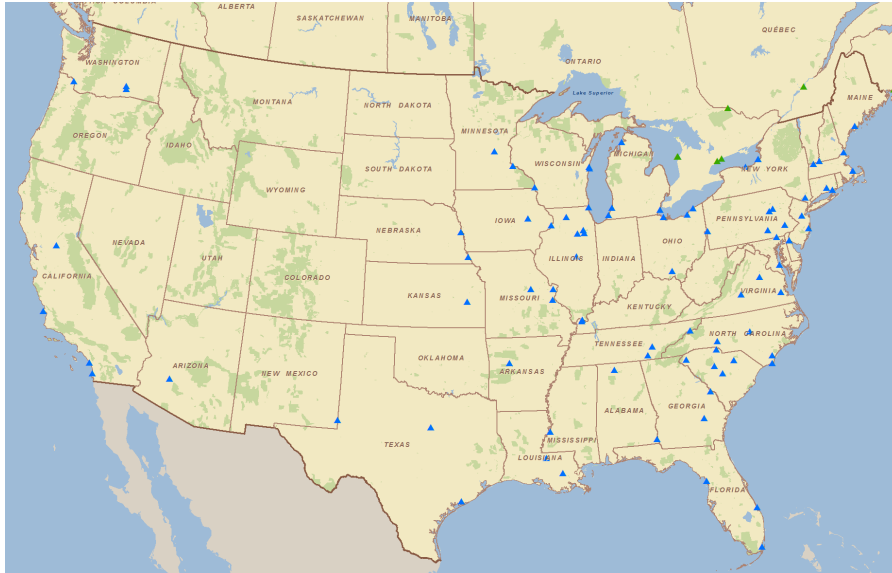


# TRANSPORTATION ACCIDENT

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Part of the RASCAL Instructor-led Training

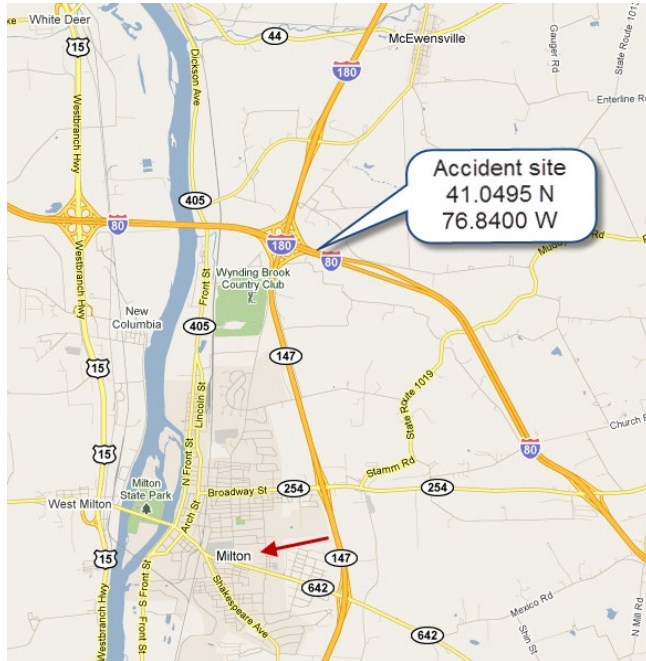
# WHAT DO YOU DO IF THE RELEASE IS AT A LOCATION THAT IS NOT PART OF THE RASCAL FACILITY DATABASE?



Use the option on Event Location to Describe a Site not in the Database.

As a minimum you will need the latitude and longitude of the accident location.

# TRANSPORTATION ACCIDENT - SCENARIO



At 02:00 a tractor trailer truck crashed in central Pennsylvania near the intersection of I-80 and I-180 when the driver lost control on the icy road.

## TRANSPORTATION ACCIDENT - SCENARIO

The truck manifest says it was carrying 150,000 Ci of tritium gas and was bound for the Safety Light facility in Bloomsburg, PA. State highway patrol reports that the trailer slid at high speed into a bridge support and split open.

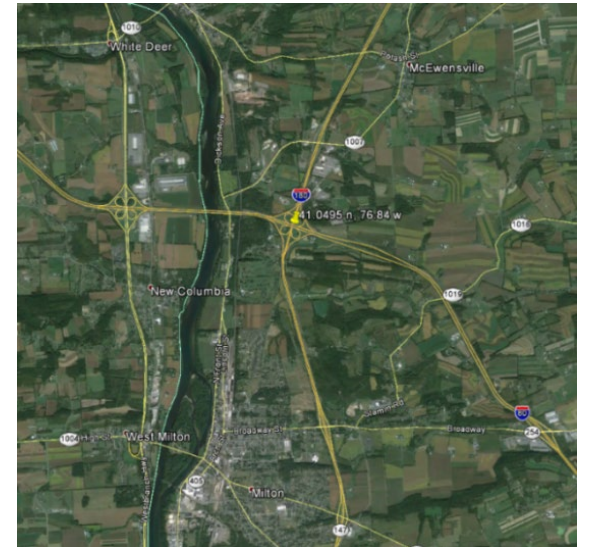
Reports from the scene are that the weather is cold, but the precipitation had stopped and the winds are very light.



# TRANSPORTATION ACCIDENT - SCENARIO

For this problem, assume that the following site information has been obtained:

Nearby population	Accident Location Information
City: Milton	Time Zone = Eastern
County: Northumberland	Latitude = $41.0495^\circ$ (positive latitude is north)
State: Pennsylvania	Longitude = $-76.8400^\circ$ (negative longitude is west)
Country: United States	Elevation = 153 meters



## TRANSPORTATION ACCIDENT - SCENARIO

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The licensee estimates that 10 percent of the containers may have ruptured and that most of their contents are likely to leak out within 10-20 minutes and would quickly volatilize and become airborne.

## TRANSPORTATION ACCIDENT - SCENARIO

What are the doses (TEDE) to persons and the first responders in the immediate vicinity of the crash (0.1 and 0.2 miles)?

What are the doses (TEDE) to nearby residents in the vicinity of the crash (0.5 and 1.0 miles)?

Dose Type	Distance from Release (miles)			
	0.1	0.2	0.5	1.0
TEDE (rem)				

## ONE WAY TO WORK THE PROBLEM IS AS FOLLOWS:

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- Event type
  - Not a nuclear power plant, spent fuel, or fuel cycle accident
  - That leaves Other Radioactive Material Releases
- Event location
  - Select the option for Define a Site not in the Material Database
  - Enter a name, city, state, time zone, latitude, longitude and elevation.



## NEXT, FIGURE OUT HOW TO DEFINE THE SOURCE TERM AND RELEASE PATHWAY.

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- Recall the data you have been given about the release
  - Inventory = 150,000 Ci
  - 10% released in 10 minutes
- You have an amount and a time so we could define a rate.

# SELECT AND FILL-IN THE OPTION FOR EFFLUENT RELEASE RATES – BY NUCLIDE

Effluent Release Rates - by Nuclide

Description of measurement: <undefined>

Effluent release rate units: **Ci/min** > ←

Release period definitions:

Check if to be used in calculation:	Release Period 1	Release Period 2	Release Period 3
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Start date:	2023/05/16	2023/05/16	2023/05/16
Start time:	02:00	00:00	00:00
Stop date:	2023/05/16	2023/05/16	2023/05/16
Stop time:	02:10	01:00	01:00

List of release rates for nuclides in the sample:

Nuclide	Ci/min	Not used	Not used
H-3	1.50E+03		

If there is enriched uranium being released, what is the enrichment level:

5.0 percent

OK  
Cancel  
Clear Help

## DETAILS ON FILLING IN THE SOURCE TERM SCREEN

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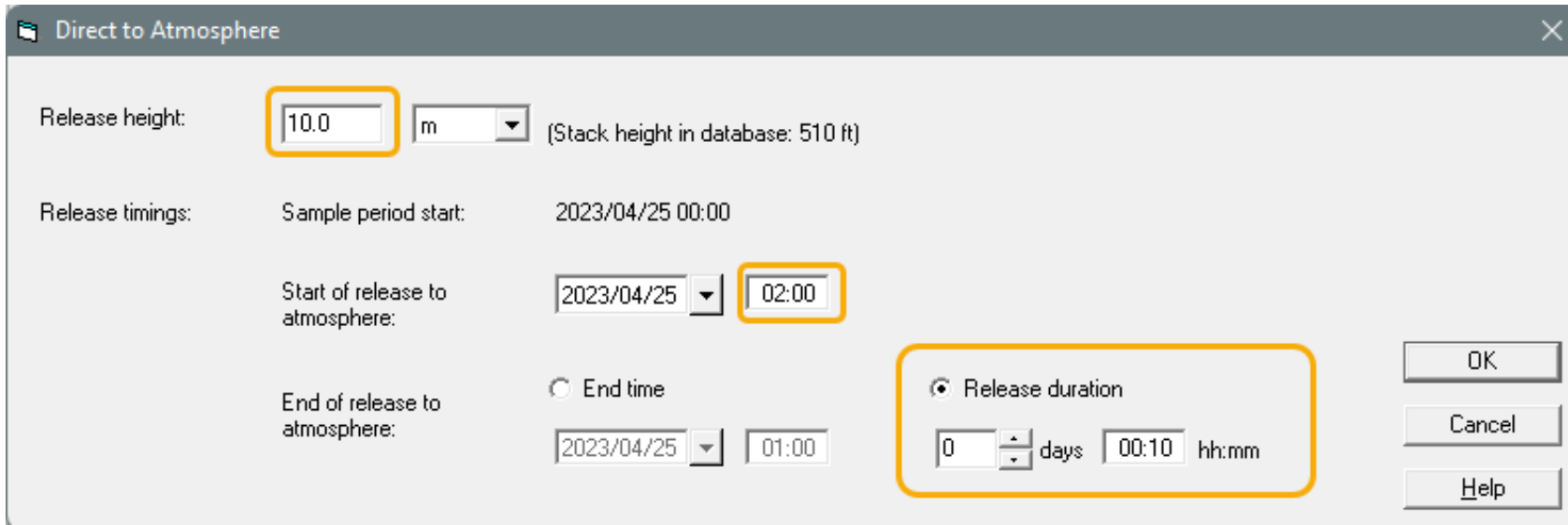
- The default release rate units are in  $\mu\text{Ci/s}$ . Change it to  $\text{Ci/min}$ .
- Set the release start time to the time of the accident: 02:00
- Set the stop time to 02:10. That defines the release period duration to be 10 minutes.
- Finally, enter H-3 as the nuclide and set a  $\text{Ci/min}$  release rate value of 1500.

## STILL NEED TO PROVIDE RELEASE PATHWAY INFORMATION

Leave release height at the default of 10 meters.

The start of release defaults to the source term start.

Set the release duration to match the 10 minutes of the single source term defined.



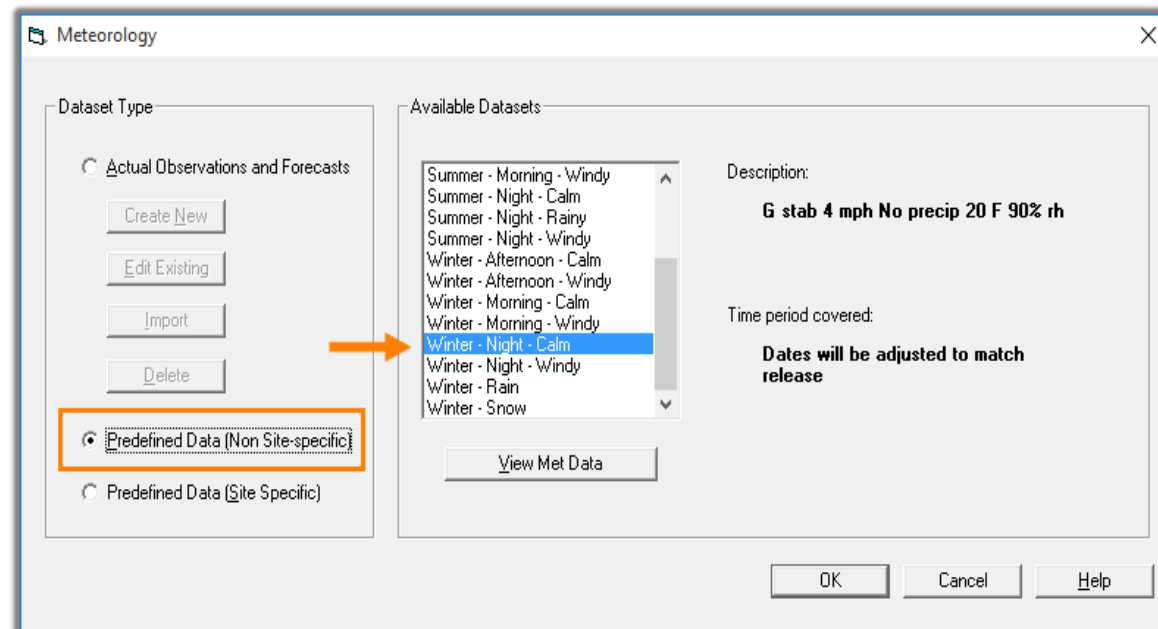
The screenshot shows a dialog box titled "Direct to Atmosphere" with the following fields and controls:

- Release height:** A text box containing "10.0" (highlighted with a yellow box) and a dropdown menu set to "m". A note indicates "(Stack height in database: 510 ft)".
- Release timings:**
  - Sample period start:** 2023/04/25 00:00
  - Start of release to atmosphere:** A date dropdown set to "2023/04/25" and a time dropdown set to "02:00" (highlighted with a yellow box).
  - End of release to atmosphere:** A date dropdown set to "2023/04/25" and a time dropdown set to "01:00".
- Release duration:** A radio button is selected, and the duration is set to "0" days and "00:10" hh:mm (highlighted with a yellow box).
- End time:** An unselected radio button.
- Buttons:** "OK", "Cancel", and "Help" buttons are located on the right side.

# METEOROLOGICAL DATA

No wind speed or direction have been provided. For a quick assessment we can make use of the predefined meteorological datasets.

Winter – Night – Calm would be a logical choice



## SET THE FINAL PARAMETERS AND START THE CALCULATIONS

Distance to 10 miles is fine; we do not expect doses at long ranges.

The default 8h calculation duration is more than enough for this 10 minute release with 4 mph winds

Start the Calculations

Specify options and title for this set of calculations, then OK to begin calculations.

Distance of calculation:

- Close-in + out to 10 miles (16 km)
- Close-in + out to 25 miles (40 km)
- Close-in + out to 50 miles (80 km)
- Close-in + out to 100 miles (160 km)
- Close-in only

Using close-in distances in miles:  
0.1, 0.2, 0.3, 0.5, 0.7, 1.0, 1.5, 2.0

- Defaults
- User defined

Start of release to atmosphere:  
2015-11-05 02:00 (from release pathway definition)

End calculations at:

- Start of release to atmosphere plus: 8 hours
- User specified time: 2015/11/05 10:00

Inhalation dose coefficients to use in calculations:

- ICRP 26/30
- ICRP 60/72

Case information:

Title:  
Transportation accident  
(required - max 45 characters)

Case description:  
  
(optional - max 600 characters)

Analyst:  
 Dose analyst

## PROBLEM CONCLUSION

From the source term summary screen, we can confirm that 15,000 Ci of tritium were released.

Then on the maximum dose values screen we see the following doses:

Dose Type	Distance from Release (miles)			
	0.1	0.2	0.5	1.0
TEDE (rem)	0.038	0.018	0.008	0.0046

## PROBLEM CONCLUSION

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RASCAL has the flexibility to model these type accidents.

You just need to take what you know, make some assumptions, and find the best fit to define the release.