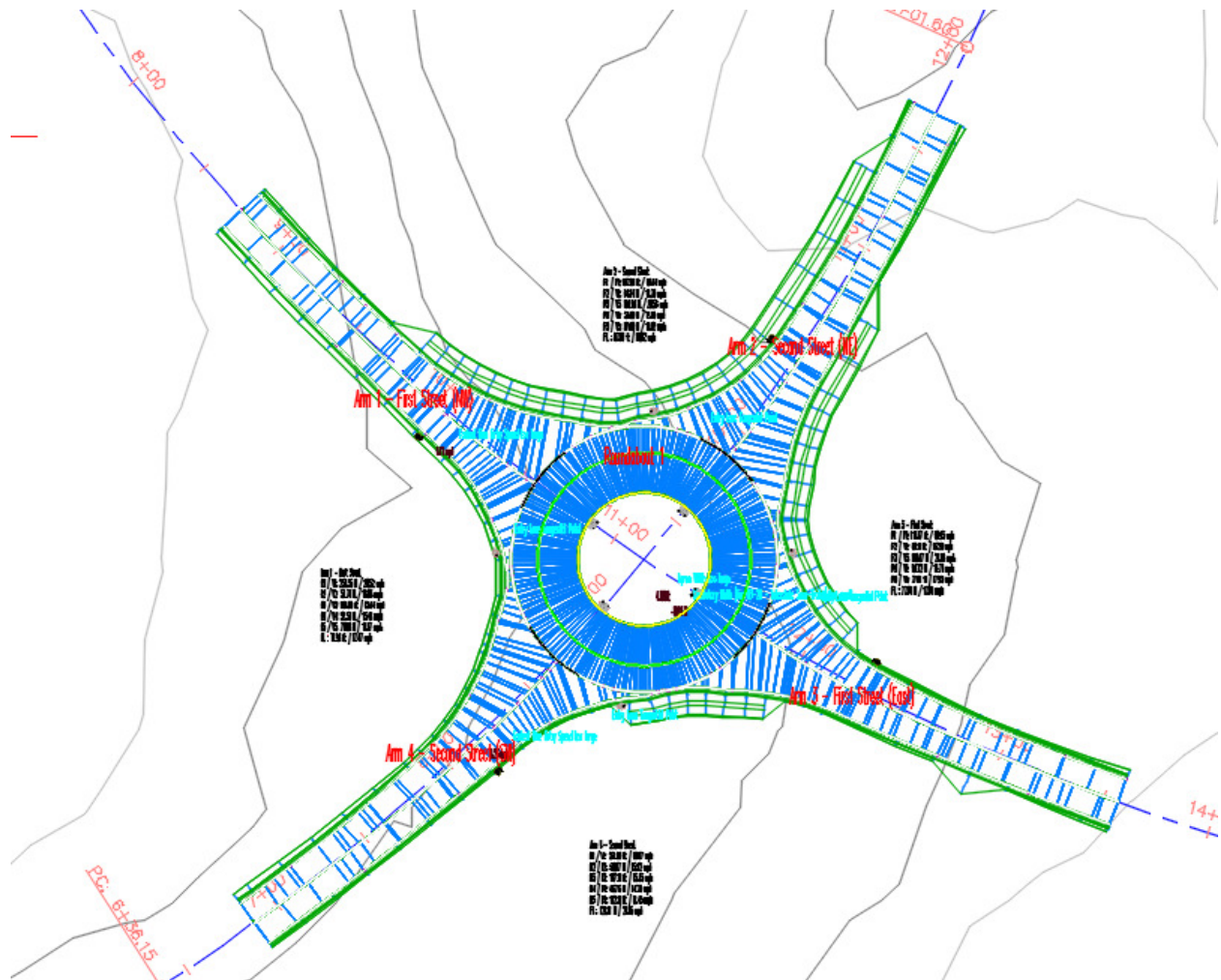
7. Select OK
8. Select the Intersection of the two alignments on screen.
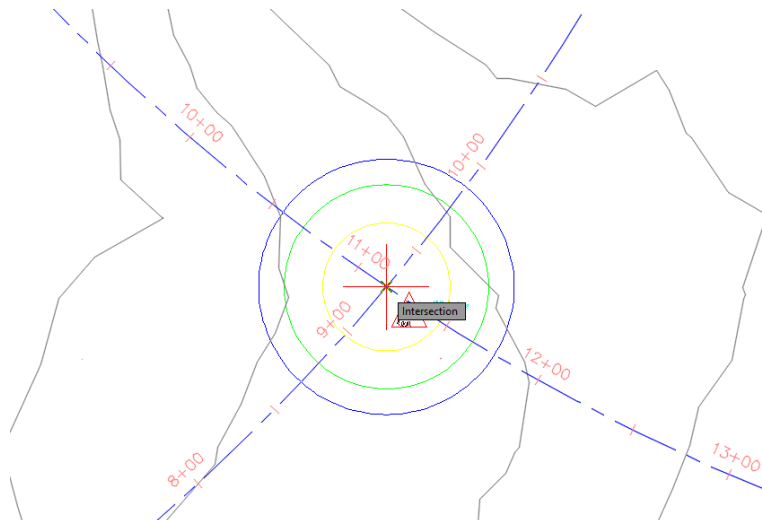
9. Select either alignment when prompted to define the centerline.
10. Select OK to accept the New Leg defaults.
11. Select additional legs of the alignment/roundabout as necessary.

12. Select OK when all 4 legs are in. Take a look at what has been created!!

I always appreciate the feedback and if you would like to know more, feel free to reach out to me by either method below.

Thank you!

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