

RadTeamSim.Route

User Manual

Software Version 1.3



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Introduction

RadTeamSim.Route is a science-based radiation contamination disaster simulation layered on the physical world. Users can enter coordinates for any location worldwide* on launch and load a simulation file set created by Radiation Emergency Services. This simulation file translates externally provided modeled radiological contamination into a format that can be used in RadTeamSim.Route. Users then can navigate through areas and receive their dose-rate readings and total dosimetry details upon simulation exit.

**Note: Tunnels are not yet supported.*

System Requirements

The requirements below are the minimum that will enable RadTeamSim.Route to run. However, there may be some lag experienced at these minimums while driving through the simulation.

Windows:

Operating system: Windows 7 (SP1+), Windows 10, and Windows 11

CPU: x86, x64 architecture with SSE2

Graphics: DX10, DX11, DX12 capable

RAM: 8GB

Storage: 2GB

Mac:

Operating system: High Sierra 10.13+

CPU: Apple Silicon, x64 architecture with SSE2

Graphics: Metal capable Intel and AMD GPUs

RAM: 8GB

Storage: 2GB

Regardless of system used (Windows or Mac), access to the internet is also required for the majority of functions in RadTeamSim.Route.

Prior To Start-Up: RadTeamSim.Route Simulation Files

Radiation Emergency Services can create RadTeamSim.Route formatted radiation simulation files upon request using files from the following sources:

1. A National Atmospheric Release Advisory Center (NARAC)¹ model run
2. A Radiological Assessment System for Consequence Analysis for radiological emergencies (RASCAL)² model run
3. A RadResponder simulation file
4. Additional atmospheric models may also be used, but we must first test them to confirm that the model outputs can be converted to the format required for importing into RadTeamSim.Route. Contact us to discuss these options further if desired.

There are also several sample simulation file sets available for no cost. Contact us through the RadTeamSim.Route user page for access to these files and pricing and parameters for obtaining custom simulation files:

<https://www.radiationemergencyservices.com/radteamsim-route-user-materials>

¹ <https://narac.llnl.gov/>

² <https://ramp.nrc-gateway.gov/codes/rascal>

Start-Up

RadTeamSim.Route was designed to enable flexibility on all parameters. Users can enter a starting location in GPS coordinates (decimal degrees) anywhere in the world. The only other requirement is to provide the file path to the RadTeamSim.Route Simulation file set.

The screenshot shows the RadTeamSim.Route Load Menu interface. At the top left is a logo for 'RADIATION EMERGENCY SERVICES'. The title 'RadTeamSim.Route' is centered at the top. To the right of the title are three links: 'Privacy Policy', 'EULA', and 'Tutorial'. The interface is divided into three main sections: 'Radiation Readings', 'Desired Load Parameters', and 'Graphic Rendering Preferences'. The 'Radiation Readings' section has a 'Enter Folder Path:' label and a button with a cloud icon and the text 'Drag your folder here or enter path manually'. Below this is a 'Route Point of Interest Markers' section with a 'Load POIs' button. The 'Desired Load Parameters' section has a 'Enter Starting Location Coordinates:' label and a text input field. Below this is a 'Select Desired Unit Set for Speed and Distance:' label and a dropdown menu currently set to 'MPH / Miles'. There are also date and time pickers for 'Enter Date' (02, 11, 2023) and 'Enter Time' (10, 15, 41). The 'Graphic Rendering Preferences' section has four dropdown menus: 'Terrain Type' (Detailed), 'Foliage Density' (Medium), 'Foliage Type' (Detailed), and 'Building Type' (Venice). At the bottom is a large blue 'LAUNCH PROGRAM' button. In the bottom right corner, there is a link: 'Click To Access Online RadTeamSim.Route User Materials'.

Figure 1. RadTeamSim.Route Load Menu

Upon launching the program, users will be provided a menu to select all desired and required settings:

Required Entries

RadTeamSim.Route will not launch without the required entries listed in this section.

Required Field 1: Radiation Readings Set Up

1. The Simulation file set must be in the distinct folder as provided by Radiation Emergency Services
2. It must be unzipped and moved out the download folder
3. The entire file path must be entered manually, or it can be dragged-and-dropped

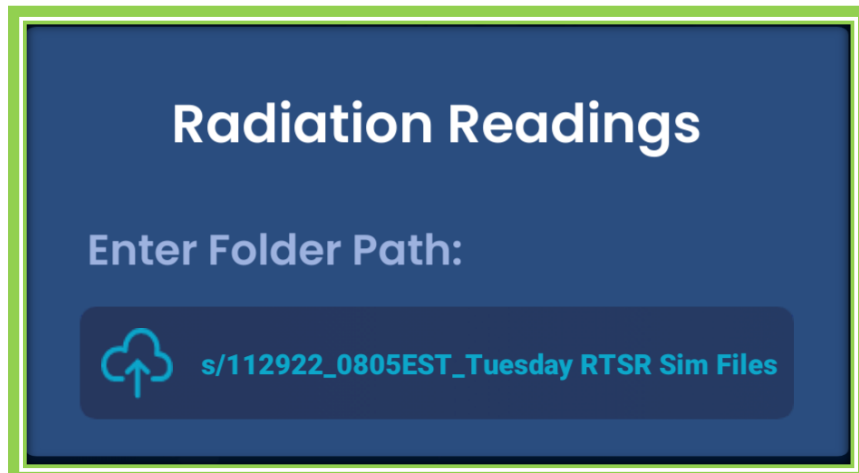


Figure 2. RadTeamSim.Route Simulation File Loading

Required Field 2: Enter Starting Location Coordinates

1. Coordinates for where the desired starting location is in RadTeamSim.Route must be entered.
2. The coordinates must be in decimal degrees.
3. Coordinates must be separated by a comma.
4. The format is: "latitude, longitude". For example:

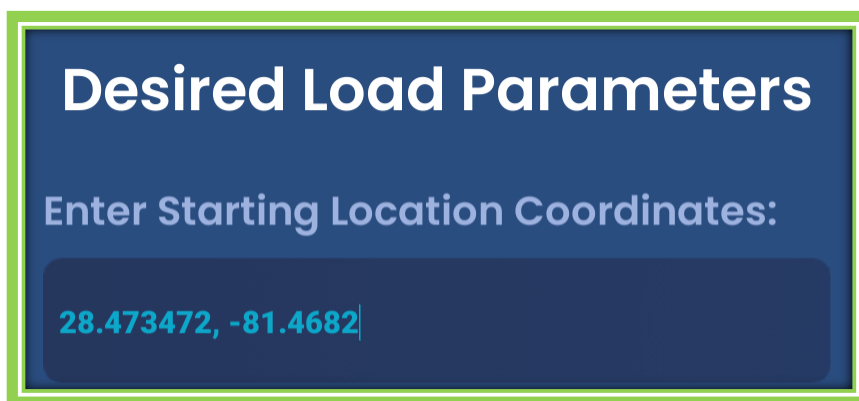


Figure 3. Example of Starting Location Coordinates for RadTeamSim.Route

Optional Entries

Optional Field 1: Route Points of Interest (POIs)

Note: A template .CSV file for POIs can also be downloaded at:

<https://www.radiationemergencyservices.com/radteamsim-route-user-materials>

1. If desired, a separate file can be loaded to indicate monitoring points visually while navigating in RadTeamSim.Route. Users will still need to navigate to the locations, but this provides an additional visual aid on the display.
2. There are two options provided for colors.

- a. Monitoring Point: Displays a green orb and label at desired locations

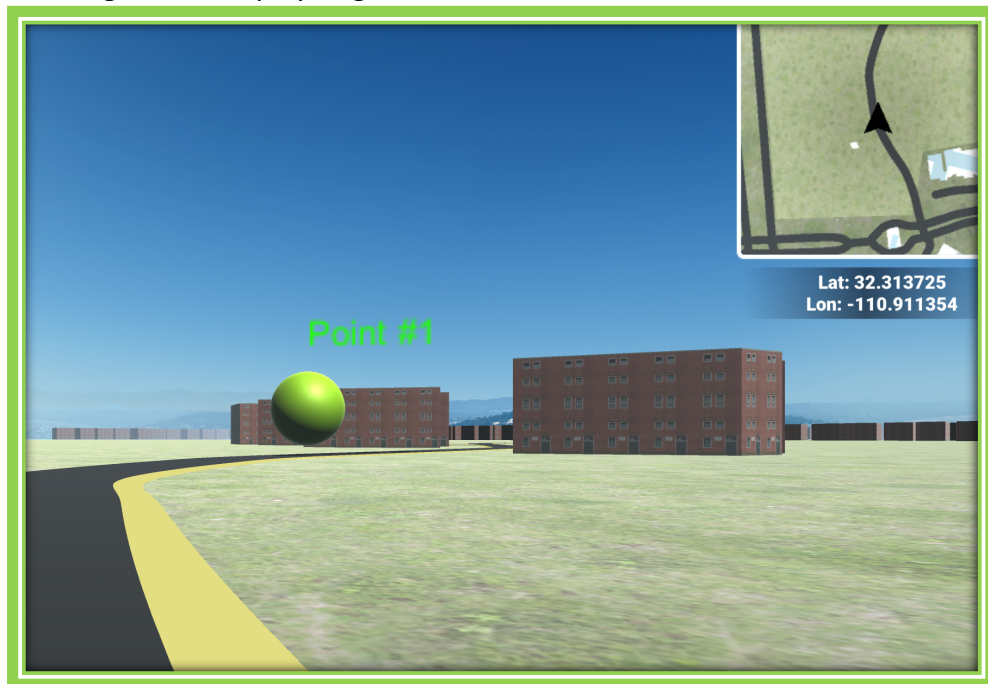


Figure 4. Example of Optional Monitoring Point POIs in RadTeamSim.Route

- b. Turn: Displays a blue orb and label at desired locations

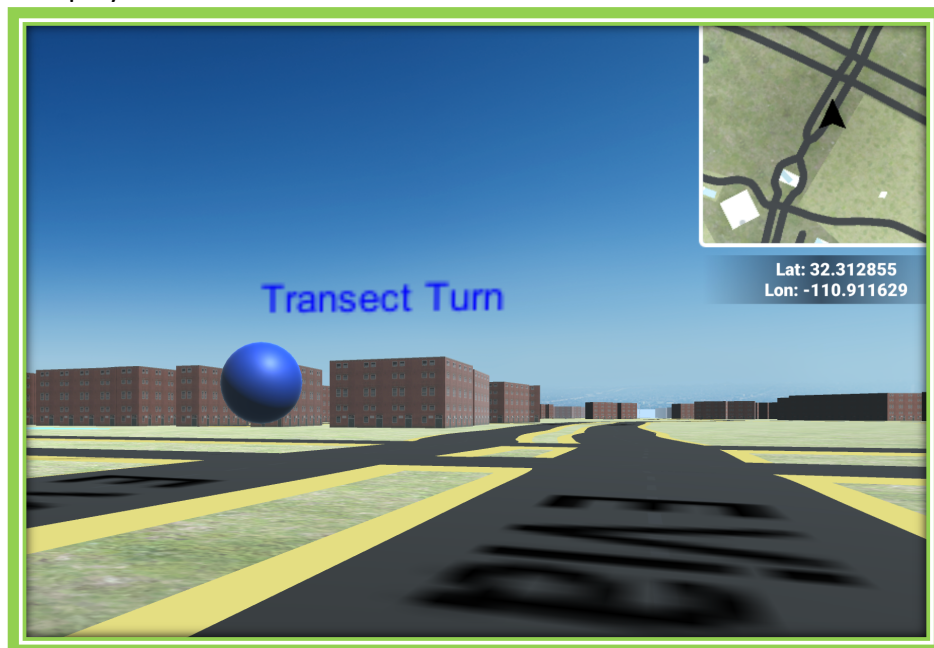


Figure 5. Example of Optional Turning Point POIs in RadTeamSim.Route

3. In order to display the POIs in RadTeamSim.Route, a CSV of the following format must be loaded:
- a. Column A: Latitude (decimal degrees)
 - b. Column B: Longitude (decimal degrees)
 - c. Column C: Type

- i. M = Monitoring Point
- ii. T = Turn
- d. Column D: Label (free form text)

	A	B	C	D
1	Latitude	Longitude	Type	Label
2	32.314014	-110.9114	M	Point #1
3	32.3164803	-110.90557	M	Point #2
4	32.3210631	-110.89624	M	Point #3
5	32.3253483	-110.88708	M	Point #4
6	32.329701	-110.8778	M	Point #5
7	32.3319892	-110.86812	M	Point #6
8	32.3341699	-110.8944	M	Point #7
9	32.3345325	-110.88139	M	Point #8
10	32.3152146	-110.88439	M	Point #9
11	32.3170274	-110.86549	M	Point #10
12	32.312688	-110.91185	T	Transect Turn
13				

Figure 6. Example of CSV File format required for loading optional POIs into RadTeamSim.Route

4. In the same manner as loading the radiation readings were obtained, the POI File path also must be entered into the menu. The path must be to the file directly or if in a folder, it must be the only POI file in that folder!

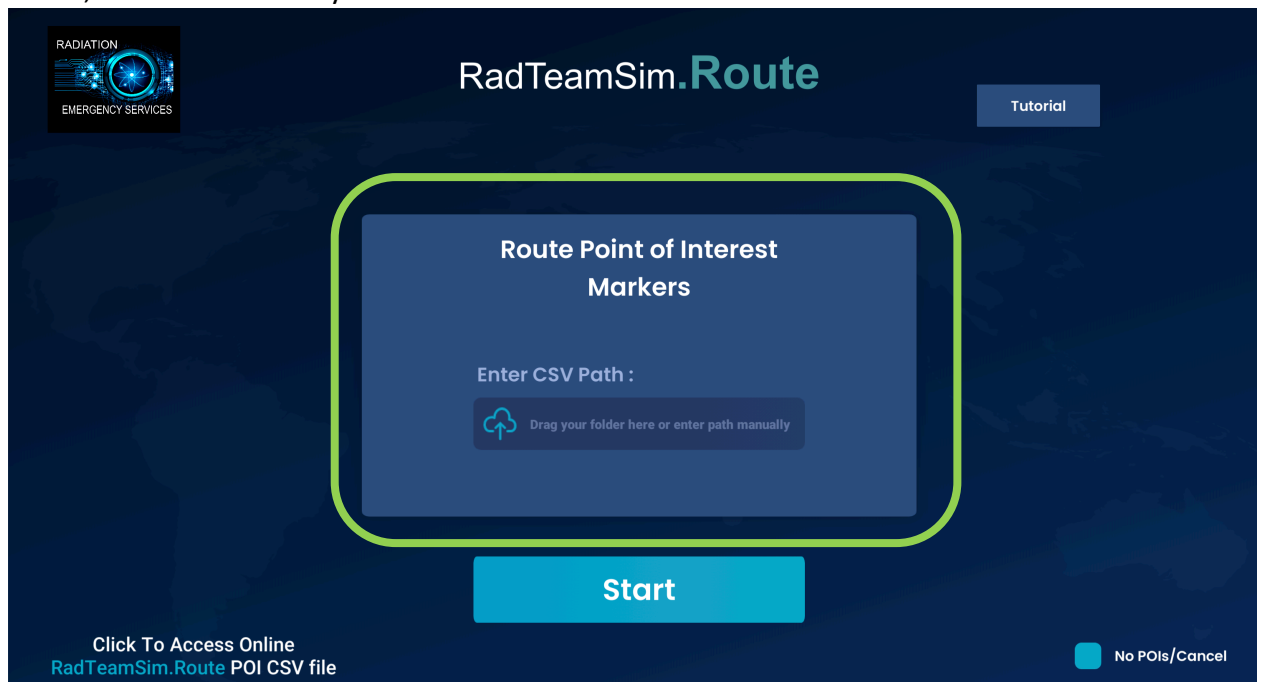


Figure 7. Screenshot of where the Route POI CSV file path must be placed on the load screen

5. Mac Example file path:

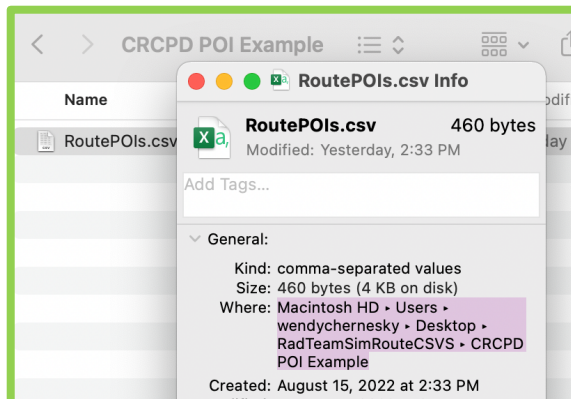


Figure 8. Mac example of correct POI file path for use in RadTeamSim.Route

6. Windows Example file path:

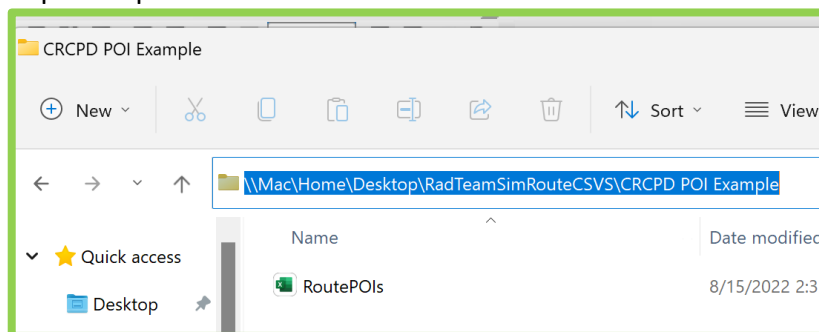


Figure 9. Windows example of correct POI file path for use in RadTeamSim.Route

Optional Field 2: Select Desired Unit Set for Speed and Distance

1. Users can opt to have the units displayed while driving in Miles Per Hour (MPH) or Kilometers Per Hour (KPH).
2. The navigation distances displayed will also be updated based on this preference to miles or kilometers.



Figure 10. Example of speed and distance menu options for RadTeamSim.Route

Optional Field 3: Graphic Rendering Preferences

While the roads and building locations match physical reality, the building types, trees, and terrain are not automatically rendered to provide identical visuals. However, RadTeamSim.Route provides users many options to fine tune the graphics as desired. With the appropriate combination of selections, many types of geographies can be closely matching the physical world as shown in the example below:

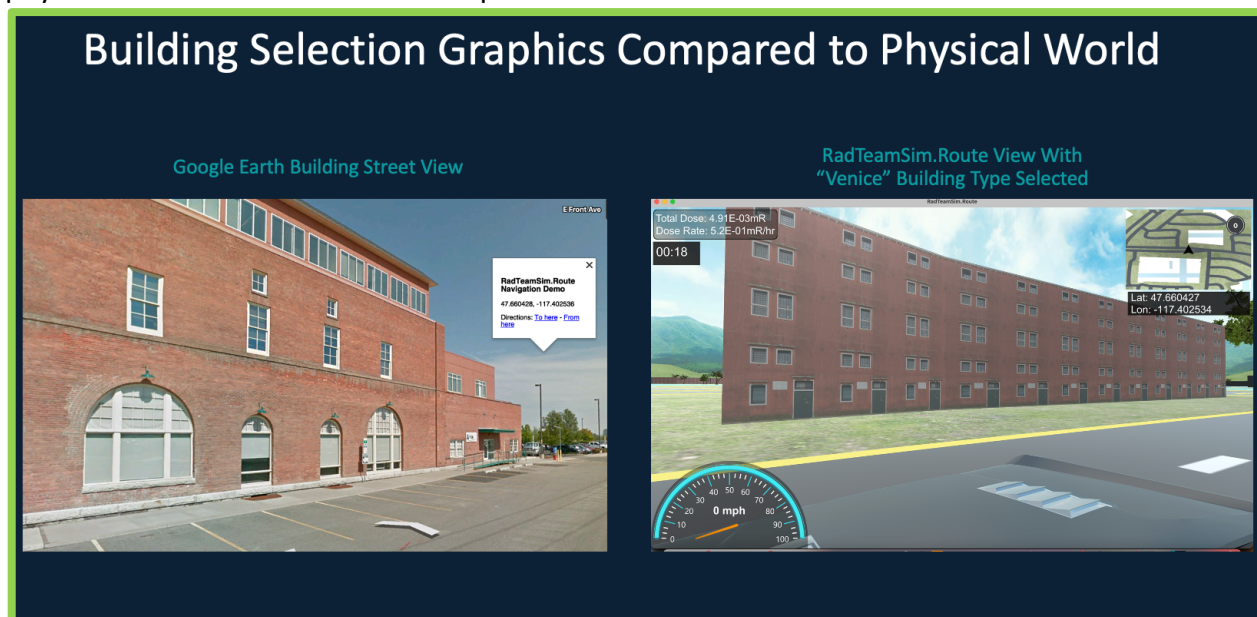


Figure 11. Example of customizing graphics in RadTeamSim.Route to closely reflect reality

Terrain Types

RadTeamSim.Route has nine different options for the terrain:

1. **Detailed:** This is the most visually developed terrain option available. It also has the most grass and rolling hills in the background of any options.
2. **Snowy:** Builds on the detailed terrain but also adds snow to the mountains and the ground.
3. **Desert:** Provides a darker sky setting and rolling brown mountains in the skybox.
4. **Rocky:** Displays red and brown rocky mountains in the background.
5. **Arizona:** Displays brown mesa mountains in the background.
6. **Night: Large City:** A large city skyline is shown in the distance along with darker/nighttime lighting surrounding the vehicle.
7. **Night: Sky Only:** A starry skyline is shown in the distance along with darker/nighttime lighting surrounding the vehicle.
8. **Day: Large City:** Depending on direction, either a large city skyline or rolling hills is in the distance.
9. **Cartoonistic:** The entire terrain is rendered in cartoon graphics.



Figure 12. Terrain options in RadTeamSim.Route

Foliage Density

1. The foliage density can be modified for all types of foliage.
2. Note, this setting only applies the density settings to areas categorized as parks and outdoor preserves.

3. Foliage density settings will not impact the density inside of areas categorized by the mapping software as “city” or lacking in category. This most frequently occurs with rural areas.

Foliage Types

RadTeamSim.Route has five options for the visuals on the foliage:

1. **Detailed:** This is the most visually developed tree option available. The trees are of several types that are green, and full of leaves.
2. **Desert:** Displays cacti for all trees.
3. **Cartoonistic:** All foliage is displayed in cartoon graphics.
4. **Snowy:** Adds snow on top of the detailed tree type.
5. **Off:** Turns off the foliage

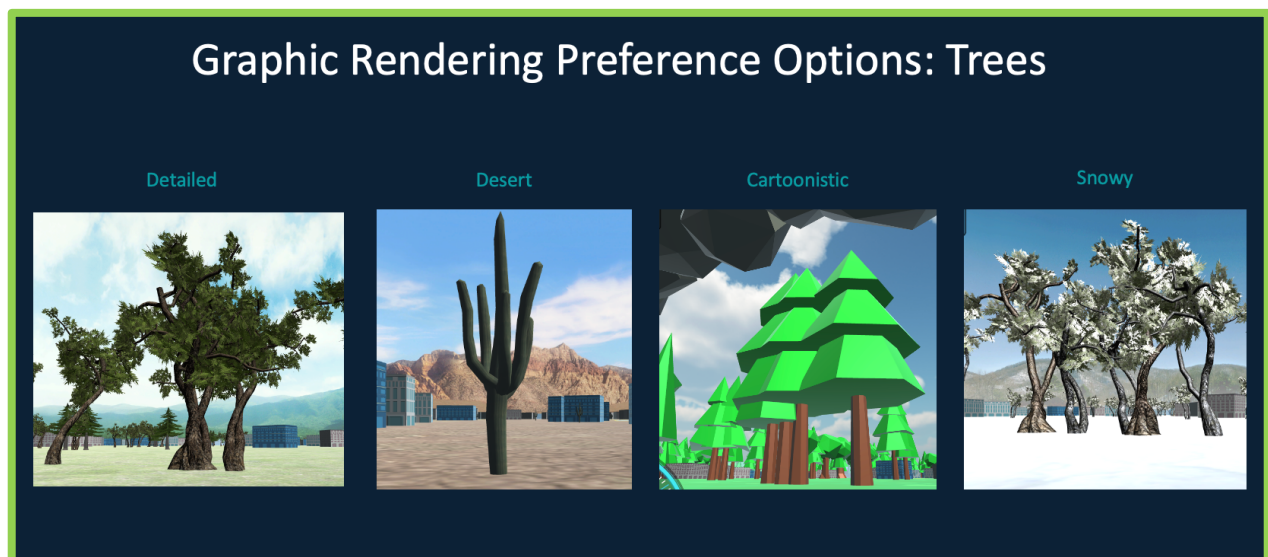


Figure 13. Foliage Options in RadTeamSim.Route

Building Types

RadTeamSim.Route has five options for the visual graphics shown on the buildings. The buildings that appear in the program are based on the underlying map database, and therefore match reality in terms of GPS location. However, the system does not have the metadata to style them to match reality. These options provide users some control over the display of buildings that are rendered:

1. **Stylish**
2. **Venice**
3. **Wood**
4. **Classical**
5. **18th Century**

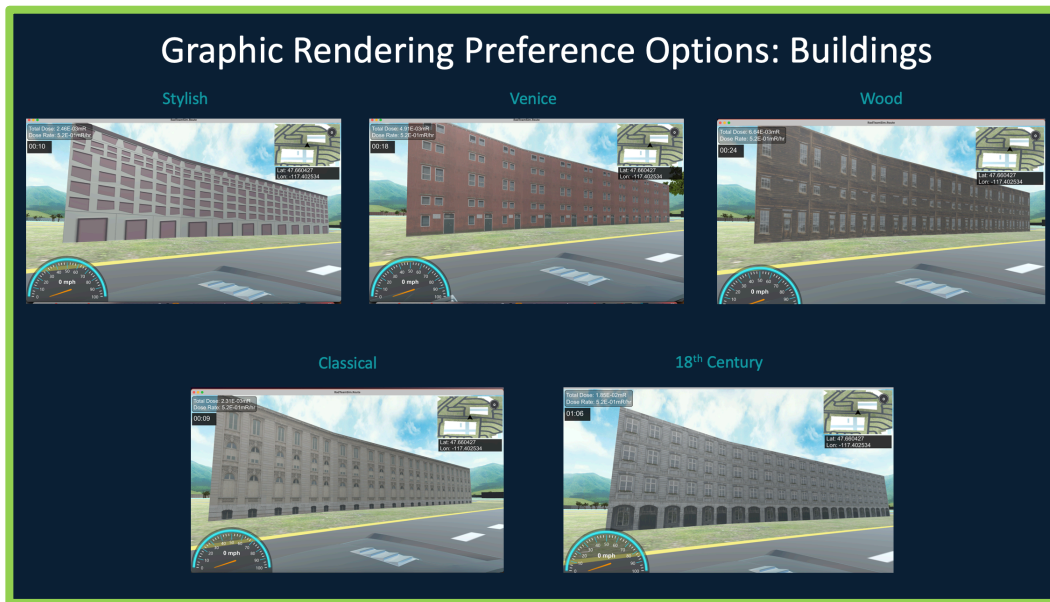


Figure 14. Building texturing options in RadTeamSim.Route

Operation

Upon clicking on the “Launch Program”, RadTeamSim.Route will load the program settings as specified on the menu. The system will begin immediately tracking:

1. Time in the program (in seconds)
2. GPS coordinates for each second
3. Dose rate at the user’s location
4. Total dose accrued

Upon exiting via the menu and selecting “Exit Simulation”, a CSV file will be generated in the same folder/location where RadTeamSim.Route is placed. For example, if RadTeamSim.Route is on your desktop, the Route Report will be placed there by the system. This CSV file will contain all of the tracking information for that simulation timeframe.

Driving the vehicle

1. The vehicle in RadTeamSim.Route can be operated on a traditional computer console using the keypad, as well as with a controller or a racing wheel.
2. For controllers and racing wheels, it is recommended that users map their keys to the desired functions, as they have not been pre-built into version 1.0.

Camera View Options

1. There are several camera views, that can be cycled through by pressing the “C” button on the user’s keyboard.
2. The mouse also functions to “pan” the camera view around the vehicle.

Behind the vehicle view:



Figure 15. Behind the vehicle view in RadTeamSim.Route

Inside of the vehicle view:



Figure 16. Inside of the vehicle view in RadTeamSim.Route

Beside the vehicle view:



Figure 17. Beside the vehicle view in RadTeamSim.Route

Main Display (Plus Version):

The display shown below is for the plus version of RadTeamSim.Route. However, the only difference between the basic and plus version on this display is the dosimeter.

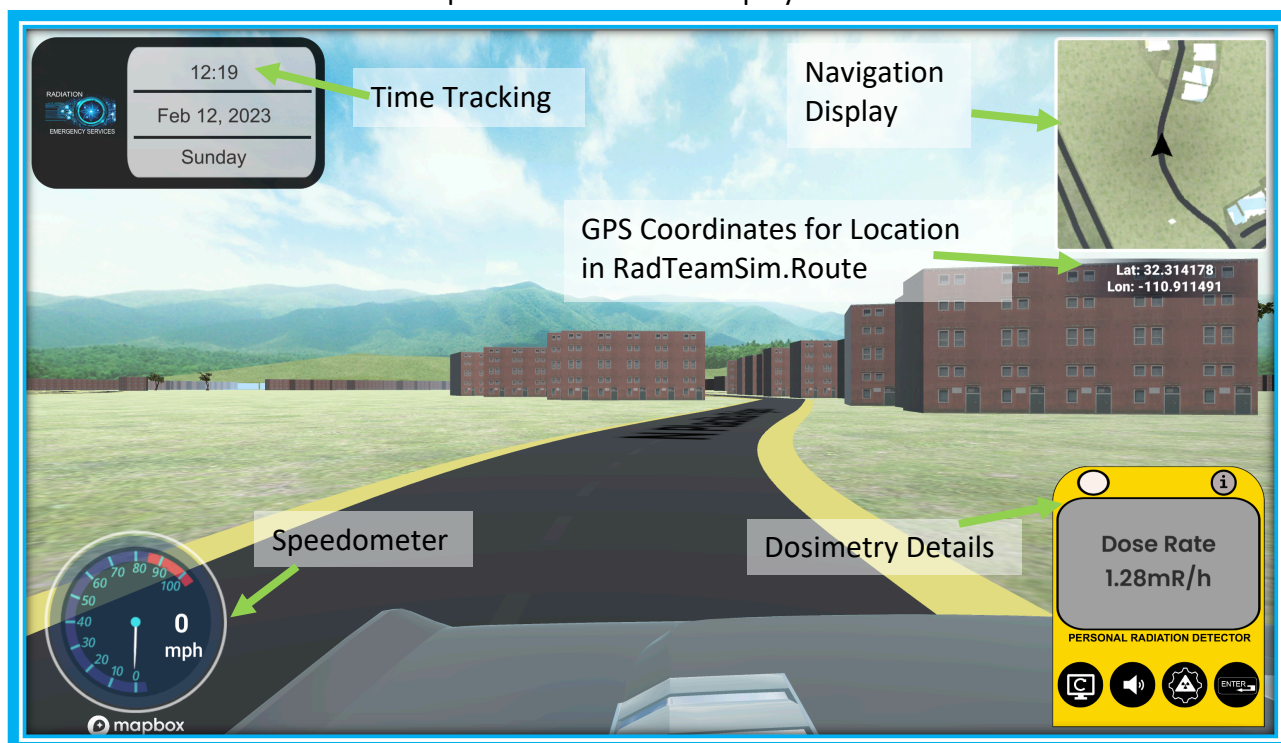


Figure 18. Main display in RadTeamSim.Route (Plus Version)

Accessing the Main Menu

RadTeamSim.Route launches in the Main Menu. Users can press the “ESCAPE” key on the keyboard to access the main menu and to return to the simulation. This also pauses RadTeamSim.Route. From the main menu, users can access:

1. Navigation functions (plus version only)
2. Exit of simulation
3. Car controls instructions for use with a keyboard

Main Menu/Pause

1. Pressing the ESCAPE key on the keyboard pauses RadTeamSim.Route as well as displays the main menu.
2. Available options in the Main menu include:
 - a. Keyboard Controls: Displays the keyboard options for use in RadTeamSim.Route
 - b. Complete Mission: Exits the program and generates the Route Report. This option MUST be used to obtain the Route Report CSV file.
 - c. Navigation Menu (Plus version only): Allows users the option to enter coordinates of destinations and provides turn-by-turn navigation for use in routing.
 - d. Silence/Play Vehicle Engine Sound: Allows users to silence the vehicle’s engine while using RadTeamSim.Route.

Note: The jeep also has an occasional backfire sound that was that does not silence at this time. Future Versions will explore how to completely silence the vehicle.

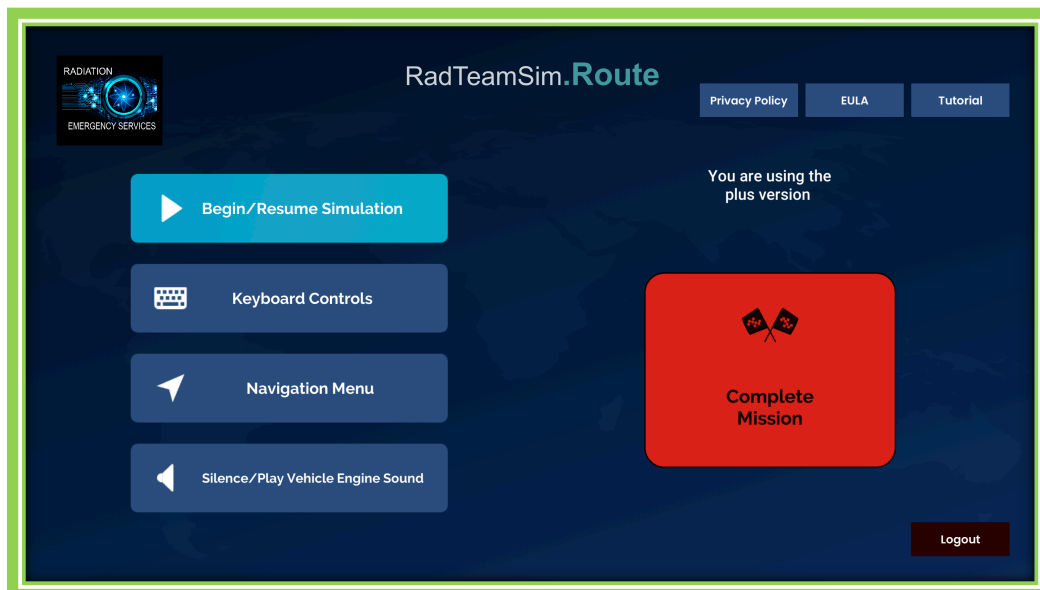


Figure 19. Main menu in RadTeamSim.Route

Keyboard Controls

The car controls option on the menu is specific to the keyboard function for driving and changing the camera views. For use with a racing wheel or controller, these functions would need to be mapped by the user for RadTeamSim.Route Version 1.0.

Keyboard Key	Function
C	Change the camera view
Esc	Pause/un-pause and access the Main Menu
Tab	Display/Hide the dose rate readings
Right Arrow →	Right turn
D	Right turn
Left Arrow ←	Left turn
A	Left turn
Up Arrow ↑	Forward
W	Forward
Down Arrow ↓	Backward/Break
S	Backward/Break

Figure 20. Keyboard controls display in RadTeamSim.Route

Dosimeter Functions

The dosimeter can be toggled on and off by pressing the “Tab” key on the keyboard. The system will continue to track the dose rate and total dose, but the display can be hidden.

Dosimeter Not Displayed:



Figure 22. Dosimetry not displayed in RadTeamSim.Route

Dosimeter Displayed (Plus version):



Figure 21. Dosimetry displayed in RadTeamSim.Route

Basic Version Dosimetry Functions

The basic version of RadTeamSim.Route includes a dosimeter that displays the current dose rate or the total dose received in the field team mission. Users can rotate between these views by clicking on the **rotate display button**.

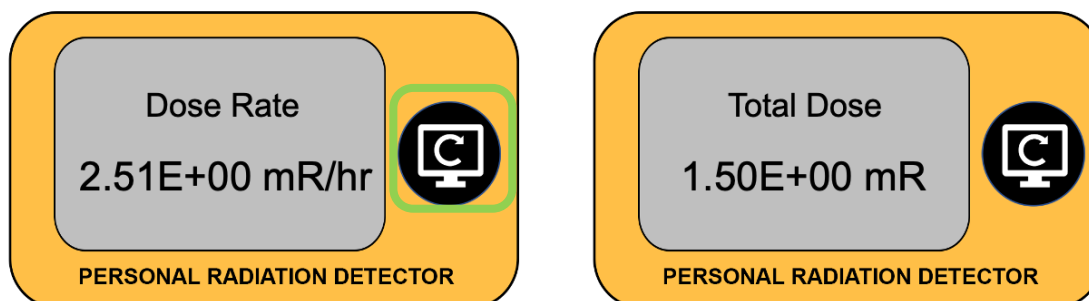


Figure 23. Basic version dosimeter display options

Plus Version Dosimetry Functions

Users that have purchased the subscription to RadTeamSim.Route have a functional dosimeter that supports dose rate and total dose alarm settings.

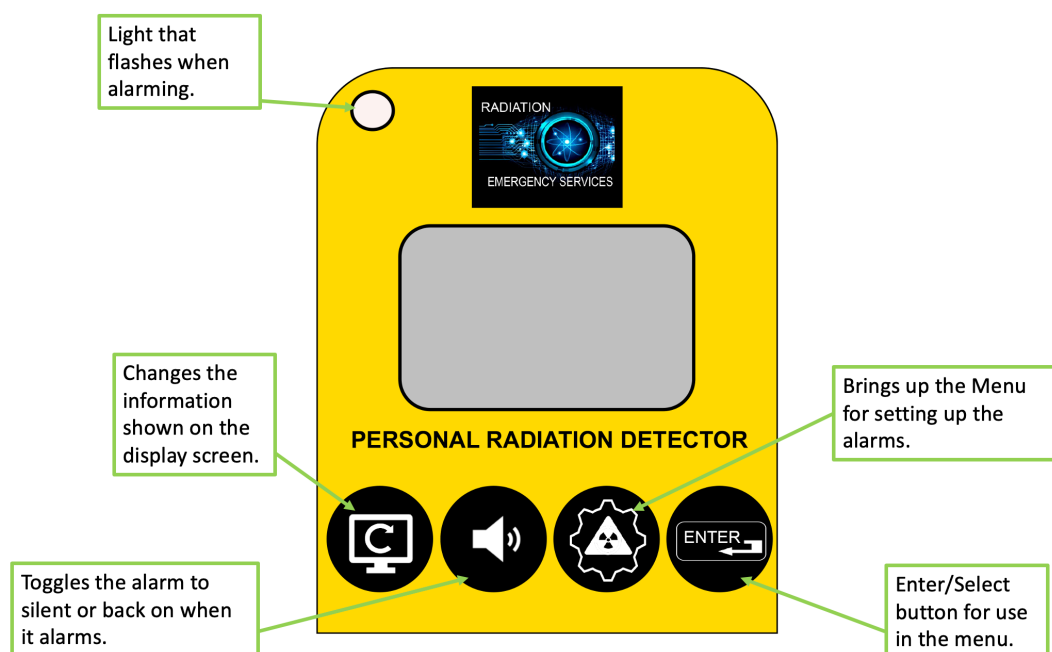


Figure 24. Plus Version Dosimeter Buttons

Plus Version Dosimeter Display Options:

Users can cycle between options by clicking on the **rotate display button**. There are three options for displaying dosimetry information:

1. Total dose received
2. Dose rate
3. Remaining dose (if the user has set up the total dose alarm function)



Figure 25. Plus Version Dosimeter Display Options

Plus Version Dosimeter Alarm Menus

Users can click the **setting button** to access the dose rate and total dose alarm menus. Once the desired menu type is displayed, users will click the **enter button**.

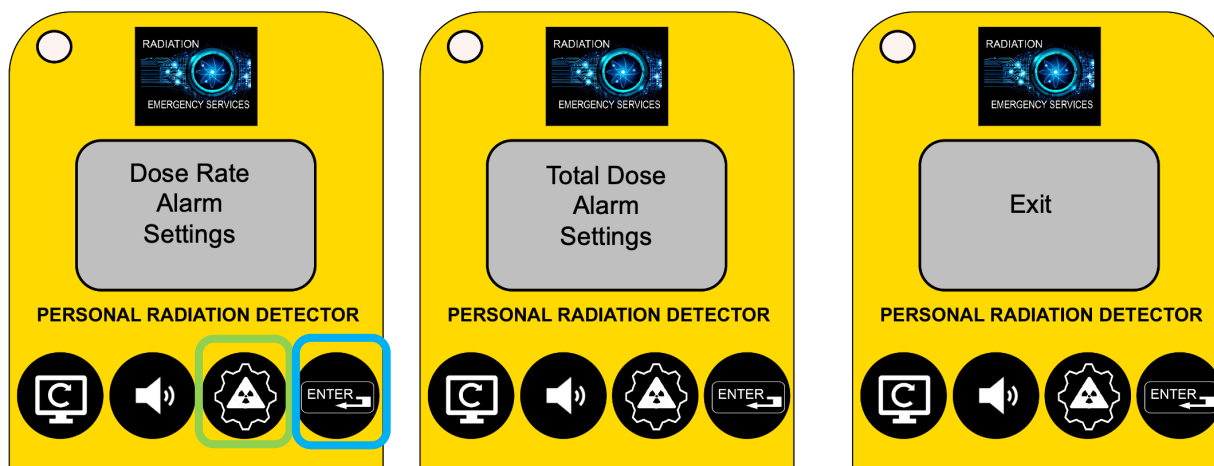


Figure 26. Plus Version Alarm Menus

Dose Rate Threshold Settings

Users can set up dose rate alarms for both a high and a low level. Once the desired dose rate value and unit are selected, users will click the **enter button** to accept the settings.

- The unit options available are uR/hr, mR/hr, and R/hr
- When the low dose rate threshold is exceeded: The red light will flash, and the alarm will sound slowly.
- When the high dose rate threshold is exceeded: The red light will flash, and the alarm will sound rapidly.

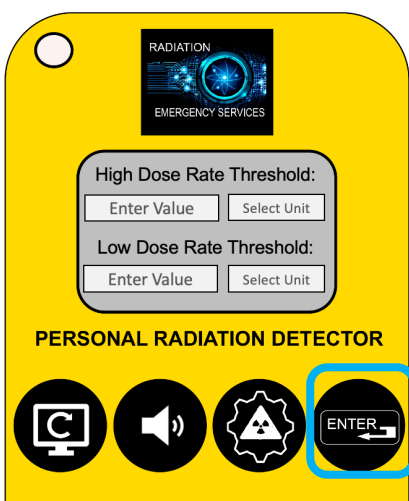


Figure 27. Dose rate threshold settings

Total Dose Threshold Settings

Users can define a total dose in units of R, mR, or uR for their field team. Once the desired value and unit are selected; users will click the **enter button** to accept the setting. When the total dose threshold is exceeded, the light will flash in orange and the alarm will sound.

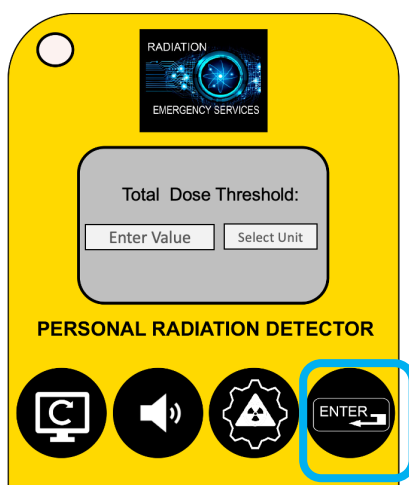


Figure 28. Plus version total dose alarm settings

Warning of Leaving Radiation Simulation Field Display

Should users leave the area in which radiation simulated values are available, a warning will appear.



Figure 29. Warning in RadTeamSim.Route when user has left area supported with radiation readings

- RadTeamSim.Route can still be used for driving in regions with no simulated values, but no additional dose will be tracked until they return to an area in which readings are available.
- The dose rate will display the last dose that was shown without updating again until the user returns to a region with values.
- The most likely event in which this would occur is when using navigation functions near the edge of the radiation simulation regions.
- Another example of when this may occur is if a user is testing it for a location that has no radiation simulation file was created (and instead used one for another location, for example using the NREP file set, which was created for Nashville, TN, and launching the program in Las Vegas, NV).

Navigation Menu (Plus Version Only)

Users that purchase a RadTeamSim.Route subscription will have access to a fully functioning navigation system that is similar to most physical world systems.

1. Click the “Navigation Menu” button to access the navigation functions.

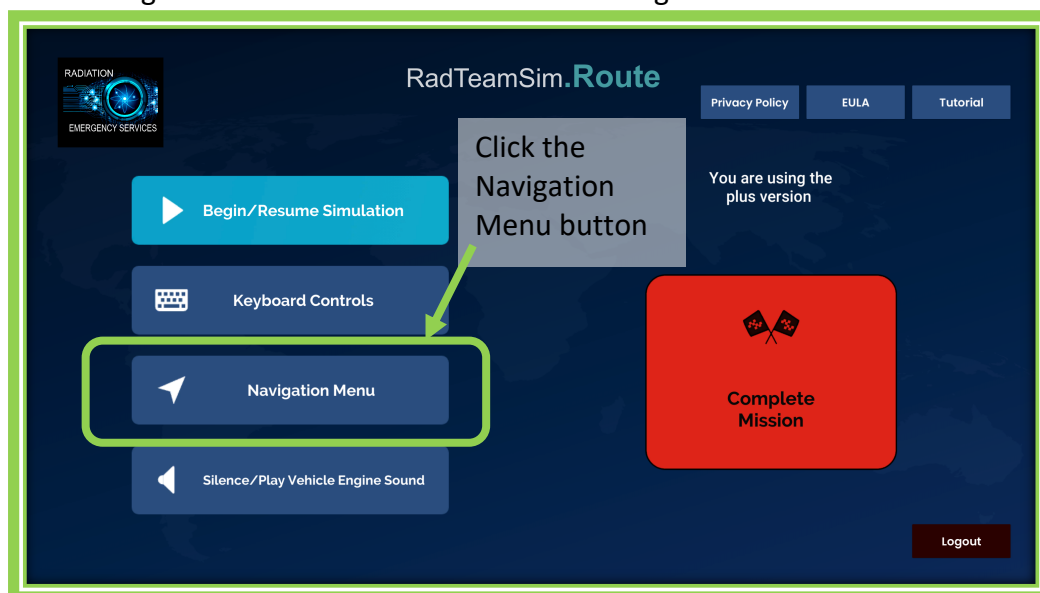


Figure 30. Accessing the Navigation Menu from the Main Menu

2. The Navigation: Destination Menu will appear if no routing is already underway.
3. Type in the GPS coordinates in decimal degrees of the destination
4. Click the go button

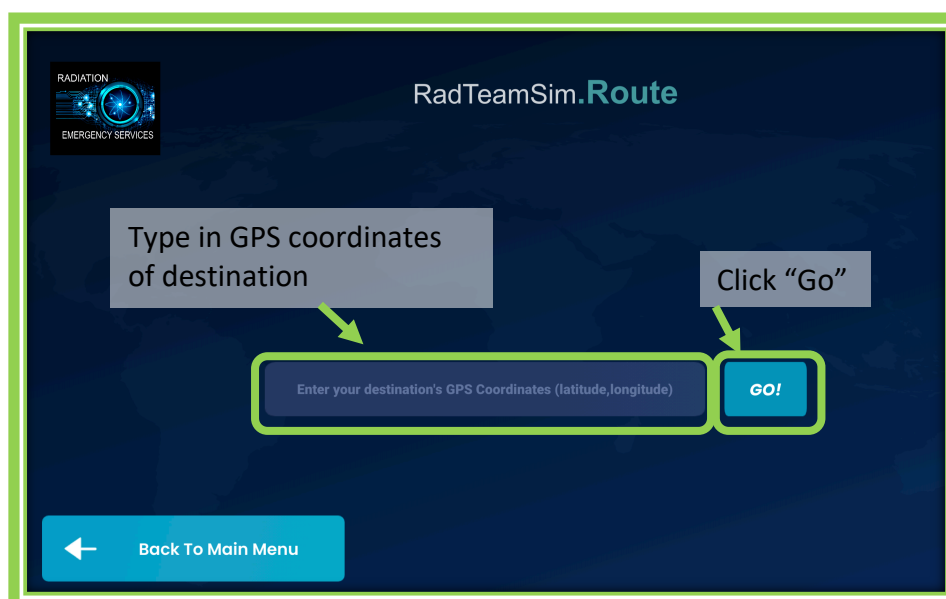


Figure 31. Entering desired destination coordinates into the navigation menu

- RadTeamSim.Route will provide routing details and turn-by-turn navigation to guide the user

Navigation Initial Display:

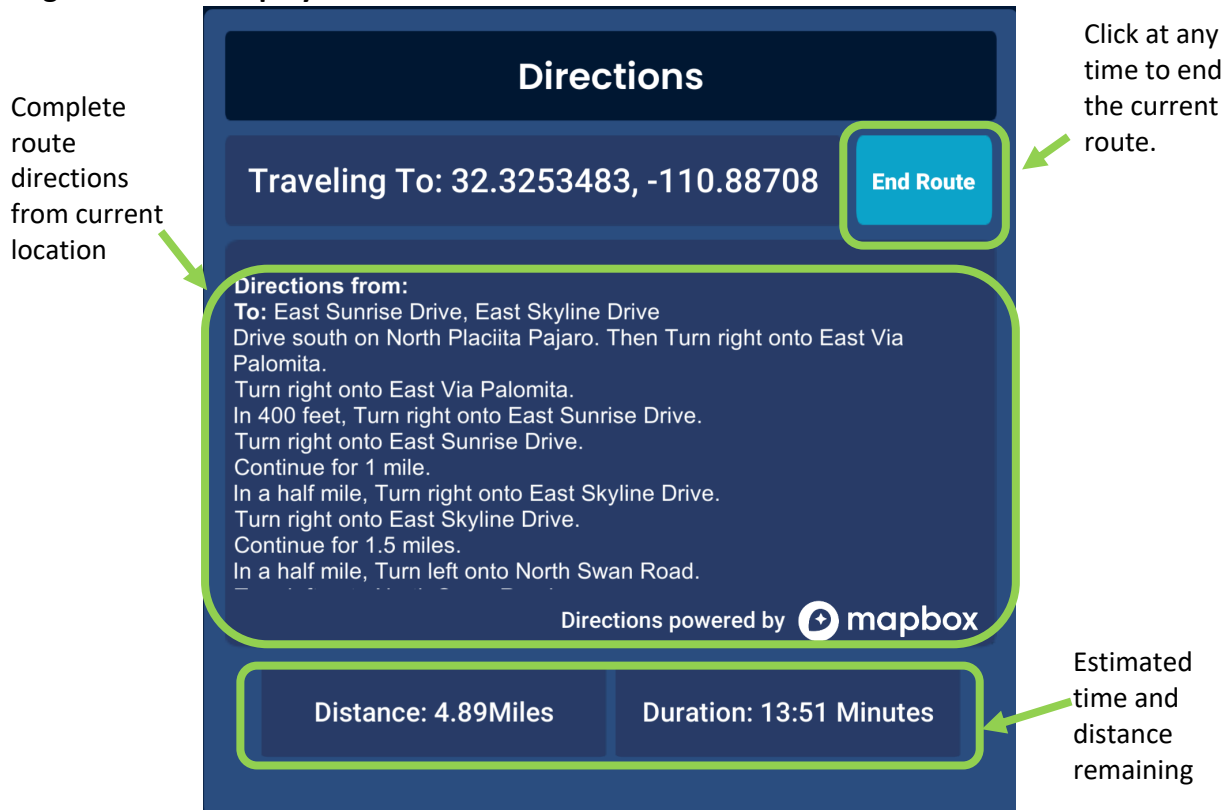


Figure 32. Initial navigation display after entering destination into RadTeamSim.Route

Navigation Driving Display:

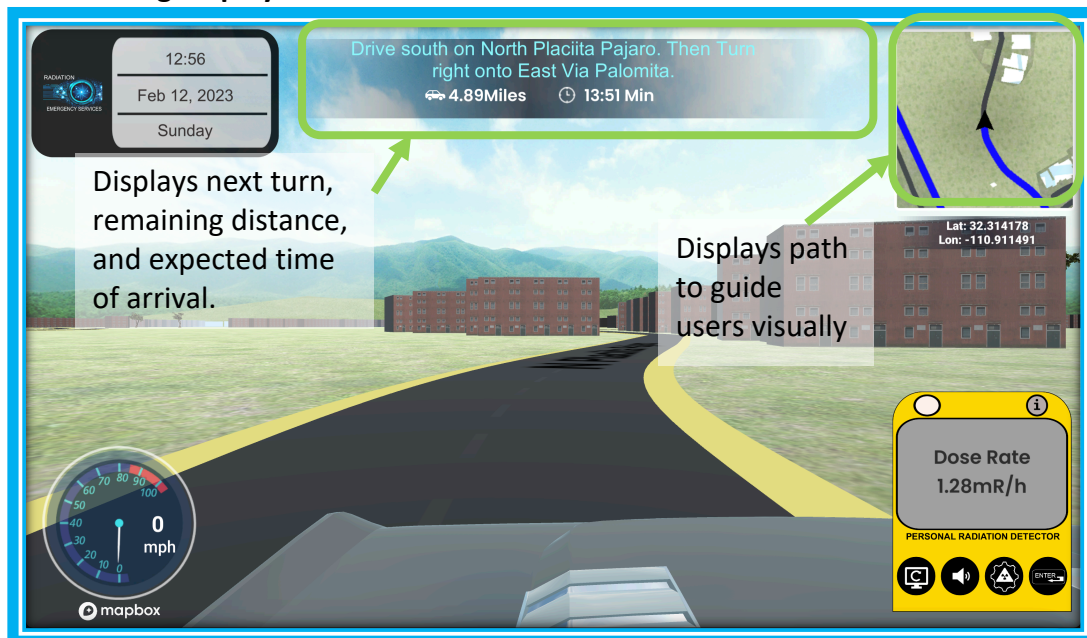


Figure 33. Navigation display while driving in RadTeamSim.Route

Simulation Exit

To exit RadTeamSim.Route, users must:

1. Navigate to the Main Menu (via the ESCAPE key) and select “Complete Mission”.



Figure 34. Complete Mission button used to end the team's activity

2. Click on the “Exit Simulation” button that is displayed along with the total dose that was accrued.

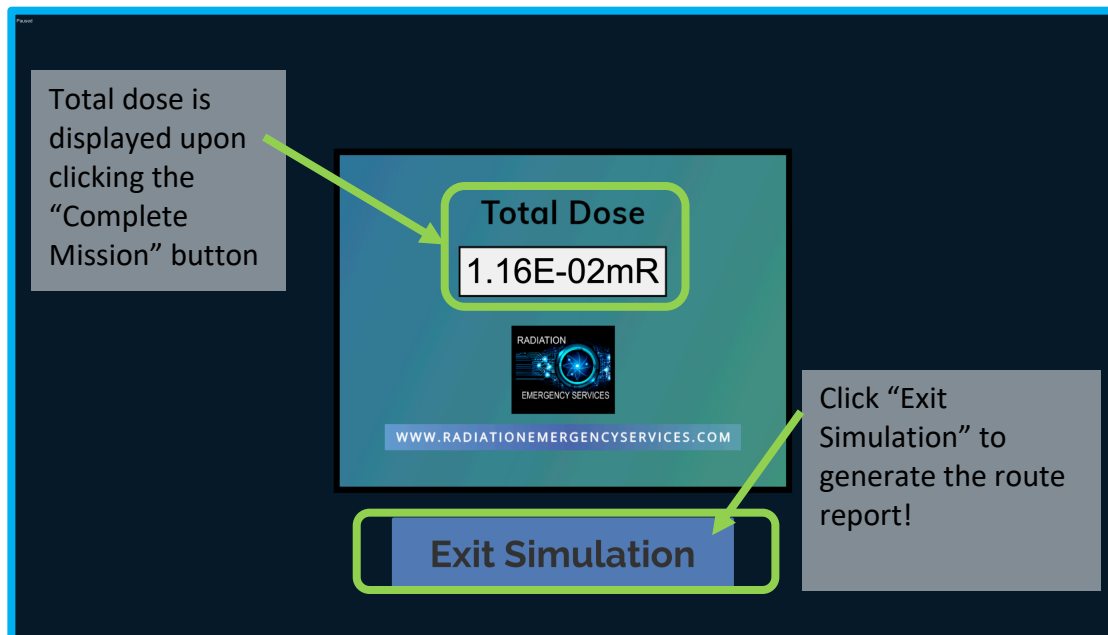


Figure 35. Exit simulation button that must be used for generating the "route report".

3. If desired, users can obtain the route report that is generated upon exiting RadTeamSim.Route.
4. The report contains tracking for the duration of the mission.
5. The report can be found by navigating to the exact same location that RadTeamSim.Route is installed. For example, here, RadTeamSim.Route is saved to the desktop, so that is where the route report will appear.
6. RadTeamSim.Route cannot be saved to the “downloads folder” and generate a route report. It must be saved in another location on the hard drive to generate the route report.

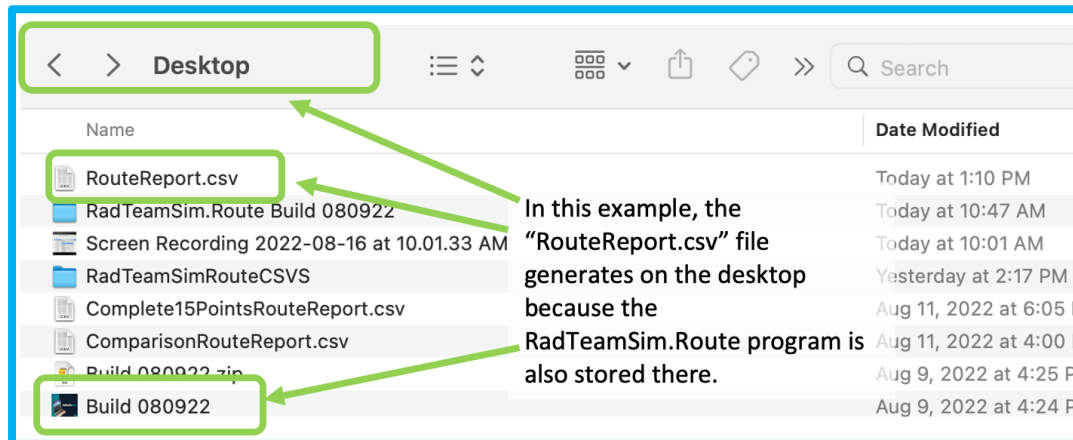


Figure 36. Example of how to locate Route Report CSV file

7. When opened, the CSV will provide second-by-second (and in some cases, multiple readings in a single second) tracking of the user’s time in RadTeamSim.Route from “Launch” to “Simulation exit”. Included details are:
 - Latitude
 - Longitude
 - Date/Time in RadTeamSim.Route (MM/DD/YY HH:MM:SS)
 - i. Note the display initially will only show up to the minutes on each cell unless it is clicked on directly.
 - ii. This can be updated if desired to show the seconds at a glance. This is useful if any dose reconstruction is desired beyond the display generated on simulation exit.
 - Dose rate at the location
 - Dose rate unit at the location

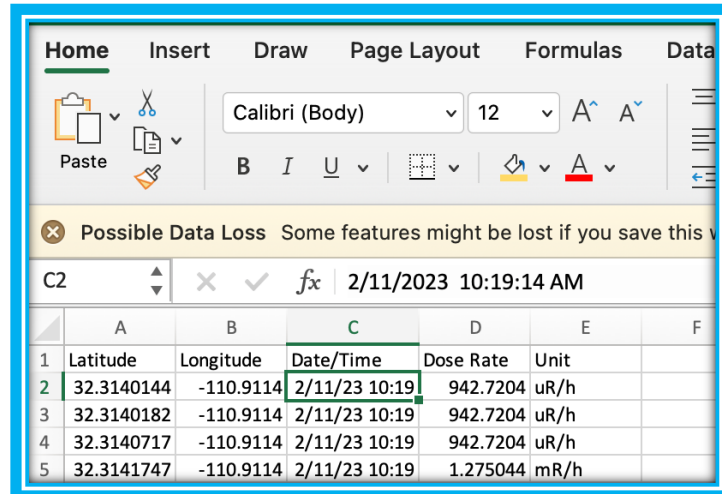


Figure 37. Route Report CSV example file

8. If desired, the date/time field display can be updated in Excel by:
 - **Right clicking** on the first cell (C2) with a date/time displayed
 - Selecting **Format Cells**
 - Selecting **Custom**
 - Entering **mm/dd/yy hh:mm:ss** into the type box
 - Click **ok**
 - **Repeat** this process for Cell C3.
 - Select cells C2 and C3 and fill down.

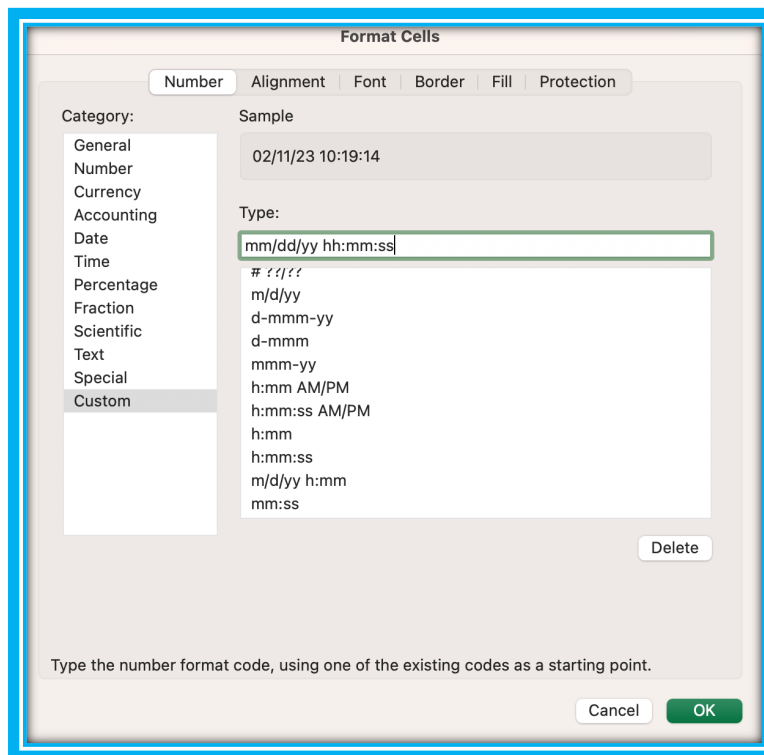


Figure 38. Format cells option for updating date/time display in Excel

9. This information can be used for further validation and examination of field team decisions.

Validation/Reporting

If desired, the RouteReport.CSV file can be used in several ways to analyze:

1. The field team mission decisions: Confirm that the team did not exceed any health and safety guidelines while navigating to monitoring locations.
2. Visualize the dose rate data that was collected against the model similar to that of if a mobile detection system was in use
3. Validate the accuracy of the data in RadTeamSim.Route against the original model
 - RadTeamSim.Route has been thoroughly tested for accuracy to models within expected margins of field team equipment reported variation ranges.
 - RadTeamSim.Route is not intended for use in areas in which ballistic particles are expected.
4. Comparisons can be done in Microsoft Excel, or another similar tool, to compare the data in RadTeamSim.Route to the original model.
 - The below example compares RadTeamSim.Route readings to a RadResponder simulation file with randomization off. In this case, the simulated readings that were generated had randomization turned off in the associated RadResponder Simulation file. This allowed for the most direct comparison given (intentionally added) random error was not introduced from the simulation on the RadResponder program side.
 - It can be seen from this example that there is excellent agreement between the two software tools.

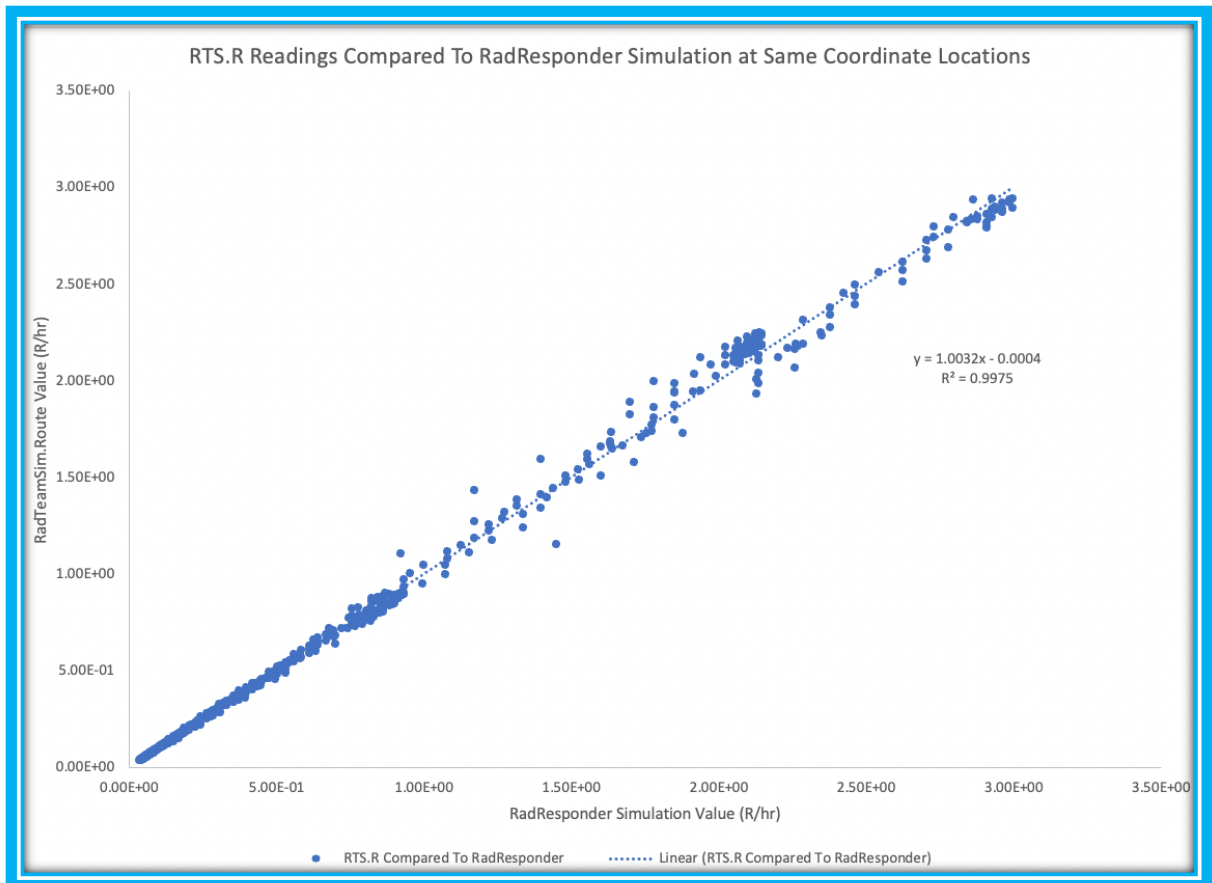


Figure 32 RadTeamSim.Route dose rate readings compared to RadResponder Simulation File with no randomization

5. Data can also be visualized using mapping tools, such as Google Earth Pro by importing the Route Report CSV file site.
 - The below example shows the second-by-second tracking categorized visually by dose rate along with the KMZ export that is available on the RadResponder site when creating a simulation file.
 - This file can also be pulled into the RadResponder map view by exporting it from Google Earth as a KML file if desired.

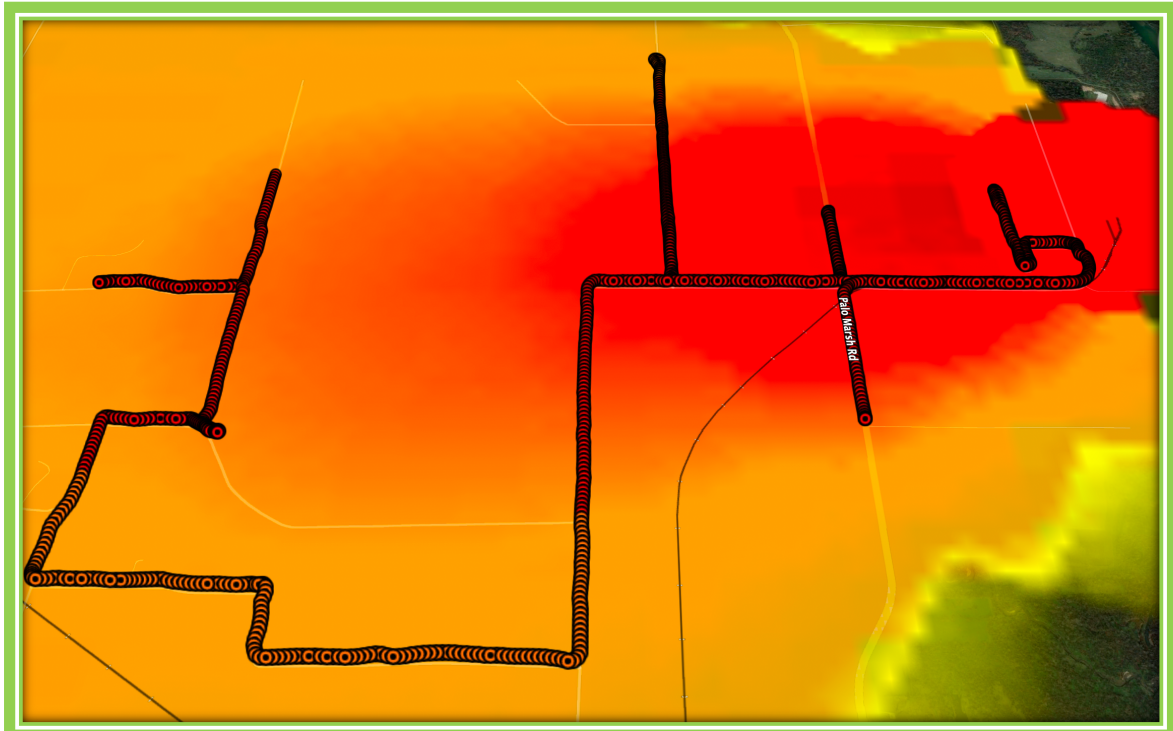


Figure 33. RadTeamSim.Route Route Report file export compared to RadResponder Simulation KML file in Google Earth Pro

The information and examples reflected in this section are provided to give users possible options for use in their own individual analysis of RadTeamSim.Route. For complete details on the scientific validation process that was applied during the development of RadTeamSim.Route, visit: <https://www.radiationemergencyservices.com/radteamsim-route-user-materials>

Troubleshooting

Issue	Suggested Resolution
Radiation Readings fail to load, or an error message is generated stating “Please Enter Valid CSV path”	<ol style="list-style-type: none"> 1. Confirm that the simulation file folder is in a unique folder with no other files in it. 2. Confirm that the path is to a file within this folder, and not an outer folder. 3. Ensure that the simulation files are unzipped and stored on the hard drive.
Route Report not appearing after exit	Ensure that RadTeamSim.Route is not in the “downloads” folder.
The vehicle will not move on launch	Ensure that your starting coordinates are on a road, and not accidentally in a building or other structure. Visually, you may not be able to see that you are in the middle of a building, so check on another mapping software service, such as Google Earth.
After a significant crash, especially if you roll the vehicle, or drive off of the top of a structure, it stops moving	You can damage the vehicle enough to cause it to stop moving. If you rolled the vehicle, and it no longer operates (visually, you may even see the wheels fall off), restart RadTeamSim.Route. If in a drill, this could be a good opportunity to report a crash to leadership.
There are buildings in the road	<p>Due to tunnels and bridges, this may occur occasionally in Version 1.0. Should this be encountered, turn around the building and wait for the navigation to route you in a different direction.</p> <p>Future releases will explore solutions to this issue.</p>

Issue	Suggested Resolution
Navigation appears to route through the water	<p>As with the buildings in the road, it is possible that navigation can route users through a tunnel that is under water.</p> <p>Future releases will explore solutions to this issue.</p>
RadTeamSim.Route will not provide directions when coordinates are entered into the Navigation menu	<p>Confirm that there is a functioning internet connection. Navigation requires the internet to be available.</p>

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