air pollution control district
SANTA BARBARA COUNTY

User Guide for HRA Screenings Using Lakes' AERSCREEN View and HARP 2

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June 2019

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1. Introduction

This user guide describes how to conduct a health risk assessment (HRA) screening using Lakes' AERSCREEN View and the Risk Assessment Standalone Tool of CARB's HARP 2. Section 2 explains how to use Google Earth to determine the following inputs for AERSCREEN: the dispersion option (urban or rural), the appropriate AERSURFACE file and the distances to the nearest resident and worker. Section 3 contains step-by-step instructions for running AERSCREEN View for the project to obtain modeled ambient concentrations at the point of maximum impact (PMI), maximally exposed individual resident (MEIR) and maximally exposed individual worker (MEIW), based on unit emission rates. Section 4 shows the required calculations for scaling the concentrations based on actual emission rates of each emitted pollutant and includes an example calculation spreadsheet. Lastly, Section 5 describes how to calculate the risk in HARP 2 and correctly sum the risk from all pollutants to obtain the final results for cancer risk and chronic, 8-hour and acute non-cancer risk.

Before getting started, make sure that you have the following:

- Latest versions of Lakes' AERSCREEN View and CARB's HARP 2 Risk Assessment Standalone Tool installed
- Google Earth installed
- Location of the project to be modeled
- Source modeling parameters for the project
- Maximum hourly and average annual emissions of each toxic air contaminant (TAC) released from the source; see the District's *Toxic Air Contaminant Emission Factors* webpage for more information on calculating TAC emissions: https://www.ourair.org/tac-efs/

2. Google Earth

Open Google Earth, locate the project site, and follow the steps below:

- Draw a circle with a radius of 3 km centered on the project site. Determine if the area within the circle is primarily urban or rural.
    - Industrial, commercial, dense single/multi-family, and multi-family two-story land use types are considered to be urban.
    - Large estates, residences with large grass lawns, parks, golf courses, agricultural areas, undeveloped land, and water surfaces are considered to be rural.
- Determine the appropriate meteorological data set for the project. A list of the available data sets can be found at the District's *Meteorological Data* webpage: https://www.ourair.org/metdata/. Download the AERSURFACE output file for the chosen meteorological data set. Typically, the most appropriate meteorological data set comes from the site nearest to the project site. However, this is not always the case (examples noted below). Contact the District if you are unsure of which meteorological data set to use.
    - The Carpinteria meteorological data set is only appropriate for the inland, mountainous region of Carpinteria. A project in the coastal area of Carpinteria should use the Santa Barbara National Guard meteorological data set.
    - Most projects in the Santa Ynez Valley and other rural, inland areas in Santa Barbara County should use the Santa Maria Airport meteorological data set.

- Use the ruler tool to determine the distance to the nearest resident and to the nearest worker[1].
    - The resident should be located at the nearest edge of the closest house, apartment building, college/boarding school dorm, K-12 school, daycare or care facility, or hospital.
    - The worker should be located at the nearest point of the closest commercial building or outdoor area where a worker could be located on a daily basis (i.e., an agricultural field, golf course, park, etc.).

3. AERSCREEN View

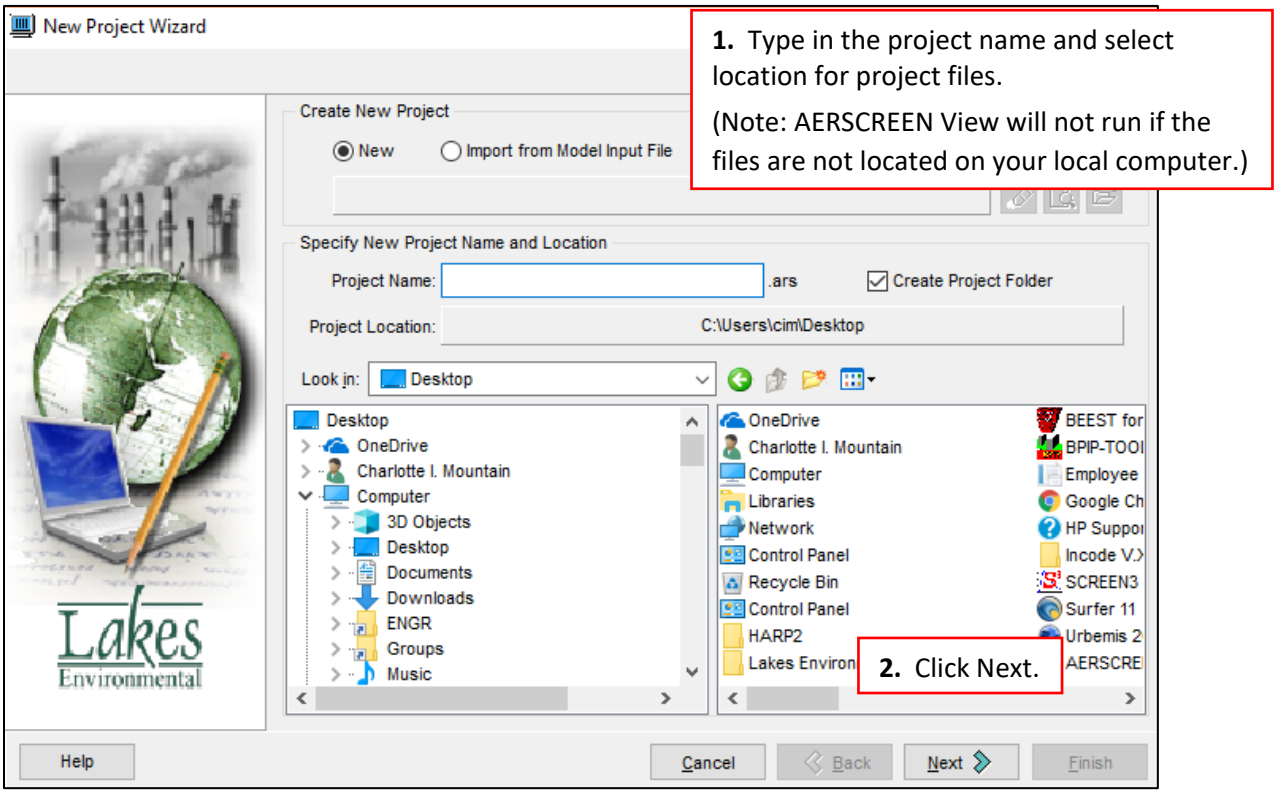
AERSCREEN is the USEPA-recommended screening model based on AERMOD. AERSCREEN produces estimates of worst-case 1-hour concentrations for a single source and is intended to produce concentration estimates equal to or greater than the estimates produced by AERMOD. The District uses Lakes' user interface AERSCREEN View for conducting HRA screenings.

3.1 Air Dispersion Modeling

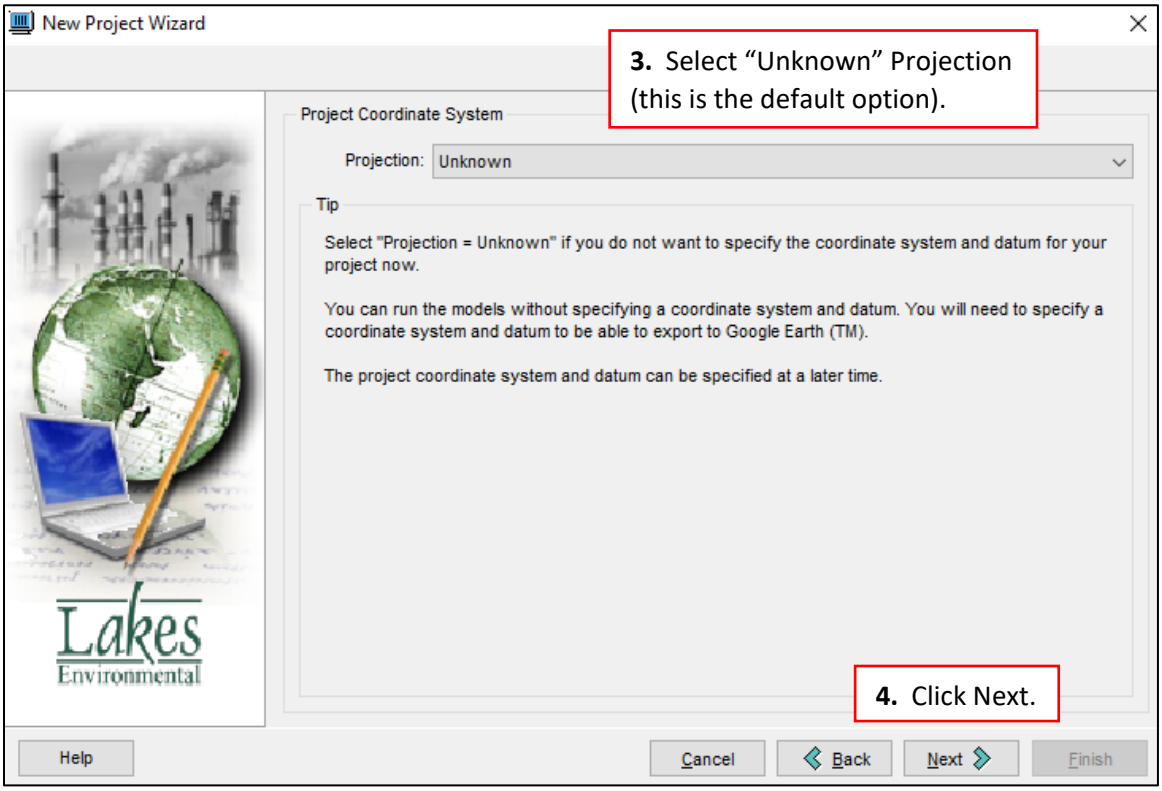
Open AERSCREEN View to perform the air dispersion modeling:

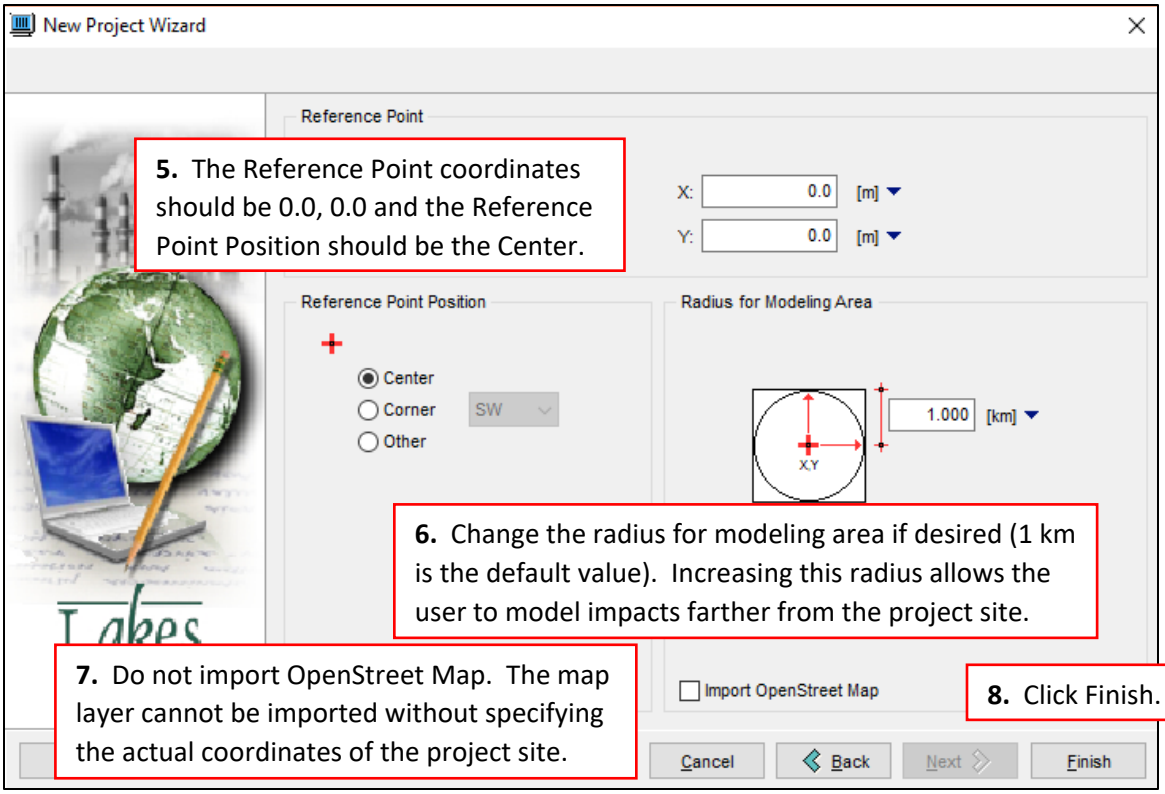
- 

Click the "New" button, and then follow the steps described below.



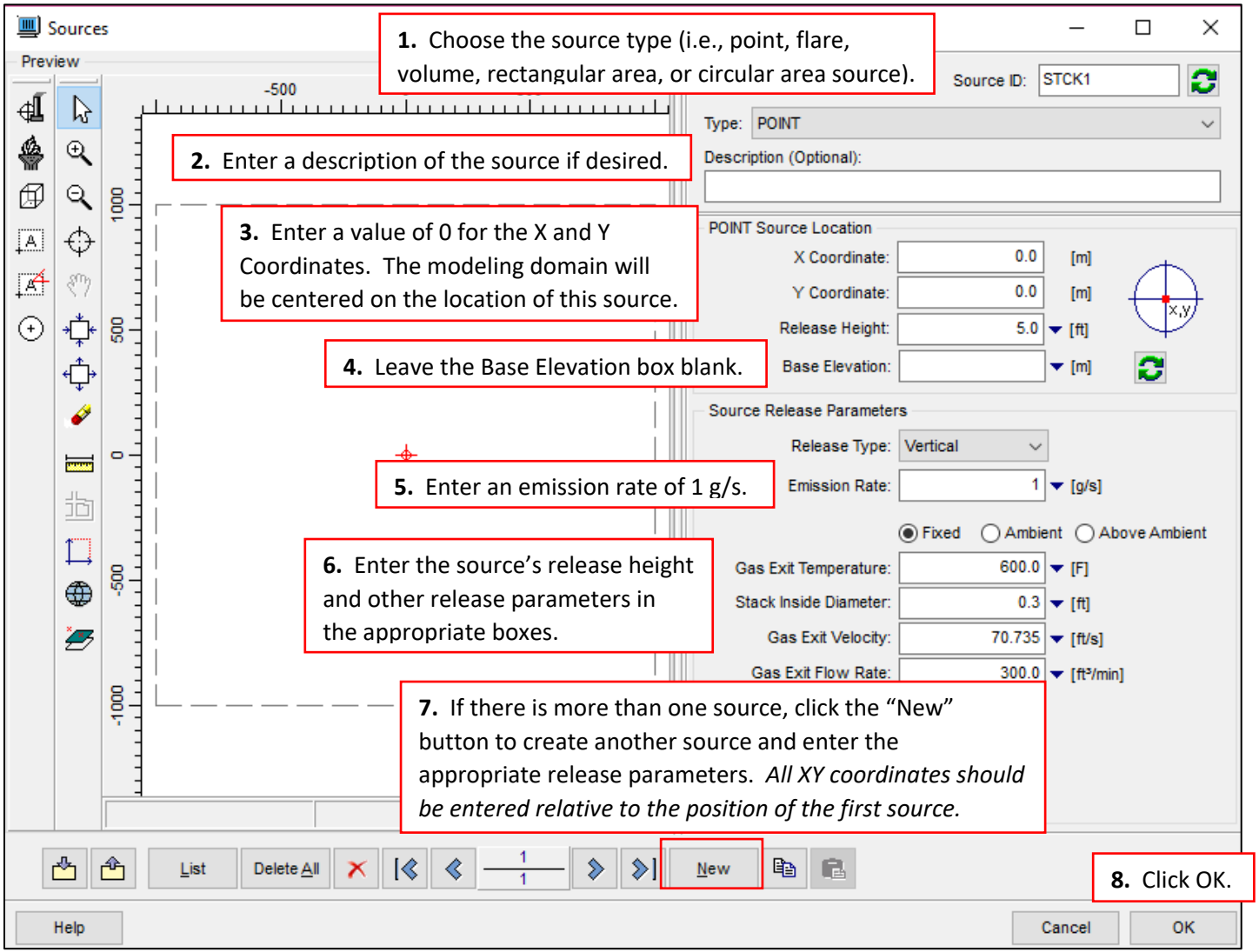
[1] Typically this refers to the nearest offsite worker. However, this could be an onsite receptor where a person works if they are not employed by or monetarily tied to the facility being evaluated (e.g. agricultural workers on a field within an oil lease, employees of restaurants located on a military base, etc.). See Section 3.8.7, *Onsite Receptors*, of the District's Form-15i for additional information: https://www.ourair.org/wp-content/uploads/apcd-15i.pdf.


New Project Wizard
3. Select "Unknown" Projection (this is the default option).
Project Coordinate System
Projection: Unknown
Tip
Select "Projection = Unknown" if you do not want to specify the coordinate system and datum for your project now.
You can run the models without specifying a coordinate system and datum. You will need to specify a coordinate system and datum to be able to export to Google Earth (TM).
The project coordinate system and datum can be specified at a later time.
4. Click Next.
Lakes Environmental
Help
Cancel
Back
Next
Finish


New Project Wizard
Reference Point
5. The Reference Point coordinates should be 0.0, 0.0 and the Reference Point Position should be the Center.
X: 0.0 [m]
Y: 0.0 [m]
Reference Point Position
Center
Corner SW
Other
Radius for Modeling Area
1.000 [km]
XY
6. Change the radius for modeling area if desired (1 km is the default value). Increasing this radius allows the user to model impacts farther from the project site.
7. Do not import OpenStreet Map. The map layer cannot be imported without specifying the actual coordinates of the project site.
Import OpenStreet Map
8. Click Finish.
Cancel
Back
Next
Finish

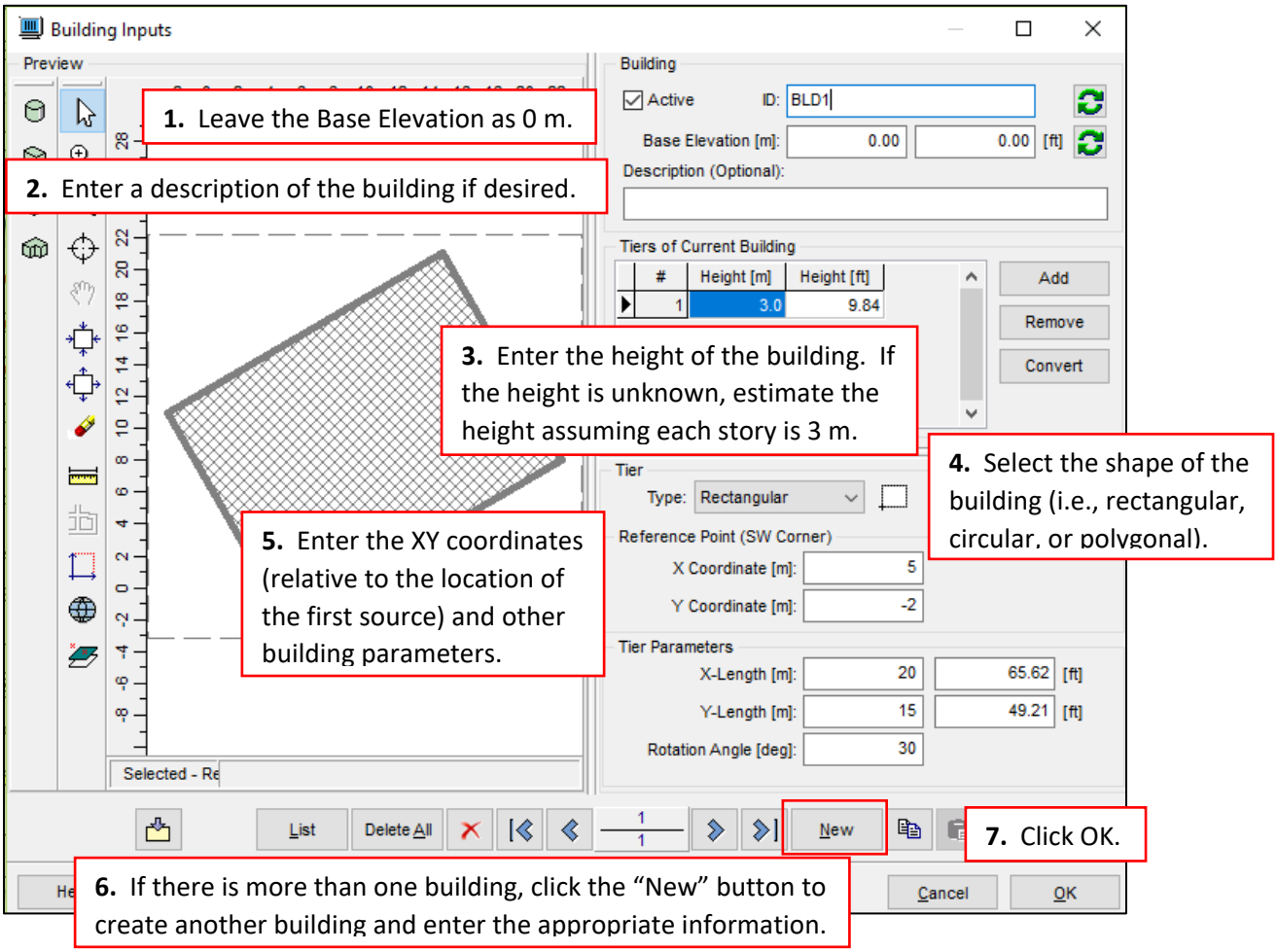
- 

Click the "Source" button to enter the release parameters for the source:



- 

Click the "Building" button to enter the building information:



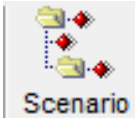
Building downwash only affects the dispersion from point sources. All sufficiently large buildings and other structures (i.e., tanks, boilers, etc.) near the project site should be included in the model, if any of the emitting equipment is modeled as a point source. **If you are unsure if a structure will cause downwash effects, include it in the model.** Buildings or other structures can be excluded from the model only if the following is true:

$$\boldsymbol{D \geq 5L}$$

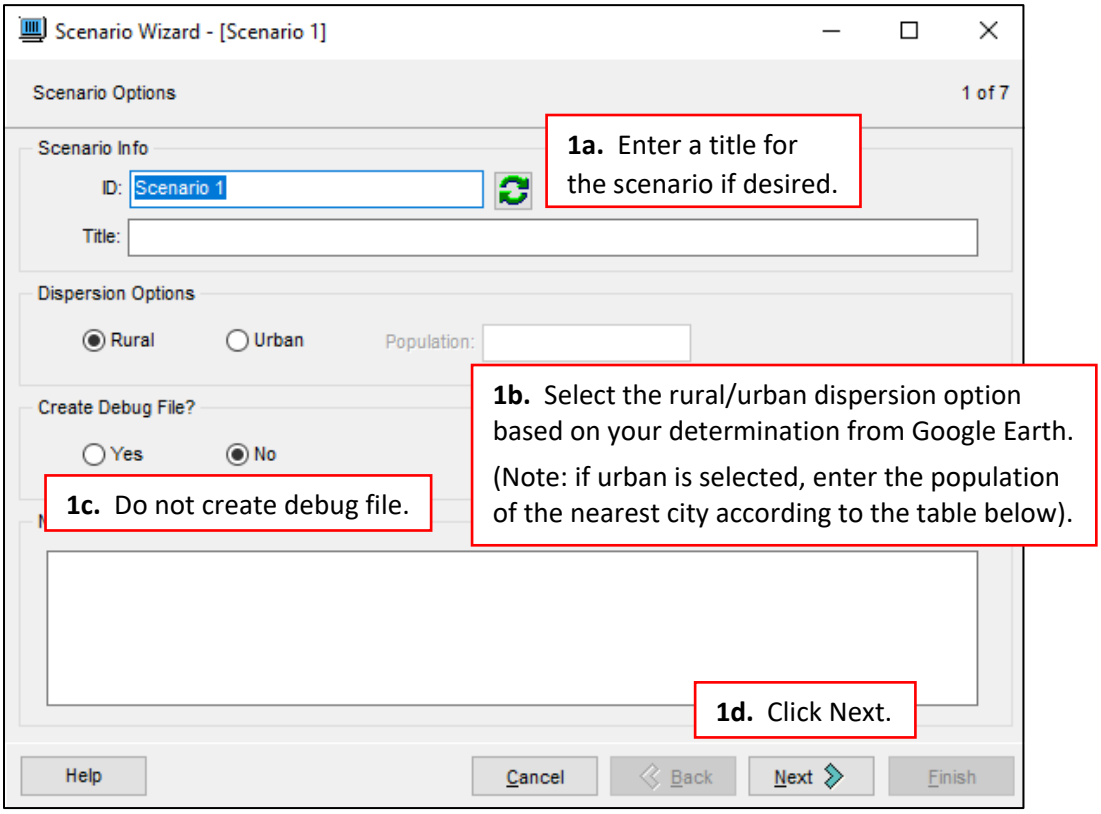
where: $D = shortest\ distance\ from\ the\ exhaust\ stack\ to\ the\ building$

$L = lesser\ of\ the\ following\ two\ values$:
$building\ height\ and\ projected\ building\ width\ (PBW)$

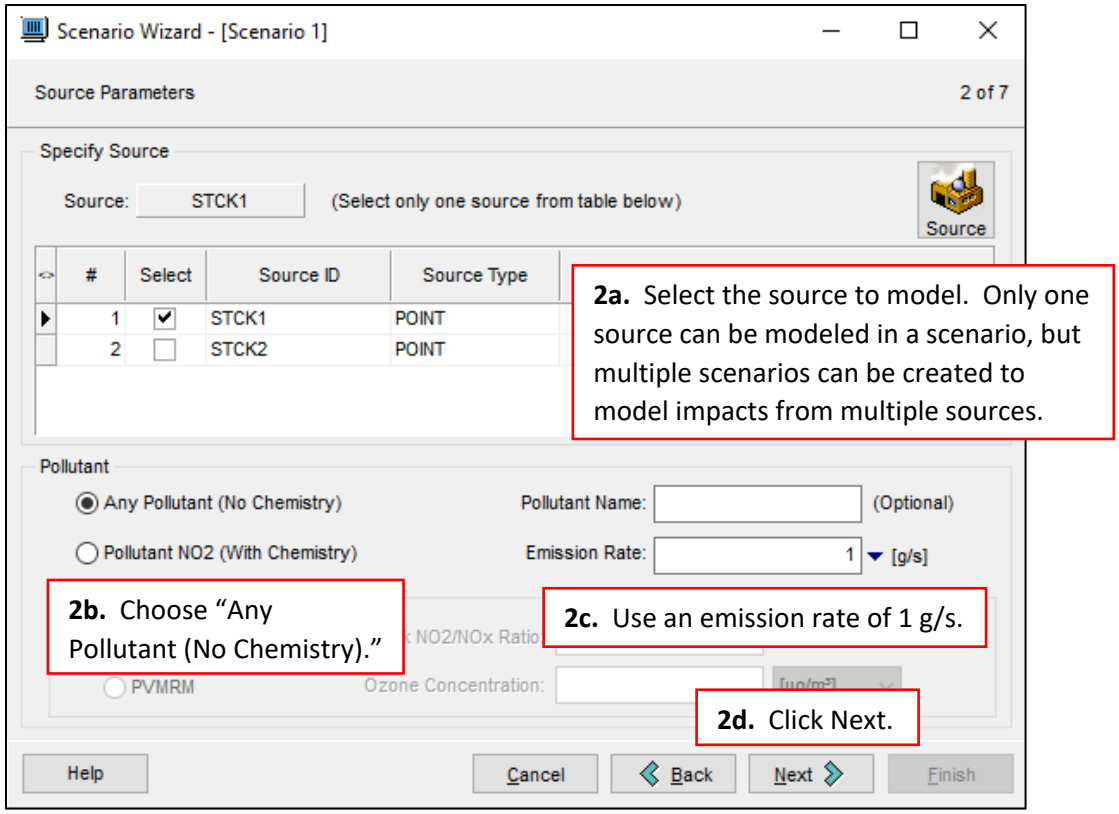
$PBW = maximum\ cross-sectional\ length\ of\ the\ building$;
$for\ rectangular\ buildings,\ PBW = \sqrt{(length^2 + width^2)}$

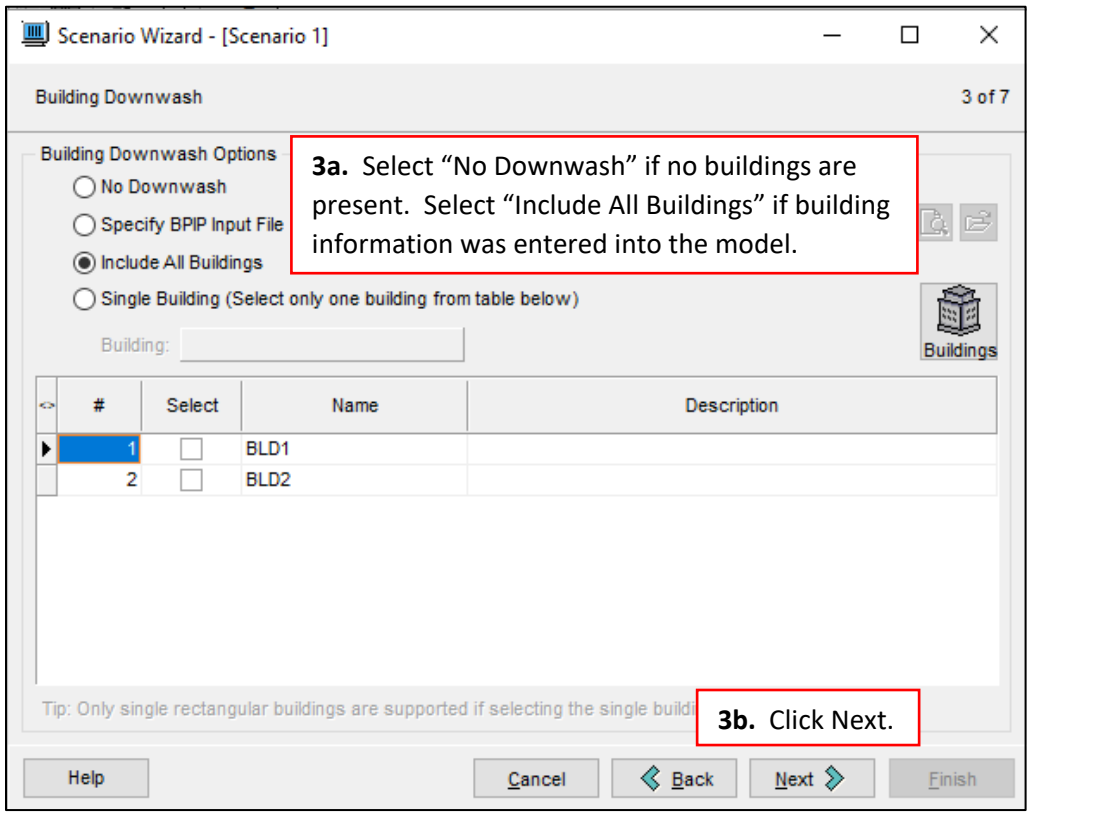
- 

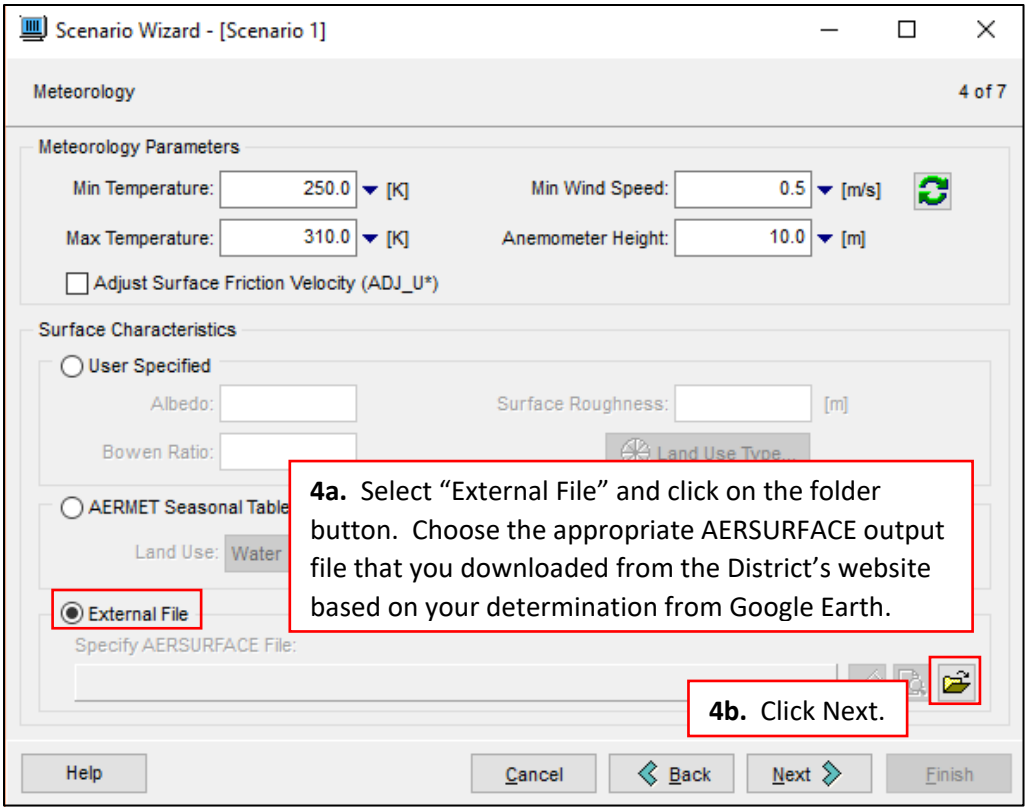
  Click the "Scenario" button, select "New" and follow the steps below. **If there are multiple emitting sources, create a scenario for each source.**

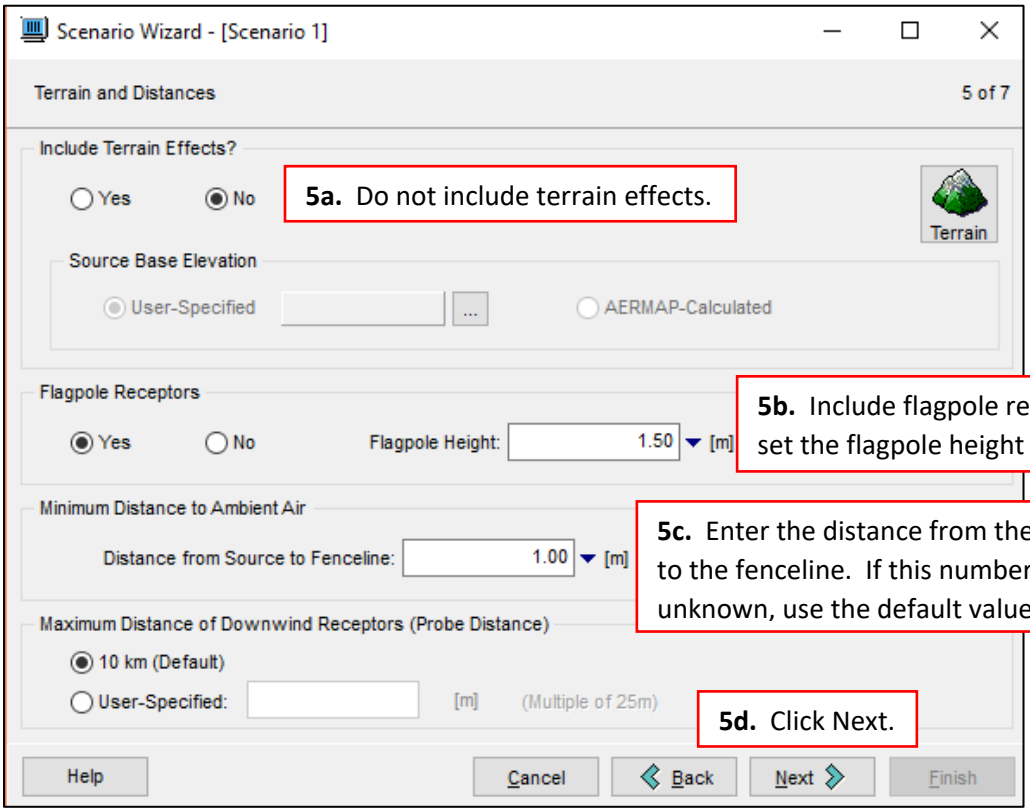


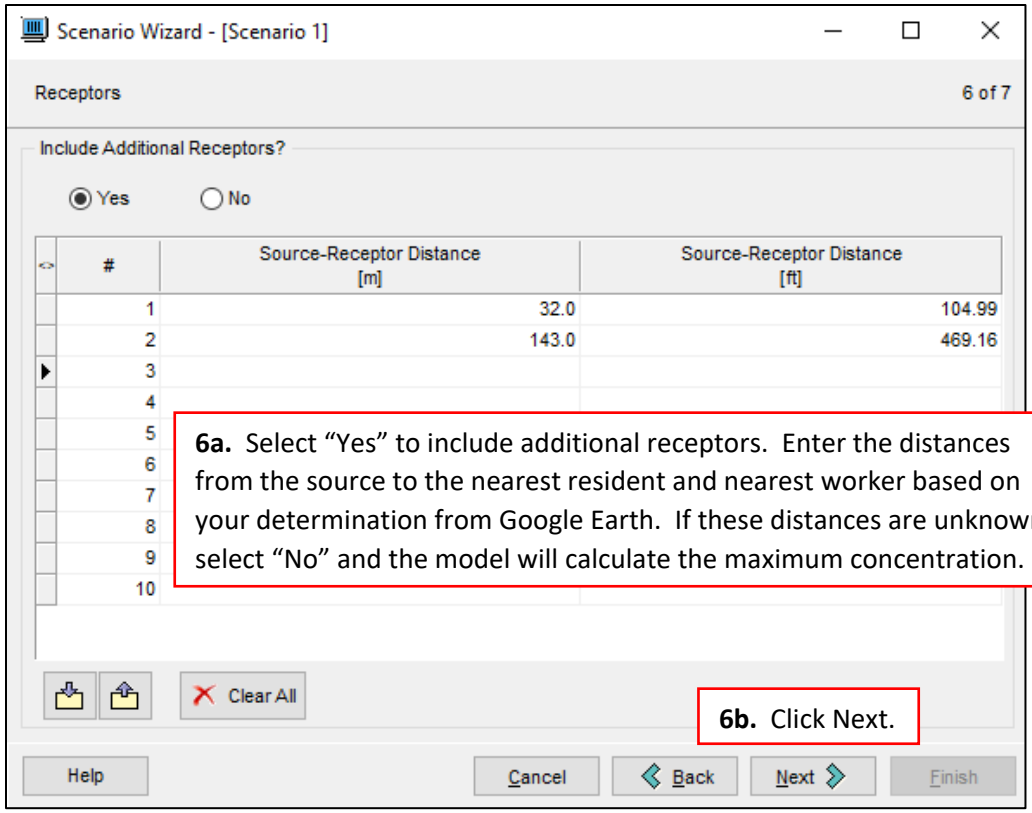
City Name	Population (2010 Census)
Buellton	4,828
Carpinteria	13,040
Goleta	29,888
Guadalupe	7,080
Lompoc	42,434
New Cuyama	517
Santa Barbara	88,410
Santa Maria	99,553
Solvang	5,245

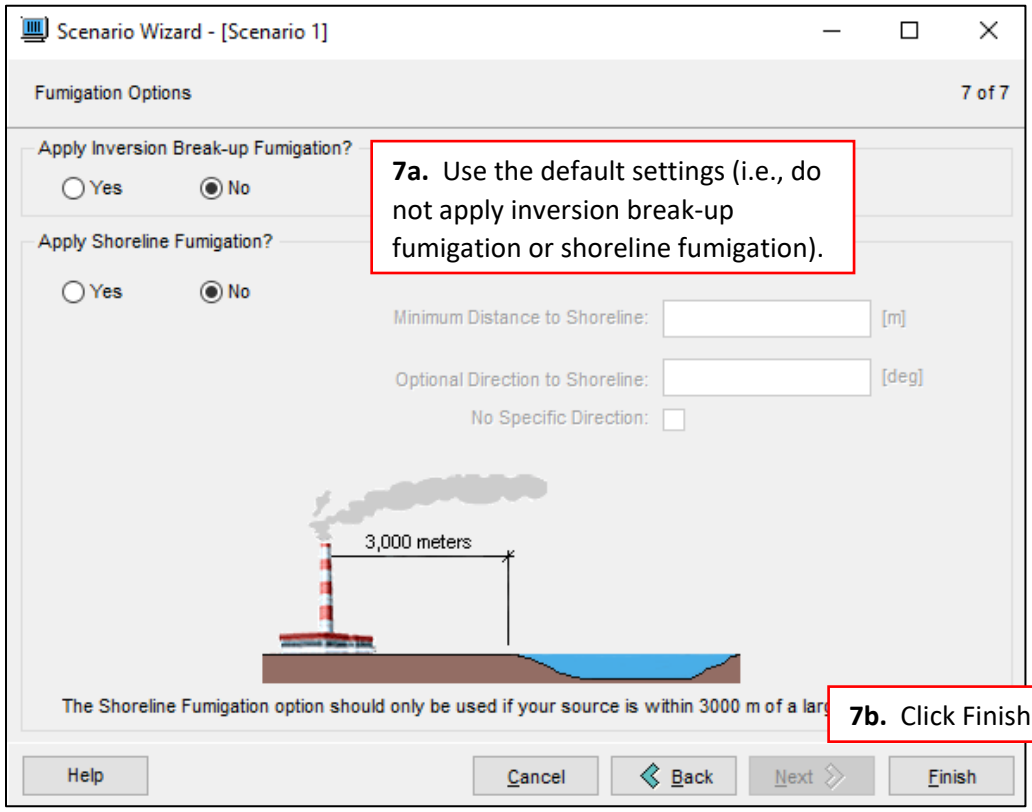

Scenario Wizard - [Scenario 1]
Source Parameters
2 of 7
Specify Source
Source: STCK1
(Select only one source from table below)
Source
Select Source ID Source Type
1 STCK1 POINT
2 STCK2 POINT
2a. Select the source to model. Only one source can be modeled in a scenario, but multiple scenarios can be created to model impacts from multiple sources.
Pollutant
Any Pollutant (No Chemistry)
Pollutant Name:
(Optional)
Pollutant NO2 (With Chemistry)
Emission Rate:
1
[g/s]
2b. Choose "Any Pollutant (No Chemistry)."
2c. Use an emission rate of 1 g/s.
PVMRM
Ozone Concentration:
2d. Click Next.
Help
Cancel
Back
Next
Finish


Scenario Wizard - [Scenario 1]
Building Downwash
3 of 7
Building Downwash Options
No Downwash
Specify BPIP Input File
Include All Buildings
Single Building (Select only one building from table below)
3a. Select "No Downwash" if no buildings are present. Select "Include All Buildings" if building information was entered into the model.
Building:
Buildings
Select Name Description
1 BLD1
2 BLD2
Tip: Only single rectangular buildings are supported if selecting the single buildi
3b. Click Next.
Help
Cancel
Back
Next
Finish


Scenario Wizard - [Scenario 1]
Meteorology
4 of 7
Meteorology Parameters
Min Temperature: 250.0 [K]
Min Wind Speed: 0.5 [m/s]
Max Temperature: 310.0 [K]
Anemometer Height: 10.0 [m]
Adjust Surface Friction Velocity (ADJ_U*)
Surface Characteristics
User Specified
Albedo:
Surface Roughness: [m]
Bowen Ratio:
Land Use Type...
AERMET Seasonal Table
Land Use: Water
External File
Specify AERSURFACE File:
4a. Select "External File" and click on the folder button. Choose the appropriate AERSURFACE output file that you downloaded from the District's website based on your determination from Google Earth.
4b. Click Next.
Help
Cancel
Back
Next
Finish

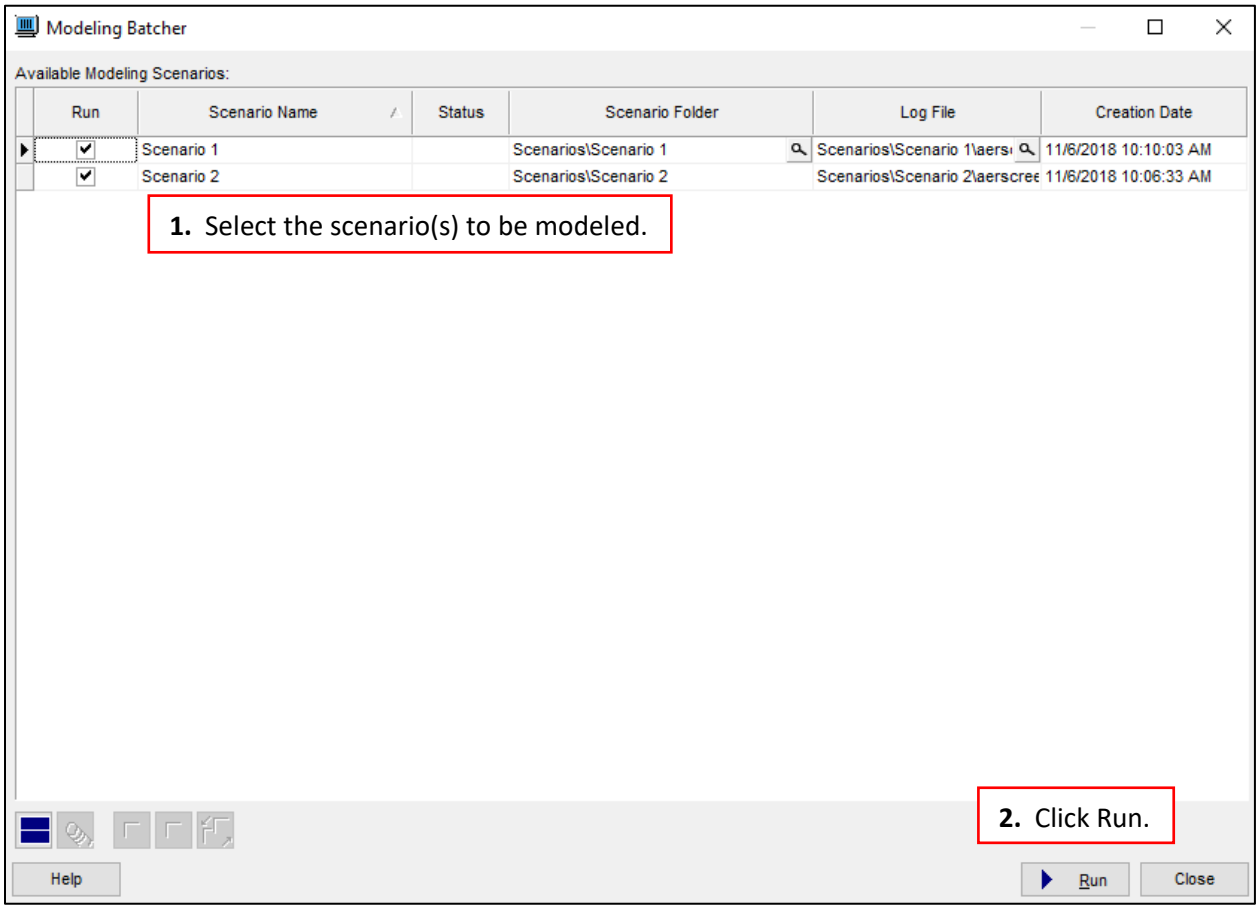

Scenario Wizard - [Scenario 1]
Terrain and Distances
5 of 7
Include Terrain Effects?
Yes
No
5a. Do not include terrain effects.
Terrain
Source Base Elevation
User-Specified
AERMAP-Calculated
Flagpole Receptors
Yes
No
Flagpole Height: 1.50 [m]
5b. Include flagpole receptors and set the flagpole height to 1.5 m.
Minimum Distance to Ambient Air
Distance from Source to Fenceline: 1.00 [m]
5c. Enter the distance from the source to the fenceline. If this number is unknown, use the default value of 1 m.
Maximum Distance of Downwind Receptors (Probe Distance)
10 km (Default)
User-Specified: [m] (Multiple of 25m)
5d. Click Next.
Help
Cancel
Back
Next
Finish


Scenario Wizard - [Scenario 1]
Receptors
6 of 7
Include Additional Receptors?
Yes
No
| Source-Receptor Distance [m] | Source-Receptor Distance [ft]
1 | 32.0 | 104.99
2 | 143.0 | 469.16
3
4
5
6
7
8
9
10
Clear All
6a. Select "Yes" to include additional receptors. Enter the distances from the source to the nearest resident and nearest worker based on your determination from Google Earth. If these distances are unknown, select "No" and the model will calculate the maximum concentration.
6b. Click Next.
Help
Cancel
Back
Next
Finish


Scenario Wizard - [Scenario 1]
Fumigation Options
7 of 7
Apply Inversion Break-up Fumigation?
Yes
No
Apply Shoreline Fumigation?
Yes
No
Minimum Distance to Shoreline:
[m]
Optional Direction to Shoreline:
[deg]
No Specific Direction:
3,000 meters
The Shoreline Fumigation option should only be used if your source is within 3000 m of a lar
7a. Use the default settings (i.e., do not apply inversion break-up fumigation or shoreline fumigation).
7b. Click Finish.
Help
Cancel
Back
Next
Finish

- 

Click the "Run" button and a pop-up window will appear.



3.2 AERSCREEN Results

After the model has finished running, close AERSCREEN View. Locate the folder where the AERSCREEN files are saved, open the "Scenarios" folder, and then open the folder corresponding to the scenario you would like to analyze. In the scenario folder, open the text file called "AERSCREEN.OUT." Locate the tables titled "AERSCREEN AUTOMATED DISTANCES" and "AERSCREEN MAXIMUM IMPACT SUMMARY," which should look similar to the tables in the screenshots below. In this example, for Scenario 1, the maximally exposed individual worker (MEIW) is located 32 meters from the source and the AERSCREEN results are circled in blue; the maximally exposed individual resident (MEIR) is located 143 meters from the source and the AERSCREEN results are circled in green; the point of maximum impact (PMI) is located 1 meter from the source and the results are circled in purple.

```
--------------------------------------------------------------------------------
********** AERSCREEN AUTOMATED DISTANCES **********
               OVERALL MAXIMUM CONCENTRATIONS BY DISTANCE
--------------------------------------------------------------------------------
```

DIST (m)	MAXIMUM 1-HR CONC (ug/m3)	DIST (m)	MAXIMUM 1-HR CONC (ug/m3)
1.00	0.1999E+06	3750.00	61.52
25.00	9401.	3775.00	
32.00	8725.	3800.00	
50.00	7227.	3825.00	
75.00	5003.	3850.00	
100.00	3046.	3875.00	
125.00	1678.	3900.00	
143.00	1114.	3925.00	
150.00	969.5	3950.00	
175.00	694.3	3975.00	
200.00	582.5	4000.00	
225.00	555.1	4025.00	
250.00	534.2	4050.00	
275.00	514.2	4075.00	
300.00	494.7	4100.00	
325.00	476.7	4125.00	
350.00	458.3	4150.00	
375.00	439.9	4175.00	
400.00	421.8	4200.00	
425.00	404.4	4225.00	54.95
450.00	387.6	4250.00	54.63
475.00	371.6	4275.00	54.31
500.00	356.5	4300.00	54.00
525.00	342.1	4325.00	53.70

NOTE: It is important to determine if the location of the nearest resident and worker corresponds to the MEIR and MEIW, respectively. For instance, if the closest worker is located 32 m from the source, we assume that there could be workers located at any distance farther than 32 m from the source as well. If AERSCREEN shows that the concentration at 32 m is 8725, the concentration at 50 m is 8865, and the concentrations at all distances farther than 50 m from the source are lower than 8865, then the MEIW is not located at the closest worker location, but is instead located at 50 m from the source.

```
--------------------------------------------------------------------------------
**********  AERSCREEN MAXIMUM IMPACT SUMMARY  **********
--------------------------------------------------------------------------------
```

CALCULATION PROCEDURE	MAXIMUM 1-HOUR CONC (ug/m3)	SCALED 3-HOUR CONC (ug/m3)	SCALED 8-HOUR CONC (ug/m3)	SCALED 24-HOUR CONC (ug/m3)	SCALED ANNUAL CONC (ug/m3)
FLAT TERRAIN	0.1999E+06	0.1999E+06	0.1799E+06	0.1200E+06	0.1999E+05

```
DISTANCE FROM SOURCE         1.00 meters directed toward 270 degrees
```

4. Calculations

The maximum hourly concentrations calculated by AERSCREEN are based on a unit emission rate of 1 g/s, and must then be scaled based on each pollutant's actual emission rate. Equation 1 below is used to calculate the maximum hourly concentrations of each emitted pollutant. The maximum hourly concentrations ($C_{hourly,i}$) for all pollutants should be calculated for the PMI; the maximum hourly concentrations from AERSCREEN ($C_{AERSCREEN}$) for the PMI is circled in purple in Section 3.2 above.

$$\boldsymbol{C_{hourly,i} = C_{AERSCREEN} * \frac{E_{h,i}}{E_u}} \quad \textbf{(Eq. 1)}$$

where: $C_{hourly,i} = maximum\ hourly\ concentration\ of\ pollutant\ i\ (\mu g/m^3)$

$C_{AERSCREEN} = maximum\ hourly\ concentration\ from\ AERSCREEN\ (\mu g/m^3)$

$E_{h,i} = maximum\ hourly\ emission\ rate\ of\ pollutant\ i\ (g/s)$

$E_u = unit\ emission\ rate = 1\ g/s$

Equation 2 below is used to calculate the average annual concentrations of each emitted pollutant. For equal emission rates, the average annual concentration is estimated to equal the maximum hourly concentration times a scaling factor of 0.10, from the USEPA's *AERSCREEN User's Guide*: https://www3.epa.gov/scram001/models/screen/aerscreen_userguide.pdf. The average annual concentrations ($C_{annual,i}$) for all pollutants should be calculated for the MEIR and MEIW; the maximum hourly concentrations from AERSCREEN ($C_{AERSCREEN}$) for the MEIR and MEIW are circled in green and blue, respectively, in Section 3.2 above.

$$\boldsymbol{C_{annual,i} = C_{AERSCREEN} * S * \frac{E_{a,i}}{E_u}} \quad \textbf{(Eq. 2)}$$

where: $C_{annual,i} = average\ annual\ concentration\ of\ pollutant\ i\ (\mu g/m^3)$

$C_{AERSCREEN} = maximum\ hourly\ concentration\ from\ AERSCREEN\ (\mu g/m^3)$

$S = scaling\ factor = 0.10$

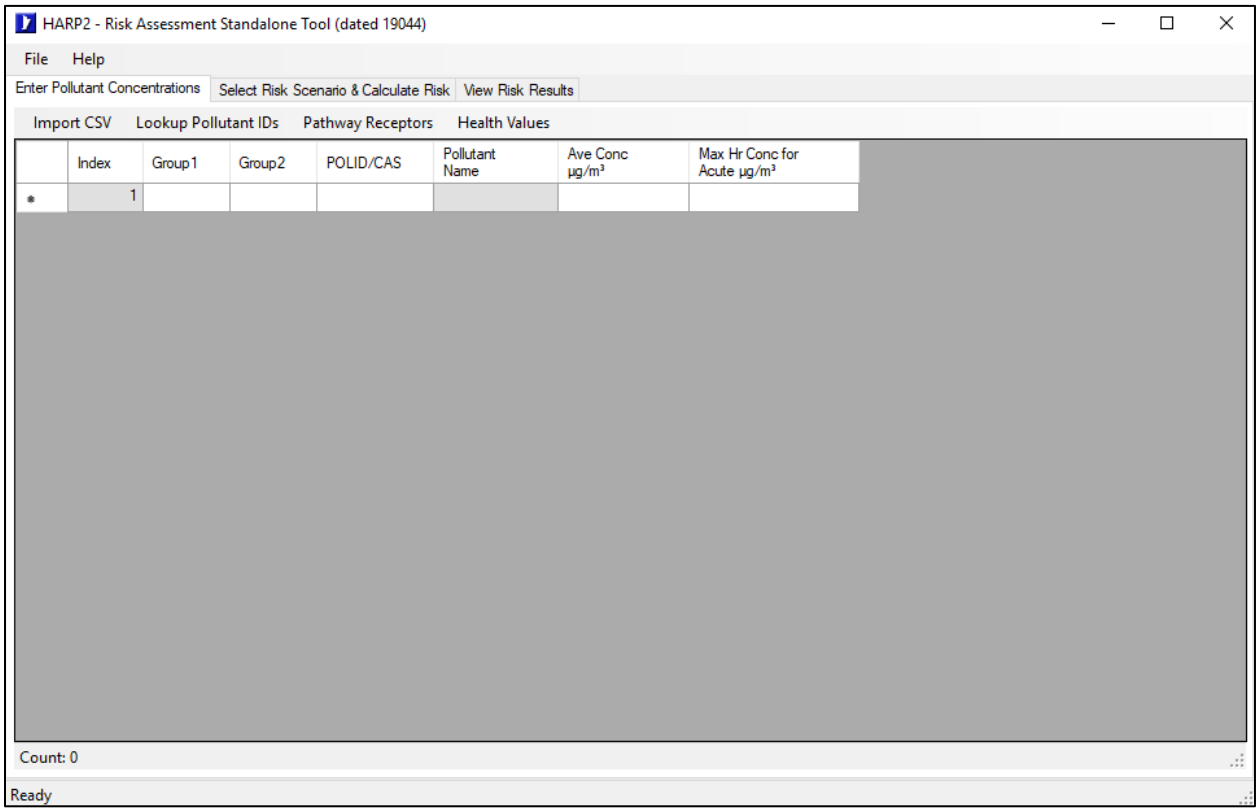
$E_{a,i} = average\ annual\ emission\ rate\ of\ pollutant\ i\ (g/s)$

$E_u = unit\ emission\ rate = 1\ g/s$

The unit emission rate is in units of g/s, while the maximum hourly and annual average emission rates are entered in units of lb/hr and lb/yr, respectively, for the HARP 2 risk analysis. Ensure that the emission rates are converted to the appropriate units so that the units cancel out in Equations 1 and 2 above. An example calculation spreadsheet, containing a template and an example calculation, can be found here: https://www.ourair.org/wp-content/uploads/HRA-Screening-Calculations.xlsx.

5. HARP 2 Risk Assessment Standalone Tool

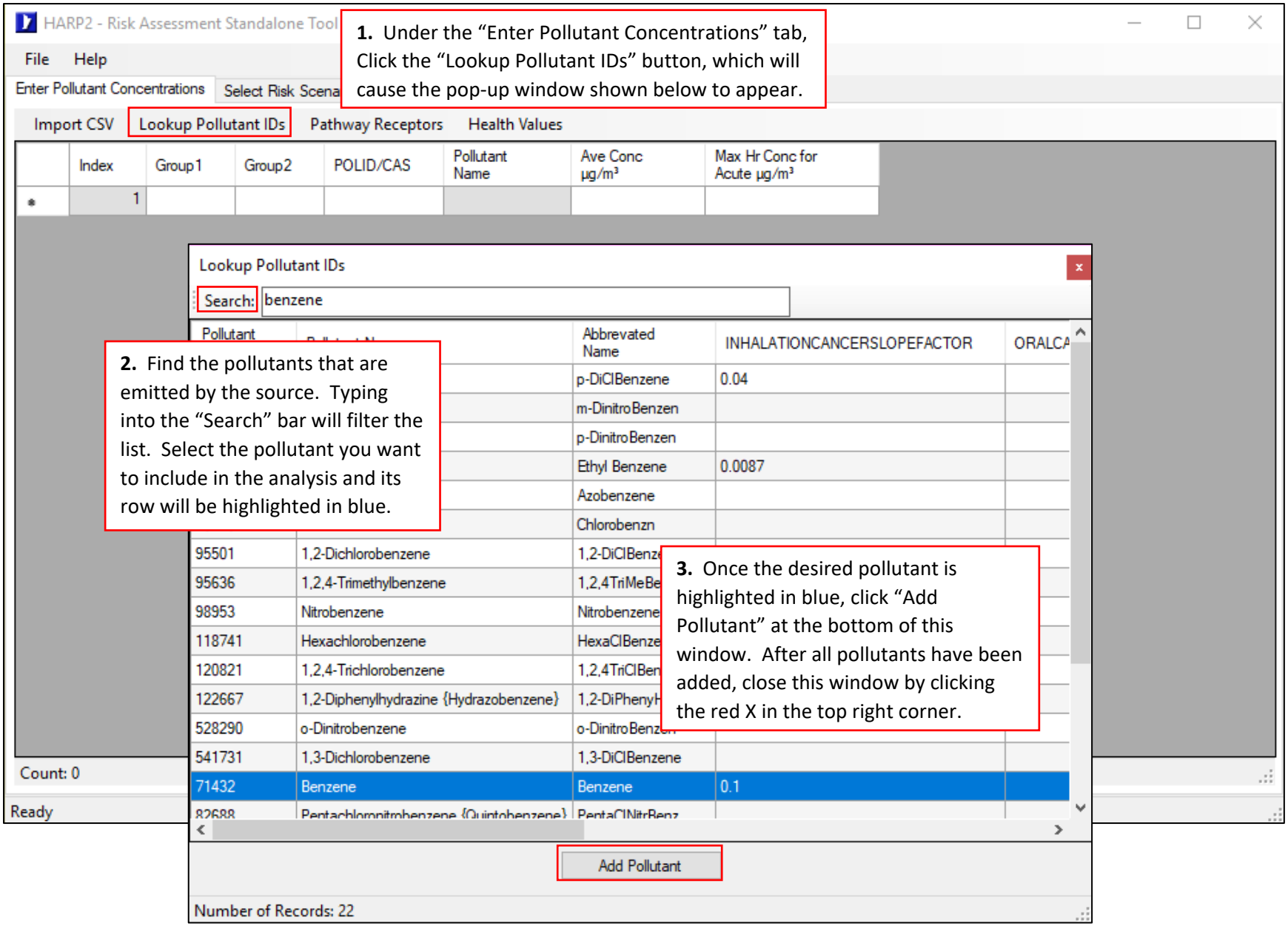
The Risk Assessment Standalone Tool (RAST) of CARB's HARP 2 calculates risk results using the same methodology as the Air Dispersion Modeling and Risk Tool module. A screenshot of the RAST is shown below. The user directly inputs the average annual and maximum hourly concentrations of each pollutant into the RAST in the "Enter Pollutant Concentrations" tab, and then selects the risk inputs for the risk analysis in the "Select Risk Scenario & Calculate Risk" tab. The risk results can then be viewed in the "View Risk Results" tab or in the .csv files that are created by the RAST. The concentrations for the PMI, MEIR and MEIW must be entered, and all of the following types of risk must be analyzed: residential cancer risk, residential chronic non-cancer risk, residential 8-hour chronic non-cancer risk (if applicable), worker cancer risk, worker chronic non-cancer risk, worker 8-hour chronic non-cancer risk, and acute non-cancer risk.

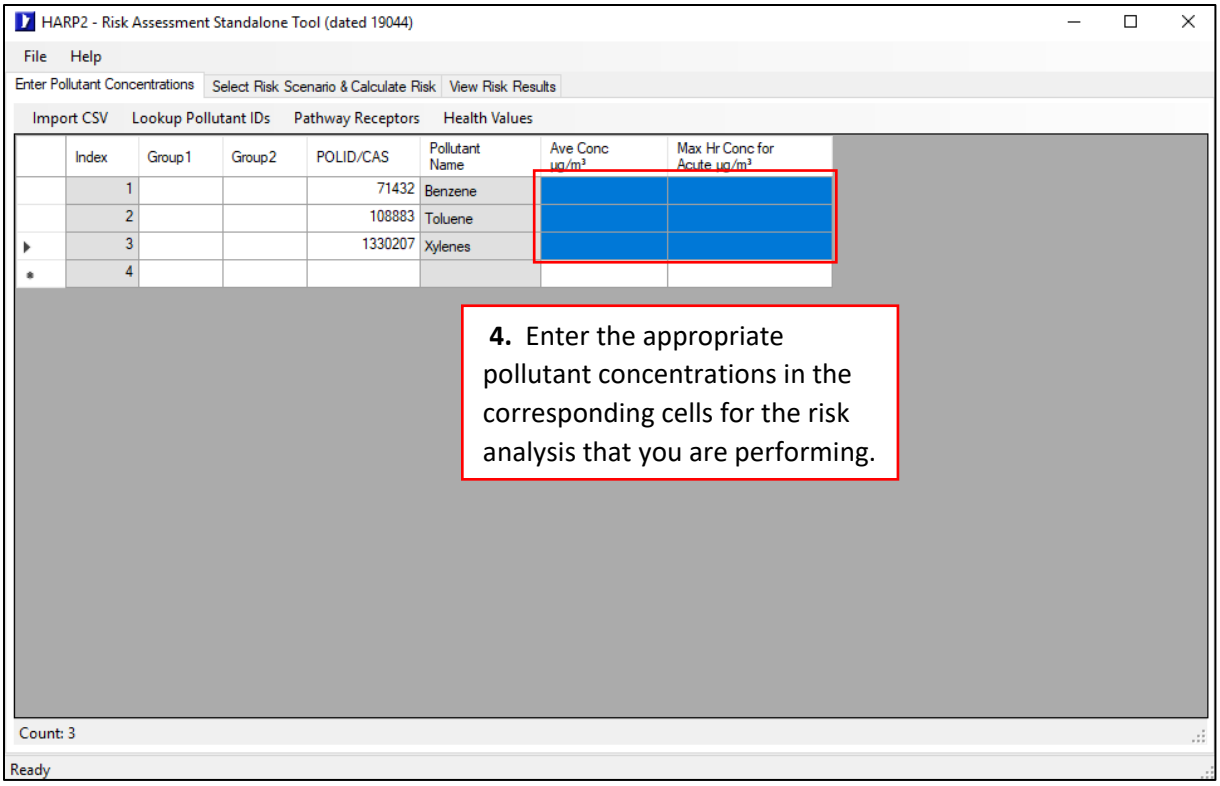


5.1 Pollutant Concentrations

Each of the emitted pollutant's concentrations must be entered in the "Enter Pollutant Concentrations" tab before performing each of the risk analyses described in Sections 5.2 through 5.7. When performing any of the residential risk analyses, the average annual concentrations corresponding to the MEIR must be used. When performing any of the worker risk analyses, the average annual concentrations corresponding to the MEIW must be used. When performing the acute non-cancer risk analysis, the maximum hourly concentrations corresponding to the PMI must be used. Because the concentrations may not be the same at the PMI, MEIR and MEIW, the user may have to return to this tab after performing one type of risk analysis and enter different concentrations before performing another type of risk analysis.

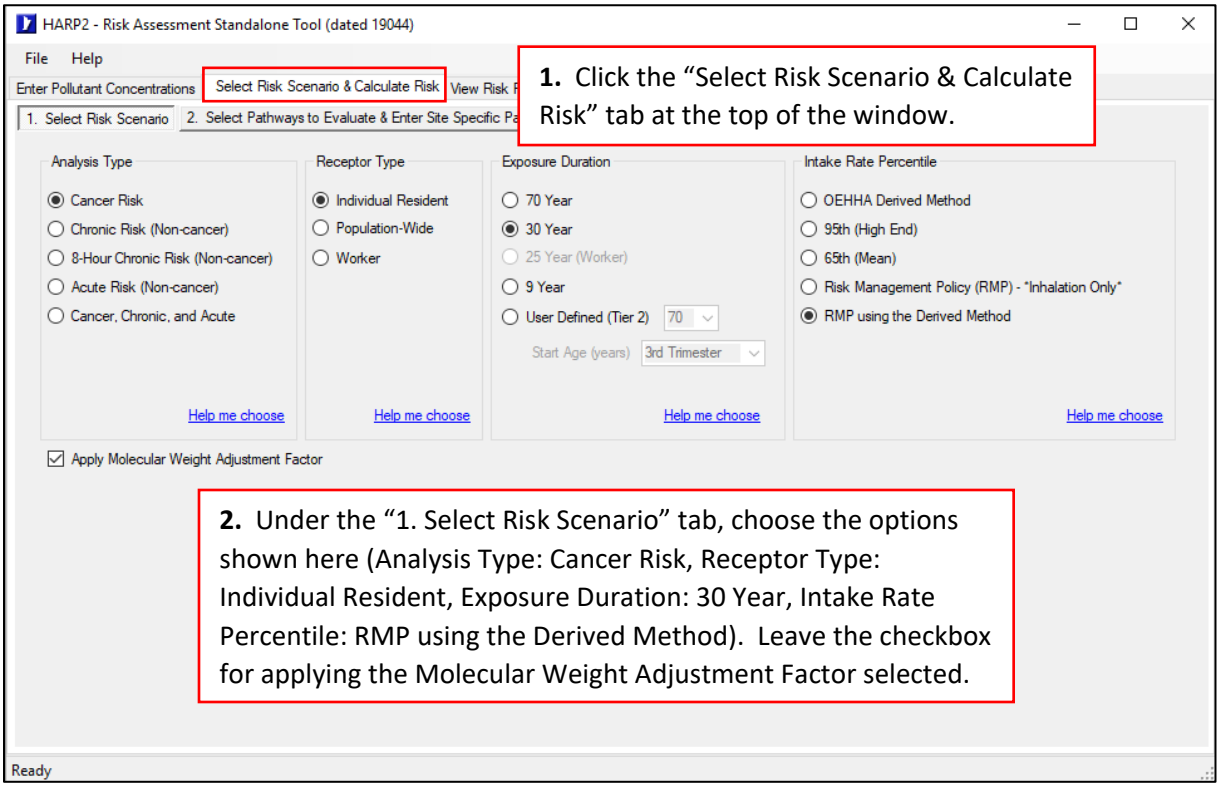
Open the RAST and follow the steps below to enter the pollutant concentrations in this tab.

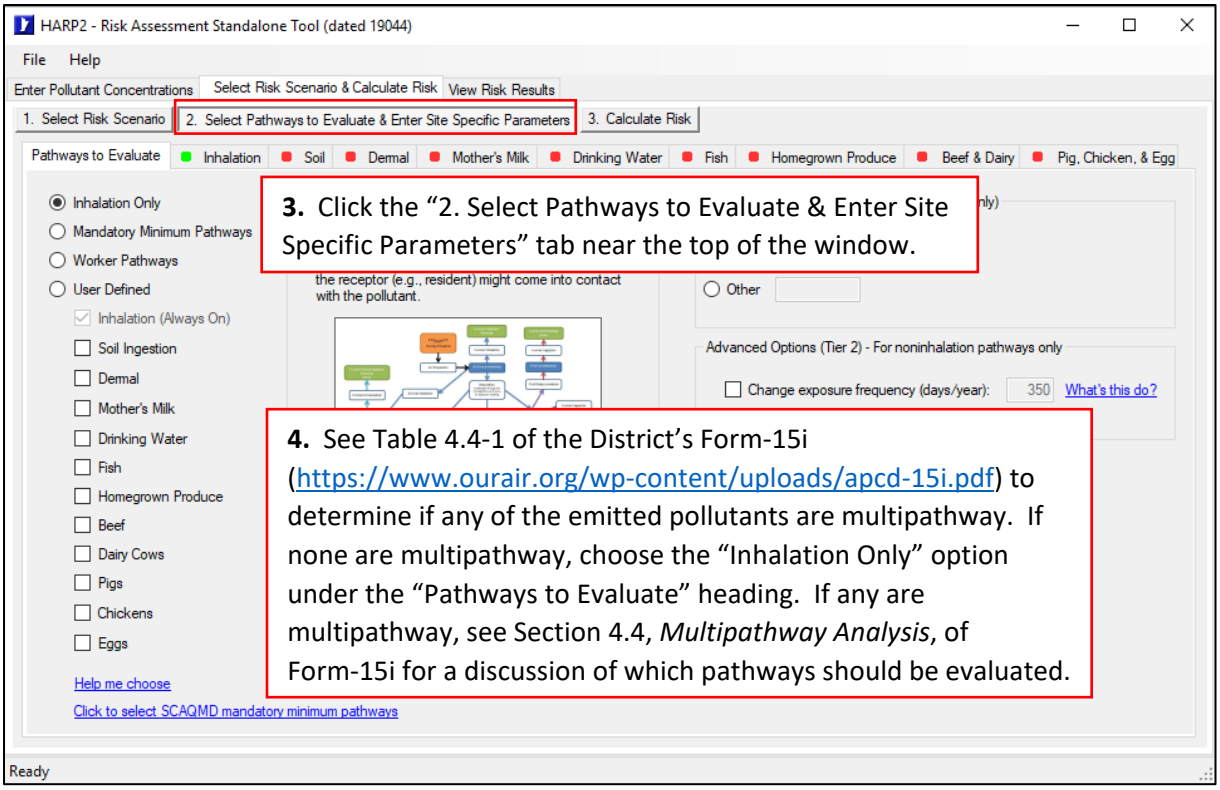

HARP2 - Risk Assessment Standalone Tool
File
Help
Enter Pollutant Concentrations
Select Risk Scena
Import CSV
Lookup Pollutant IDs
Pathway Receptors
Health Values
Index
Group1
Group2
POLID/CAS
Pollutant Name
Ave Conc µg/m³
Max Hr Conc for Acute µg/m³
1
Count: 0
Ready
1. Under the "Enter Pollutant Concentrations" tab, Click the "Lookup Pollutant IDs" button, which will cause the pop-up window shown below to appear.
2. Find the pollutants that are emitted by the source. Typing into the "Search" bar will filter the list. Select the pollutant you want to include in the analysis and its row will be highlighted in blue.
3. Once the desired pollutant is highlighted in blue, click "Add Pollutant" at the bottom of this window. After all pollutants have been added, close this window by clicking the red X in the top right corner.
Lookup Pollutant IDs
Search:
benzene
Pollutant
Abbrevated Name
INHALATIONCANCERSLOPEFACTOR
ORALCA
p-DiClBenzene
0.04
m-DinitroBenzen
p-DinitroBenzen
Ethyl Benzene
0.0087
Azobenzene
Chlorobenzn
95501
1,2-Dichlorobenzene
95636
1,2,4-Trimethylbenzene
98953
Nitrobenzene
118741
Hexachlorobenzene
120821
1,2,4-Trichlorobenzene
122667
1,2-Diphenylhydrazine {Hydrazobenzene}
528290
o-Dinitrobenzene
541731
1,3-Dichlorobenzene
1,3-DiClBenzene
71432
Benzene
Benzene
0.1
Add Pollutant
Number of Records: 22



5.2 MEIR Cancer Risk Analysis

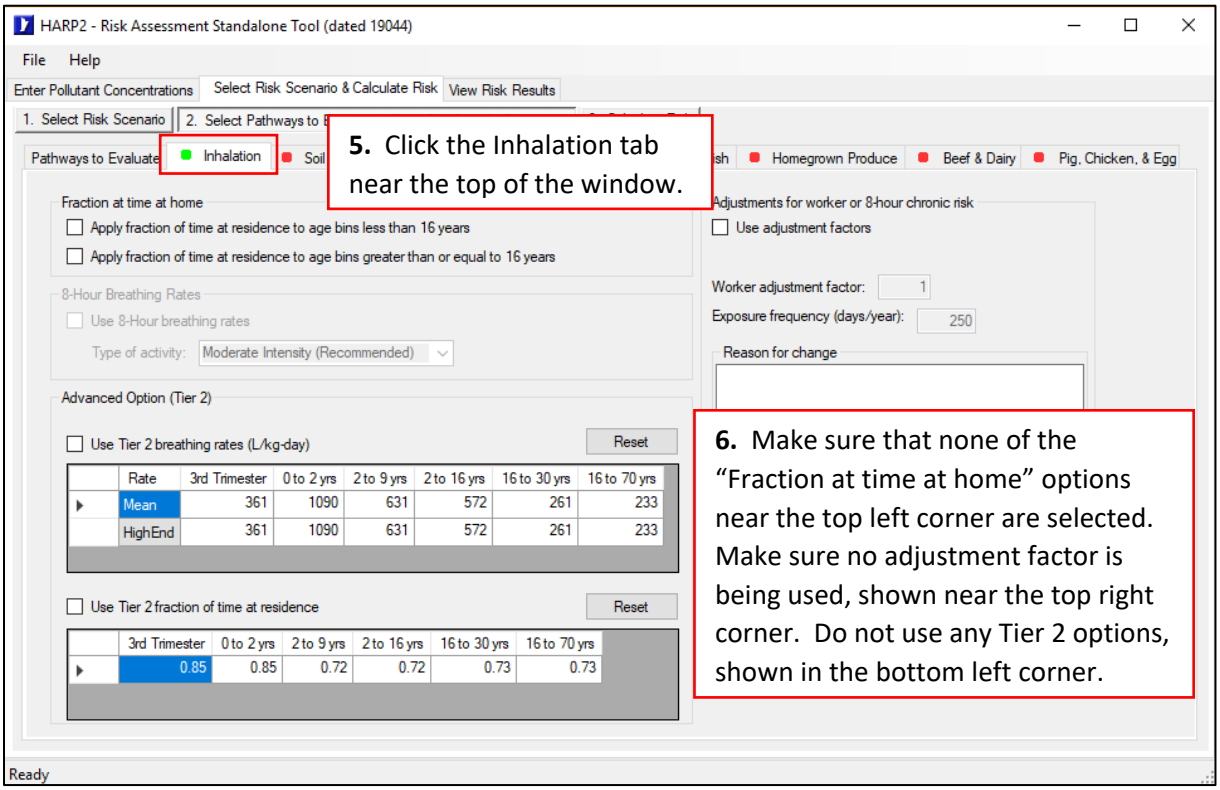
Follow the steps below to perform the cancer risk analysis for the MEIR:





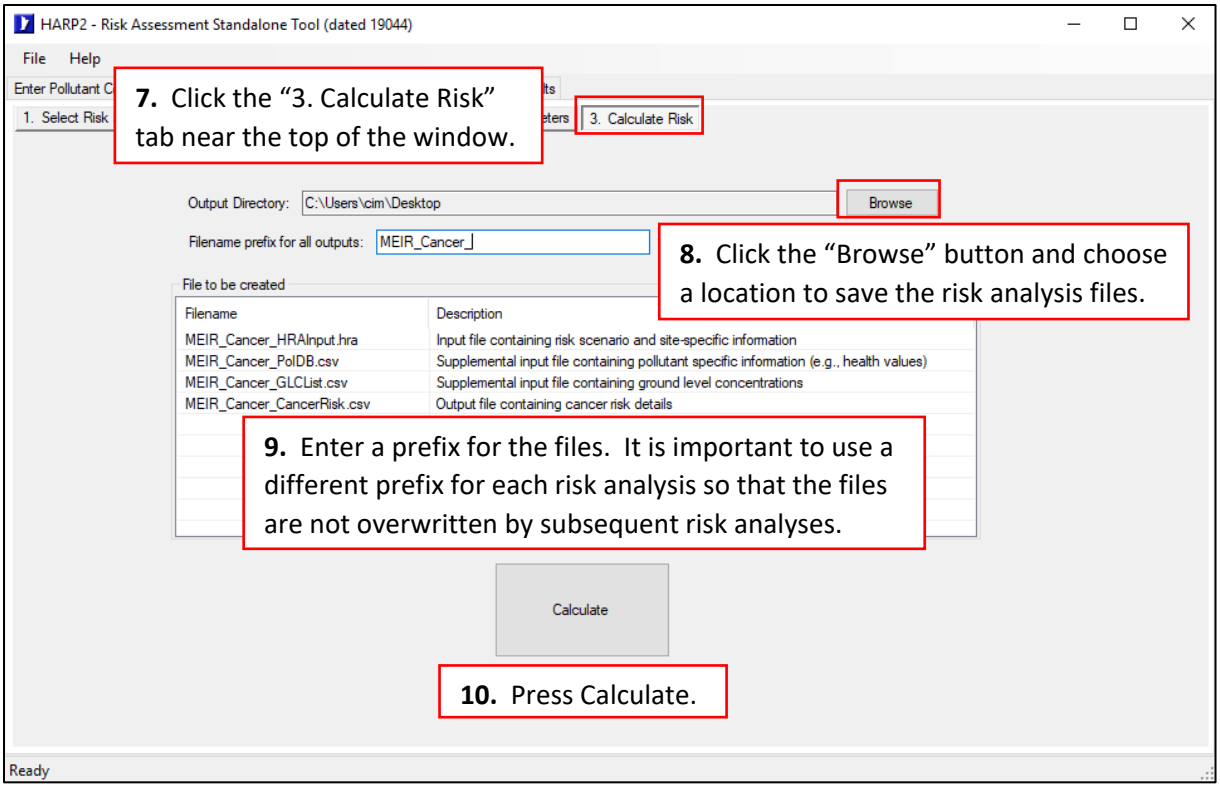
3. Click the "2. Select Pathways to Evaluate & Enter Site Specific Parameters" tab near the top of the window.

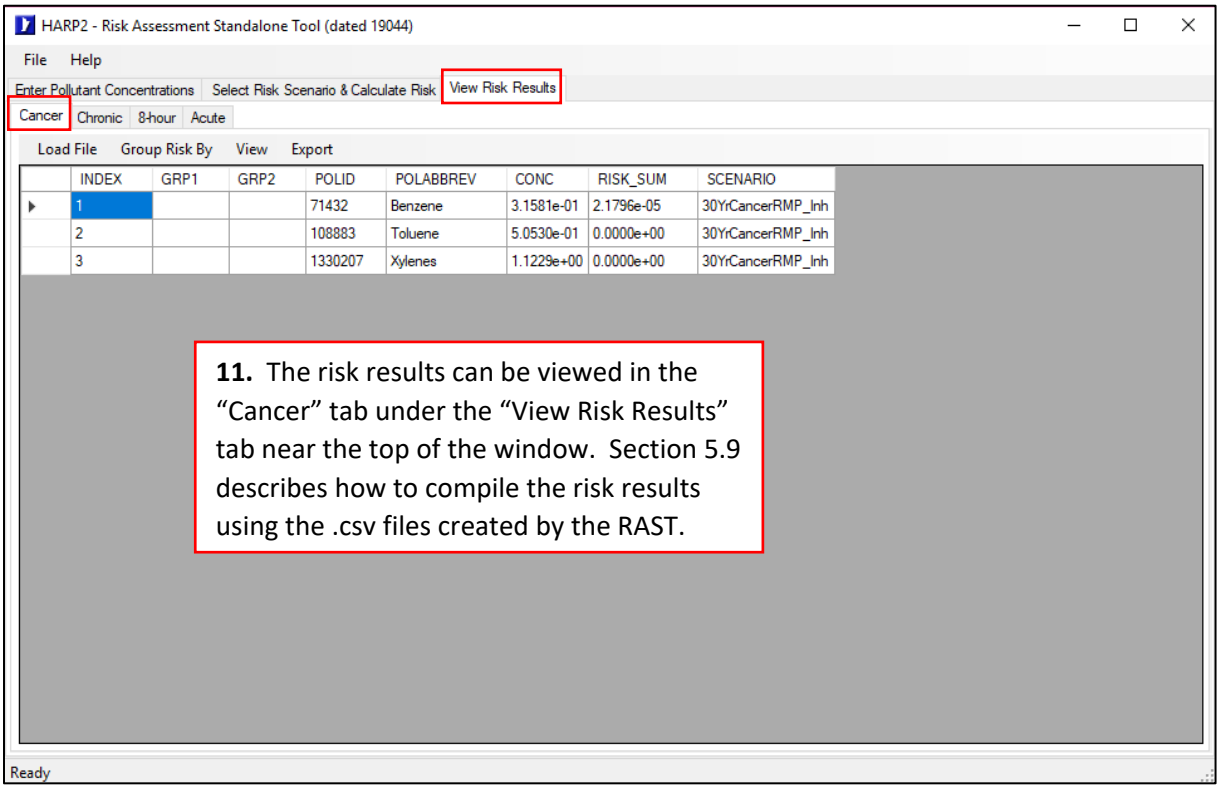
4. See Table 4.4-1 of the District's Form-15i (https://www.ourair.org/wp-content/uploads/apcd-15i.pdf) to determine if any of the emitted pollutants are multipathway. If none are multipathway, choose the "Inhalation Only" option under the "Pathways to Evaluate" heading. If any are multipathway, see Section 4.4, *Multipathway Analysis*, of Form-15i for a discussion of which pathways should be evaluated.



5. Click the Inhalation tab near the top of the window.

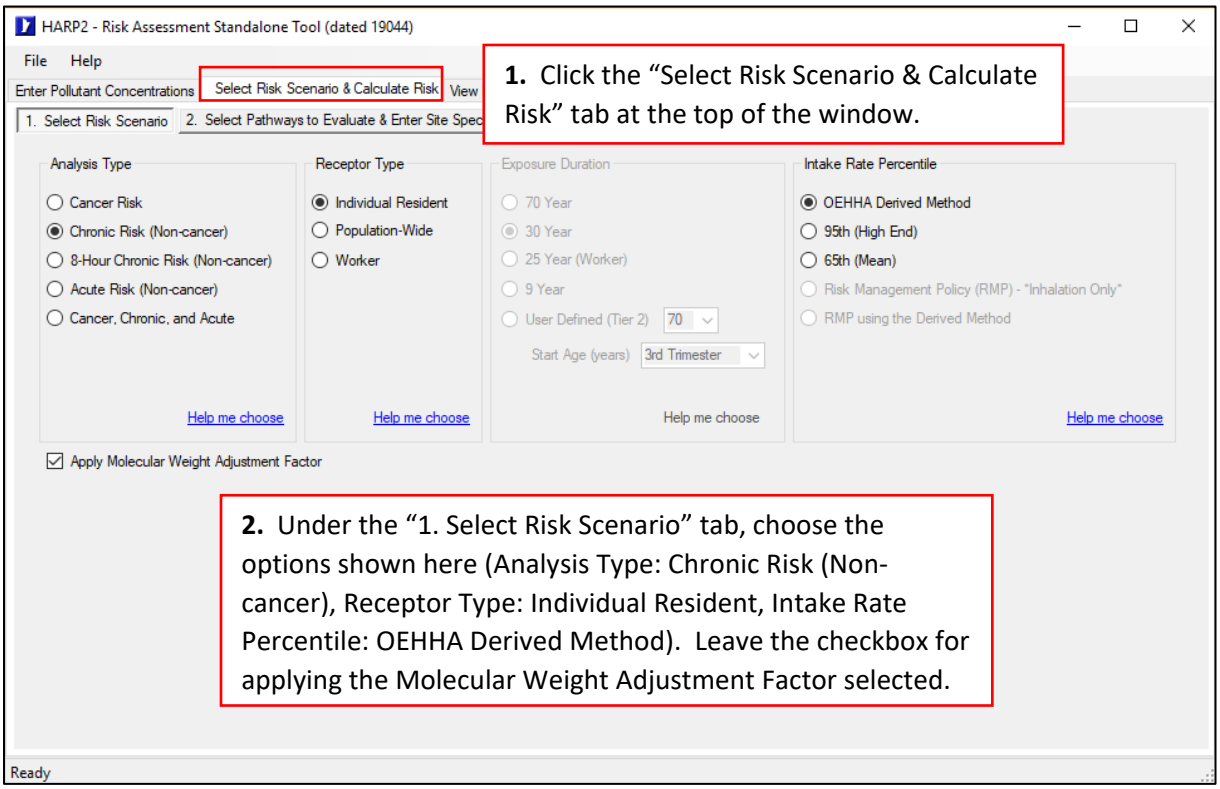
6. Make sure that none of the "Fraction at time at home" options near the top left corner are selected. Make sure no adjustment factor is being used, shown near the top right corner. Do not use any Tier 2 options, shown in the bottom left corner.

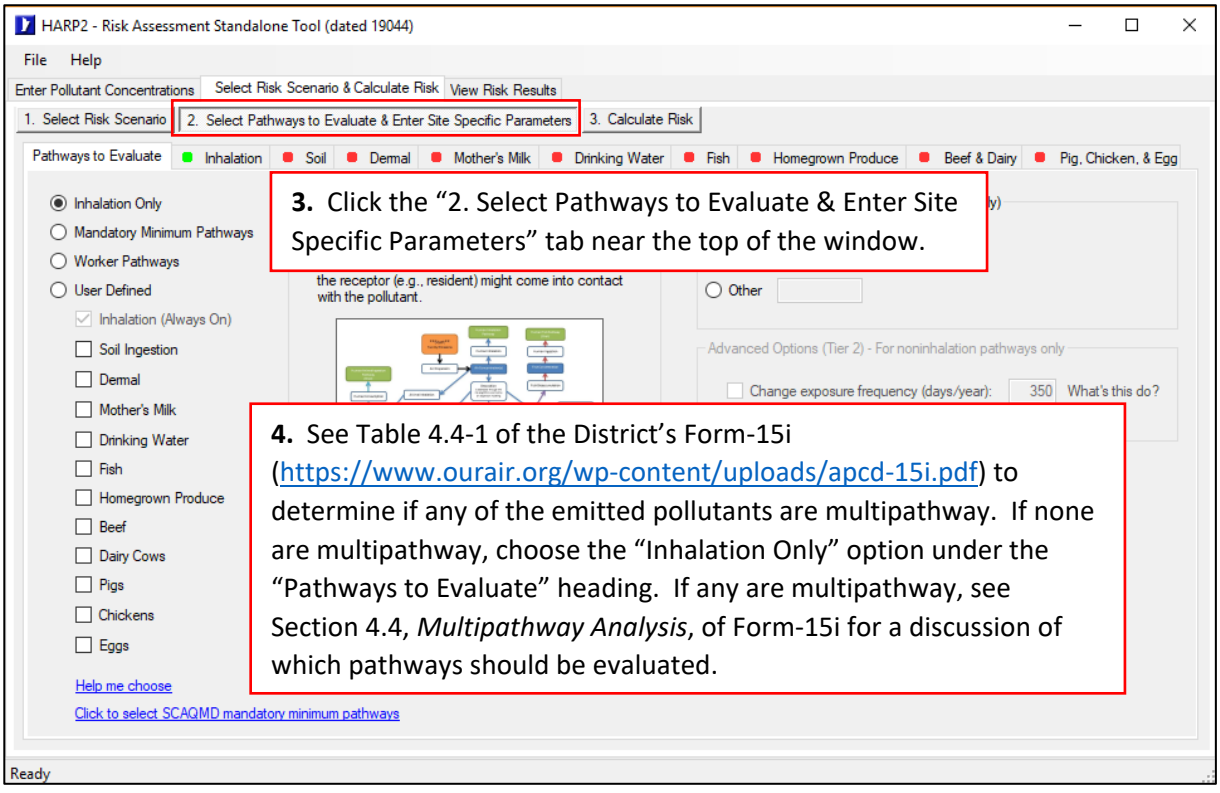

HARP2 - Risk Assessment Standalone Tool (dated 19044)
File
Help
Enter Pollutant C
1. Select Risk
3. Calculate Risk
7. Click the "3. Calculate Risk" tab near the top of the window.
Output Directory:
C:\Users\cim\Desktop
Browse
Filename prefix for all outputs:
MEIR_Cancer_
8. Click the "Browse" button and choose a location to save the risk analysis files.
File to be created
Filename
Description
MEIR_Cancer_HRAInput.hra
Input file containing risk scenario and site-specific information
MEIR_Cancer_PolDB.csv
Supplemental input file containing pollutant specific information (e.g., health values)
MEIR_Cancer_GLCList.csv
Supplemental input file containing ground level concentrations
MEIR_Cancer_CancerRisk.csv
Output file containing cancer risk details
9. Enter a prefix for the files. It is important to use a different prefix for each risk analysis so that the files are not overwritten by subsequent risk analyses.
Calculate
10. Press Calculate.
Ready

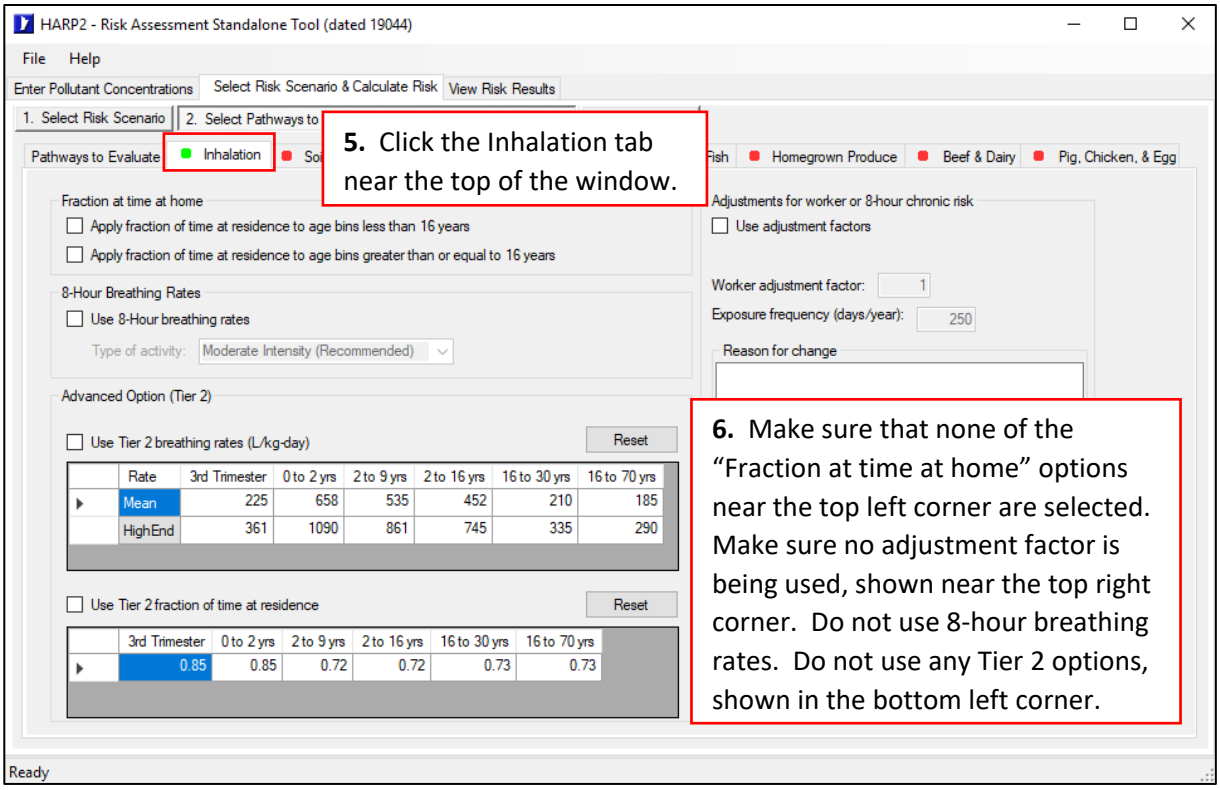

HARP2 - Risk Assessment Standalone Tool (dated 19044)
File
Help
Enter Pollutant Concentrations
Select Risk Scenario & Calculate Risk
View Risk Results
Cancer
Chronic
8-hour
Acute
Load File
Group Risk By
View
Export
INDEX GRP1 GRP2 POLID POLABBREV CONC RISK_SUM SCENARIO
1 71432 Benzene 3.1581e-01 2.1796e-05 30YrCancerRMP_Inh
2 108883 Toluene 5.0530e-01 0.0000e+00 30YrCancerRMP_Inh
3 1330207 Xylenes 1.1229e+00 0.0000e+00 30YrCancerRMP_Inh
11. The risk results can be viewed in the "Cancer" tab under the "View Risk Results" tab near the top of the window. Section 5.9 describes how to compile the risk results using the .csv files created by the RAST.
Ready

5.3 MEIR Chronic Non-Cancer Risk Analysis

Follow the steps below to perform the chronic non-cancer risk analysis for the MEIR:

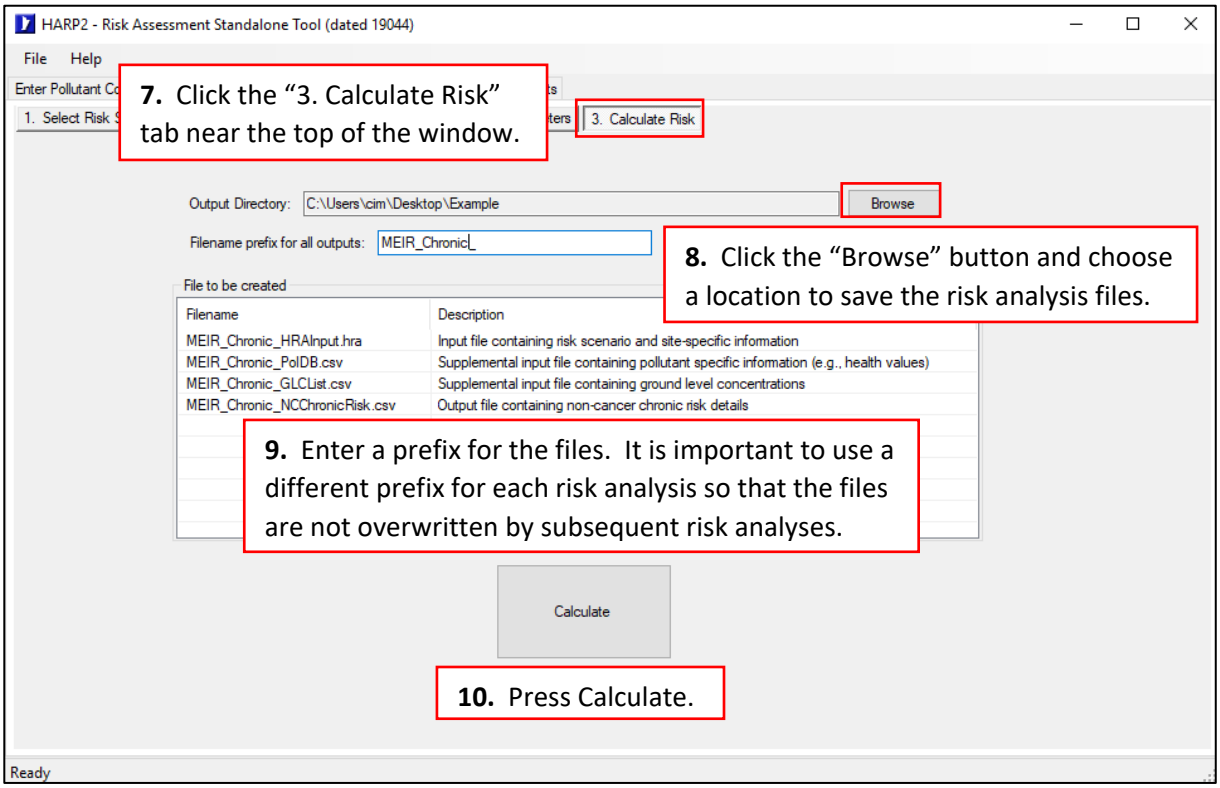






5. Click the Inhalation tab near the top of the window.

6. Make sure that none of the "Fraction at time at home" options near the top left corner are selected. Make sure no adjustment factor is being used, shown near the top right corner. Do not use 8-hour breathing rates. Do not use any Tier 2 options, shown in the bottom left corner.

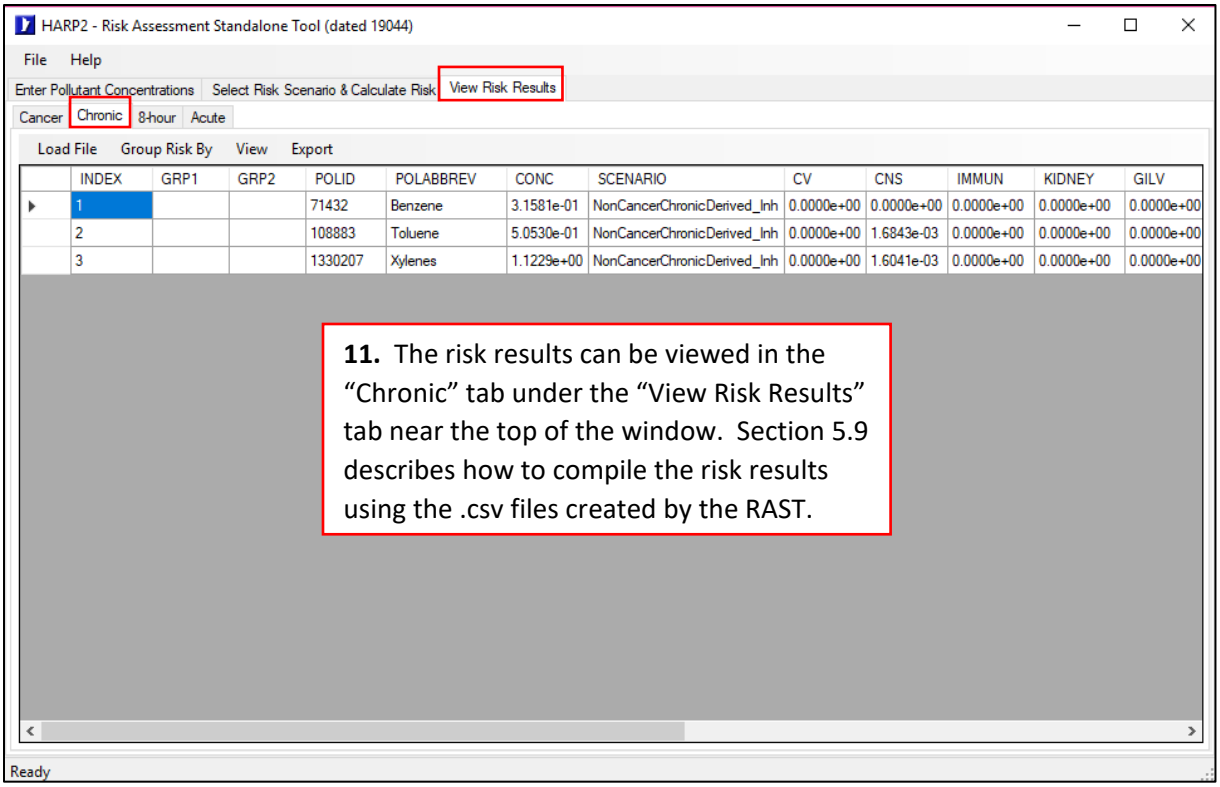


7. Click the "3. Calculate Risk" tab near the top of the window.

8. Click the "Browse" button and choose a location to save the risk analysis files.

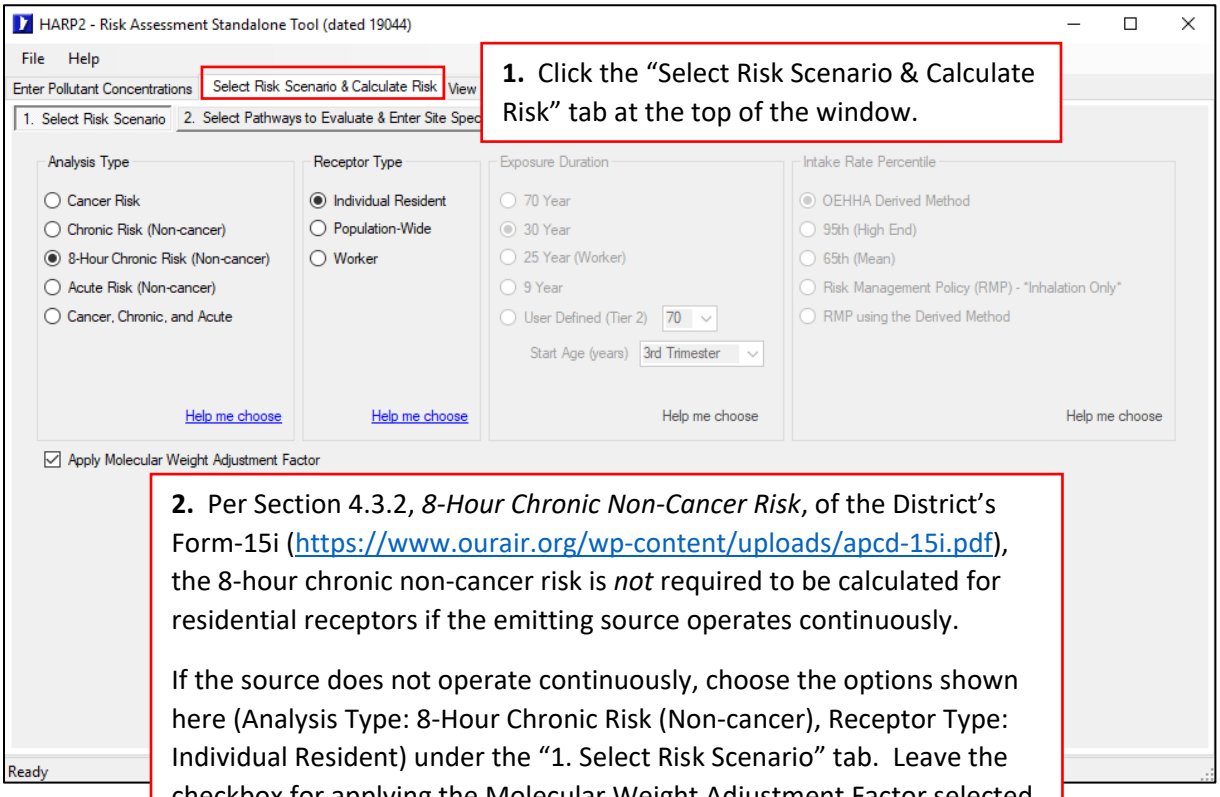
9. Enter a prefix for the files. It is important to use a different prefix for each risk analysis so that the files are not overwritten by subsequent risk analyses.

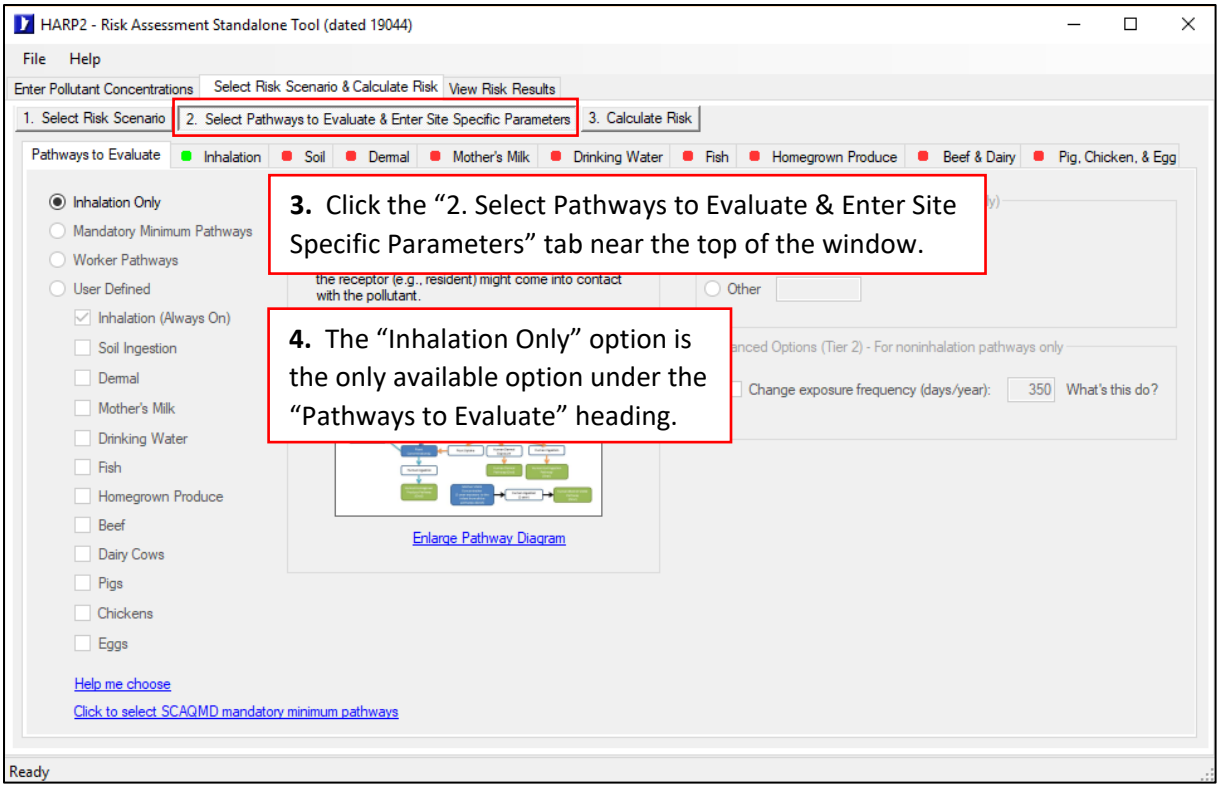
10. Press Calculate.



5.4 *MEIR 8-Hour Chronic Non-Cancer Risk Analysis*

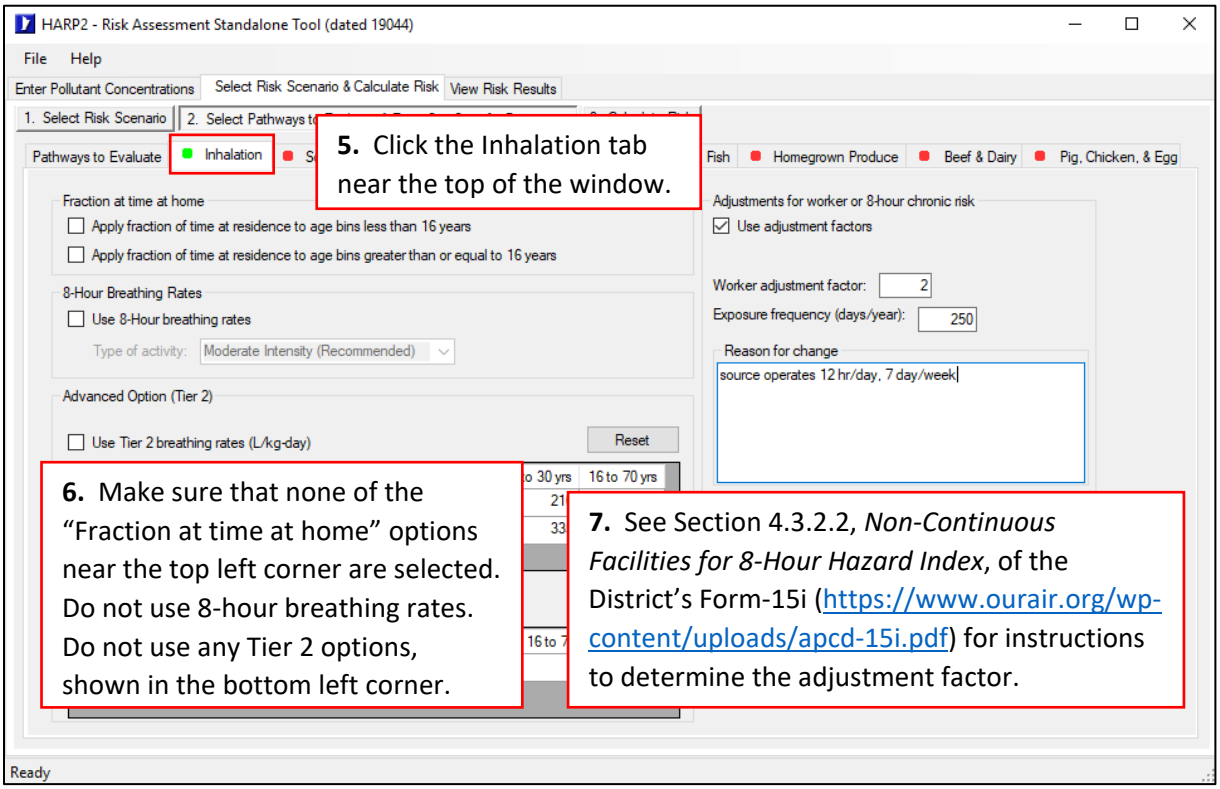
Follow the steps below to perform the 8-hour chronic non-cancer risk analysis for the MEIR:





3. Click the "2. Select Pathways to Evaluate & Enter Site Specific Parameters" tab near the top of the window.

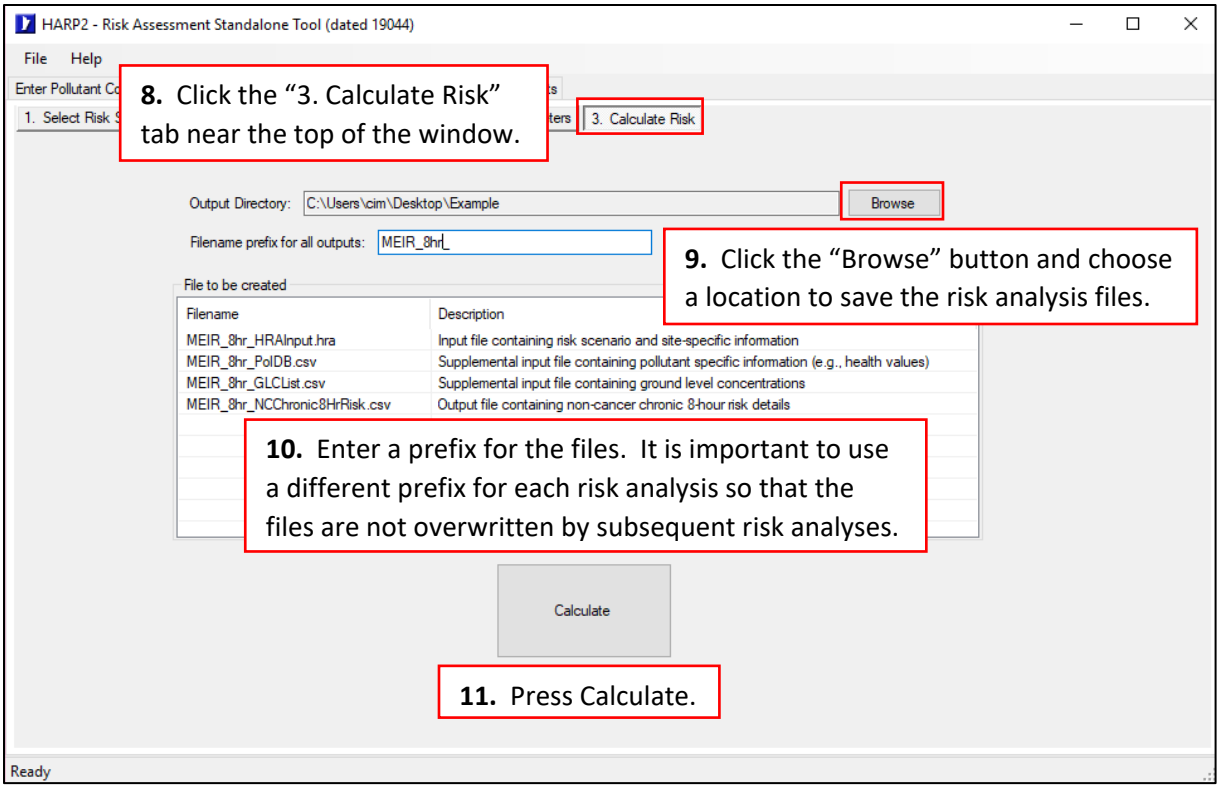
4. The "Inhalation Only" option is the only available option under the "Pathways to Evaluate" heading.

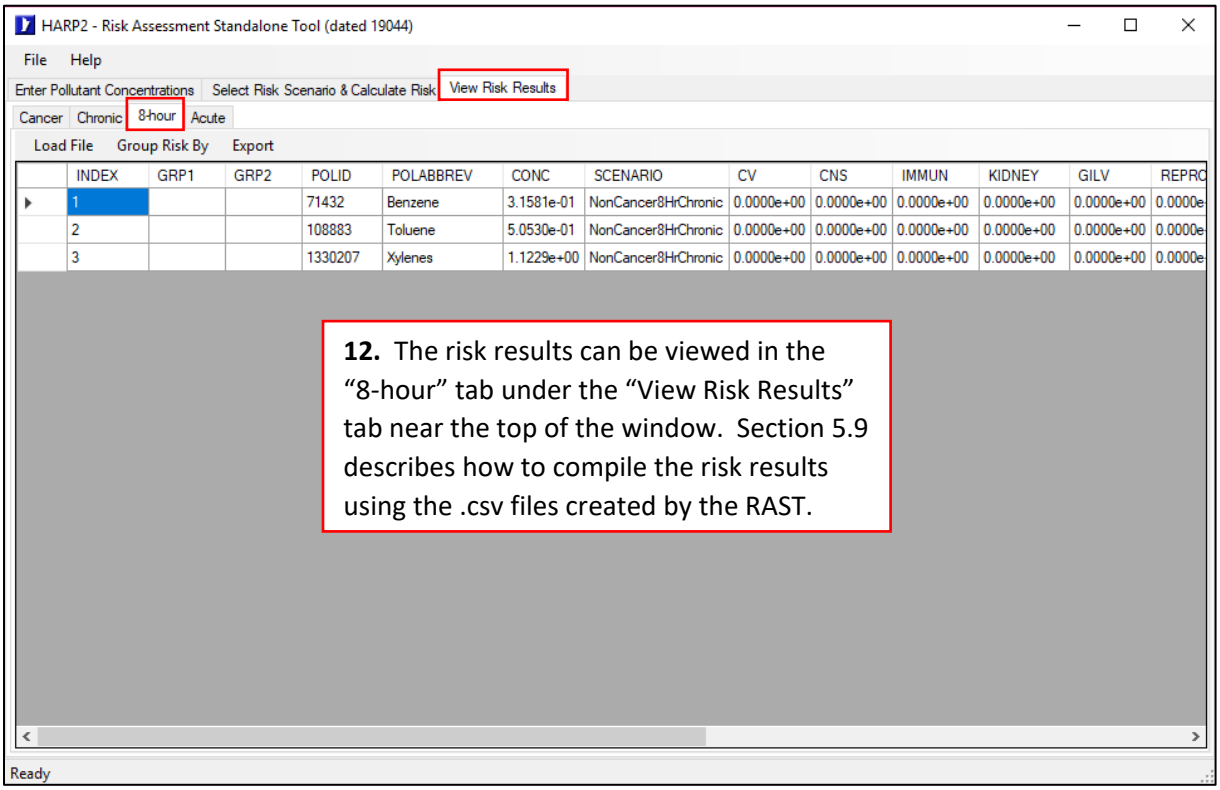


5. Click the Inhalation tab near the top of the window.

6. Make sure that none of the "Fraction at time at home" options near the top left corner are selected. Do not use 8-hour breathing rates. Do not use any Tier 2 options, shown in the bottom left corner.

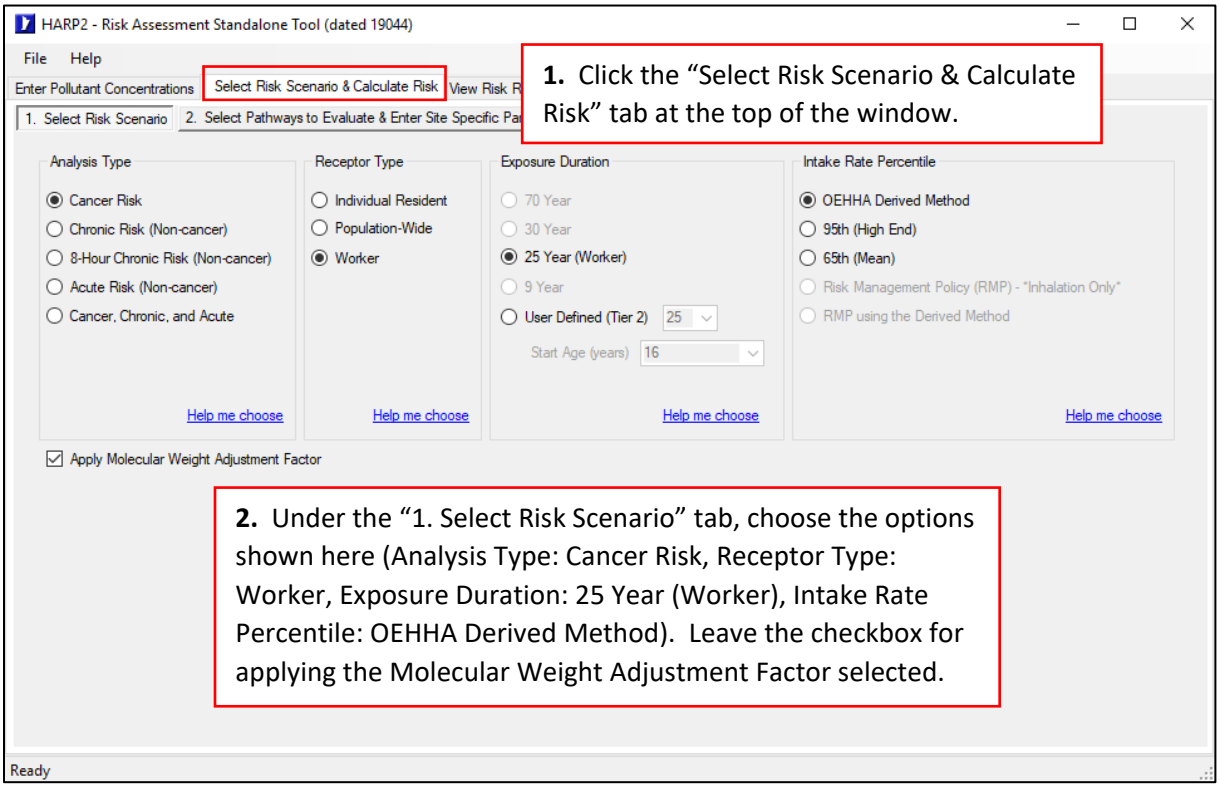
7. See Section 4.3.2.2, *Non-Continuous Facilities for 8-Hour Hazard Index*, of the District's Form-15i (https://www.ourair.org/wp-content/uploads/apcd-15i.pdf) for instructions to determine the adjustment factor.

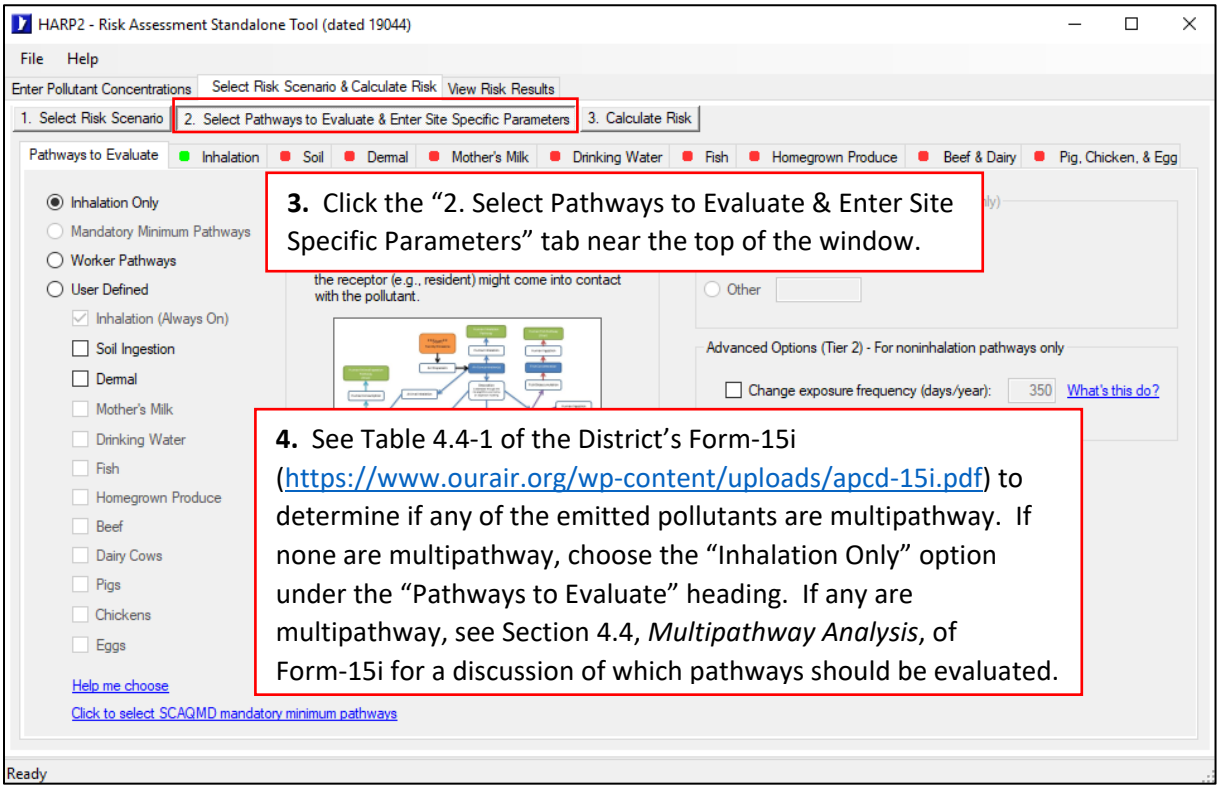

HARP2 - Risk Assessment Standalone Tool (dated 19044)
File
Help
1. Select Risk
3. Calculate Risk
8. Click the "3. Calculate Risk" tab near the top of the window.
Output Directory:
C:\Users\cim\Desktop\Example
Browse
Filename prefix for all outputs:
MEIR_8hr_
9. Click the "Browse" button and choose a location to save the risk analysis files.
File to be created
Filename
Description
MEIR_8hr_HRAInput.hra
Input file containing risk scenario and site-specific information
MEIR_8hr_PolDB.csv
Supplemental input file containing pollutant specific information (e.g., health values)
MEIR_8hr_GLCList.csv
Supplemental input file containing ground level concentrations
MEIR_8hr_NCChronic8HrRisk.csv
Output file containing non-cancer chronic 8-hour risk details
10. Enter a prefix for the files. It is important to use a different prefix for each risk analysis so that the files are not overwritten by subsequent risk analyses.
Calculate
11. Press Calculate.
Ready

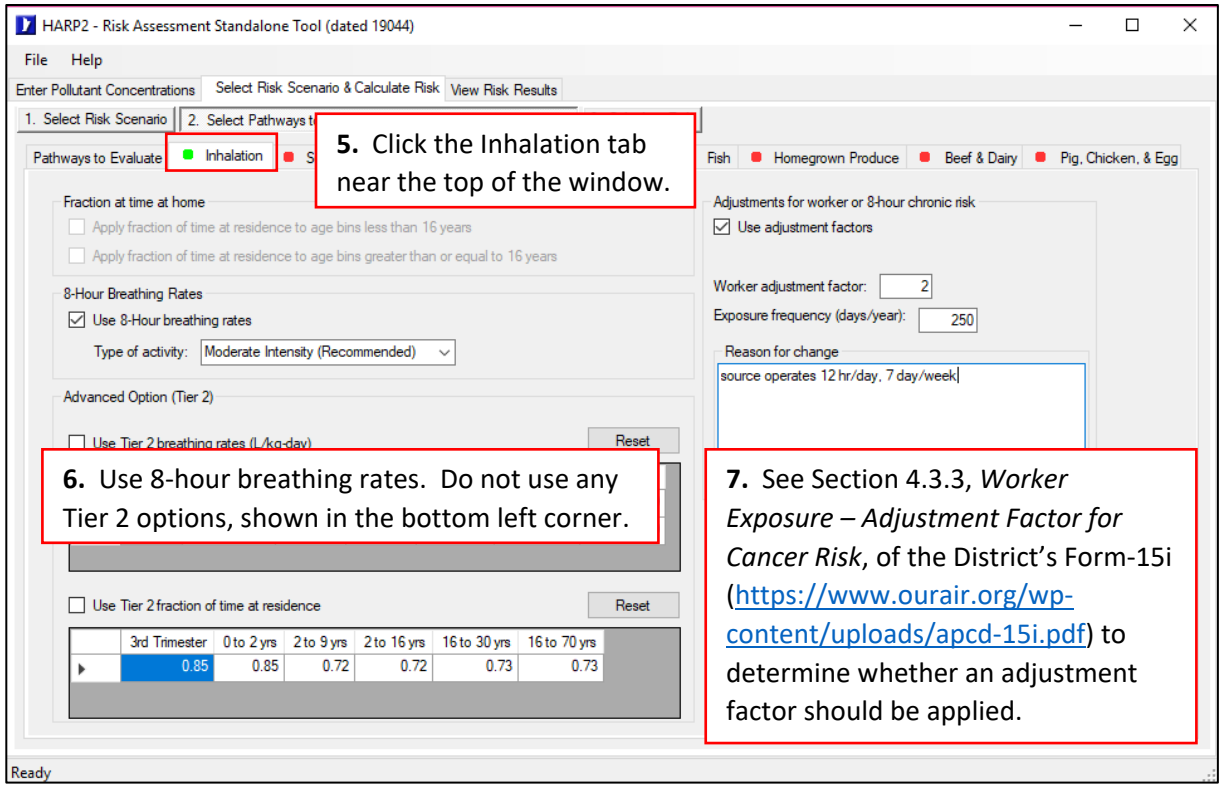

HARP2 - Risk Assessment Standalone Tool (dated 19044)
File
Help
Enter Pollutant Concentrations
Select Risk Scenario & Calculate Risk
View Risk Results
Cancer
Chronic
8-hour
Acute
Load File
Group Risk By
Export
INDEX GRP1 GRP2 POLID POLABBREV CONC SCENARIO CV CNS IMMUN KIDNEY GILV REPRO
1 71432 Benzene 3.1581e-01 NonCancer8HrChronic 0.0000e+00 0.0000e+00 0.0000e+00 0.0000e+00 0.0000e+00 0.0000e
2 108883 Toluene 5.0530e-01 NonCancer8HrChronic 0.0000e+00 0.0000e+00 0.0000e+00 0.0000e+00 0.0000e+00 0.0000e
3 1330207 Xylenes 1.1229e+00 NonCancer8HrChronic 0.0000e+00 0.0000e+00 0.0000e+00 0.0000e+00 0.0000e+00 0.0000e
12. The risk results can be viewed in the "8-hour" tab under the "View Risk Results" tab near the top of the window. Section 5.9 describes how to compile the risk results using the .csv files created by the RAST.
Ready

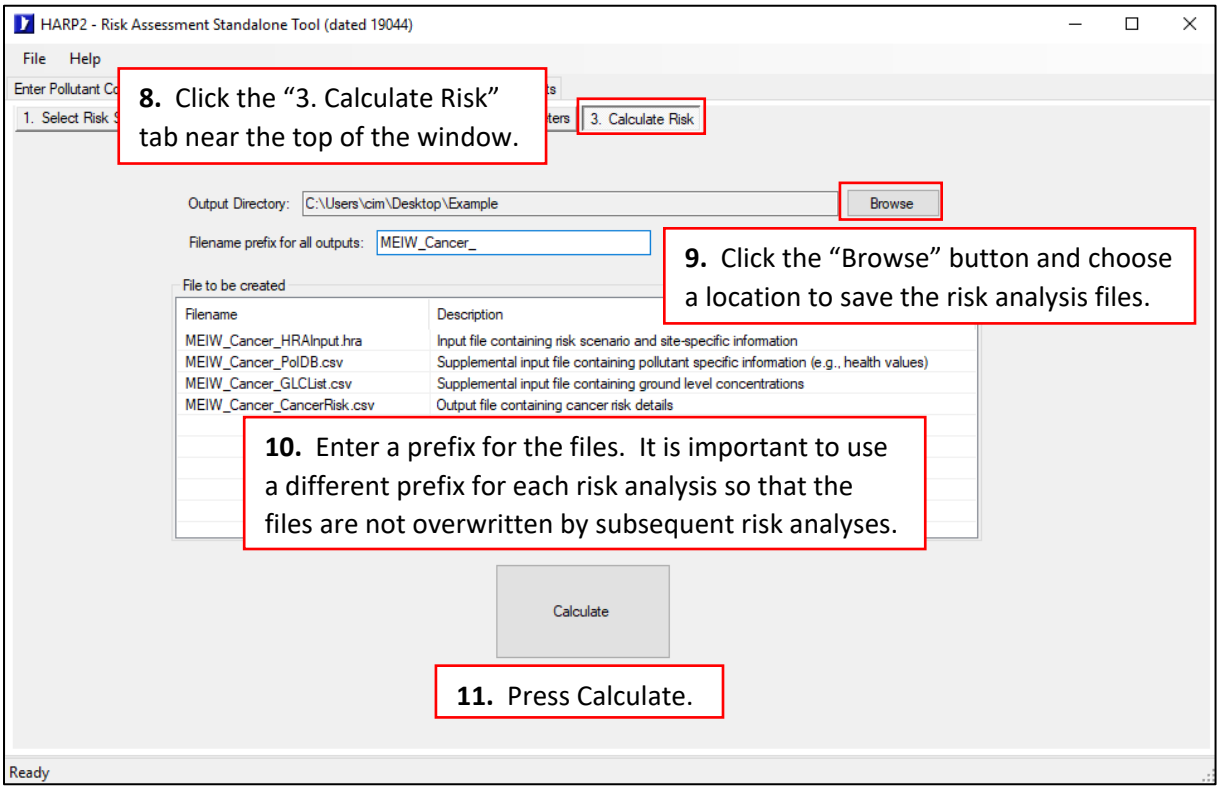
5.5 *MEIW Cancer Risk Analysis*

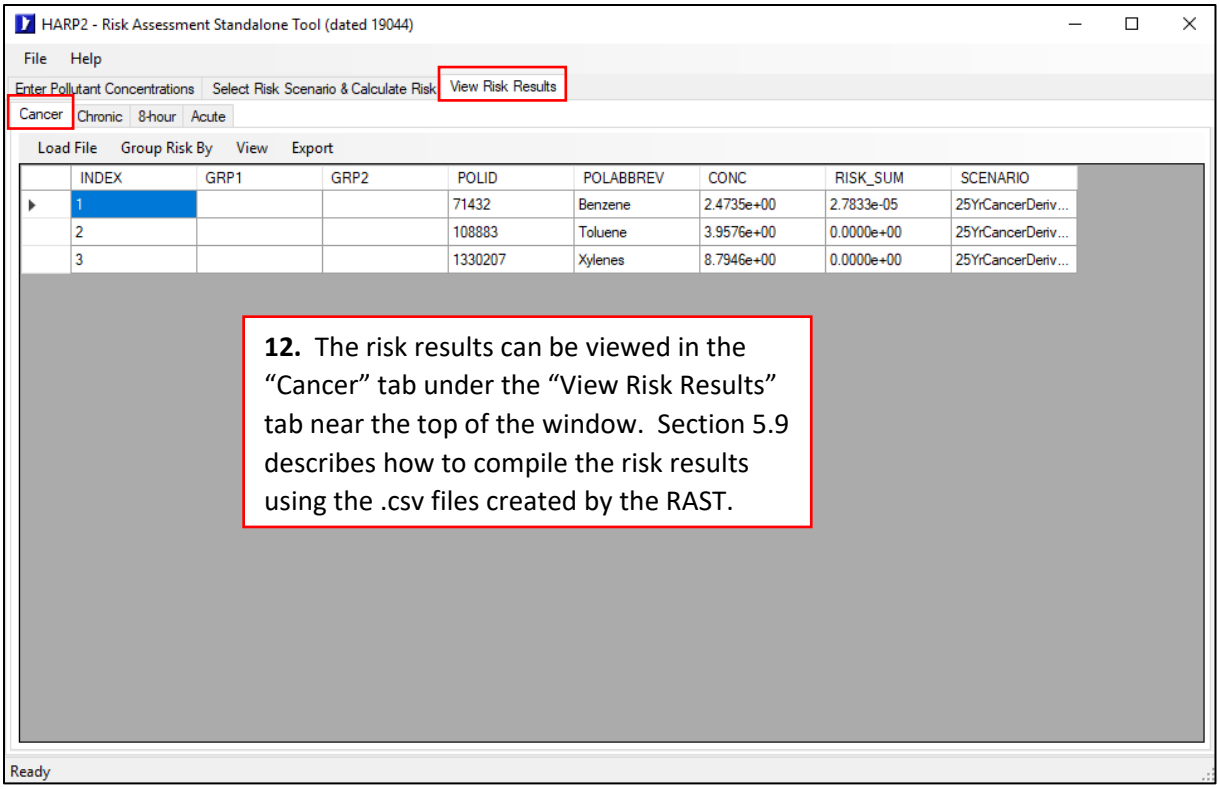
Follow the steps below to perform the cancer risk analysis for the MEIW:





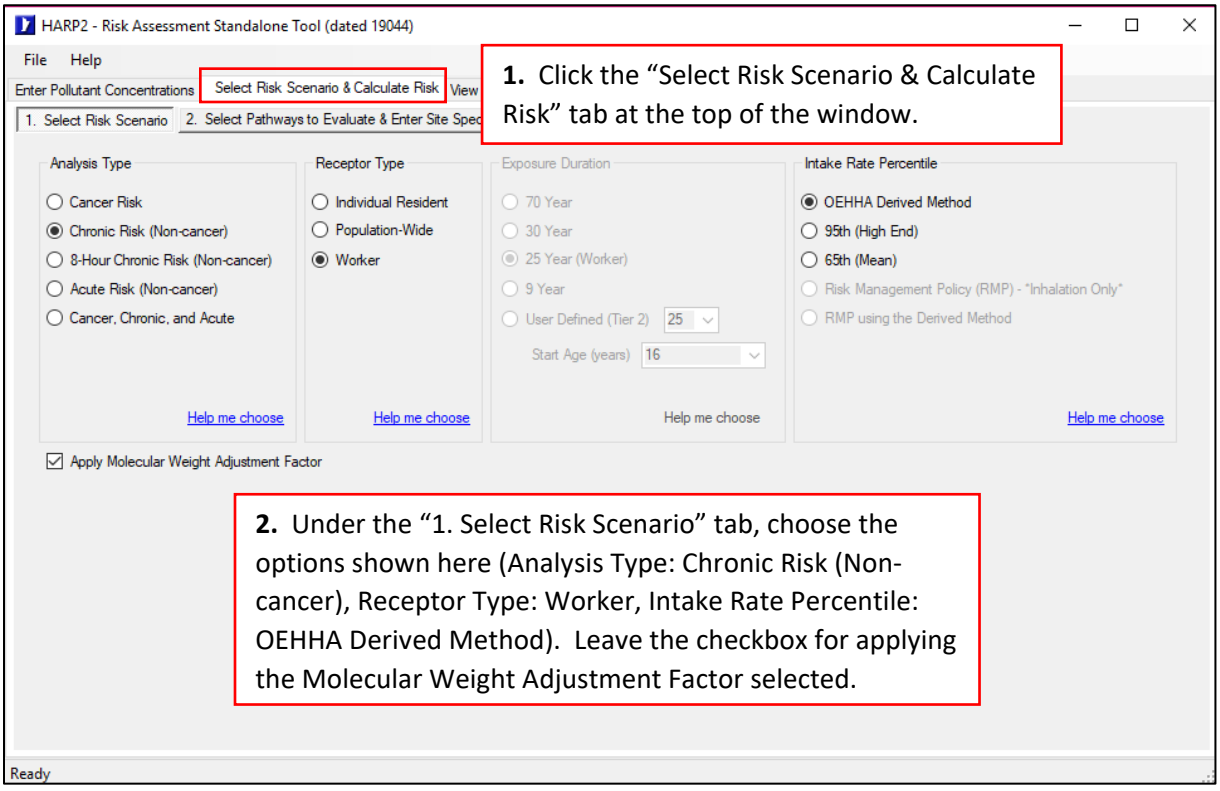

HARP2 - Risk Assessment Standalone Tool (dated 19044)
File
Help
Enter Pollutant Concentrations
Select Risk Scenario & Calculate Risk
View Risk Results
1. Select Risk Scenario
2. Select Pathways
Pathways to Evaluate
Inhalation
Fish
Homegrown Produce
Beef & Dairy
Pig, Chicken, & Egg
Fraction at time at home
Apply fraction of time at residence to age bins less than 16 years
Apply fraction of time at residence to age bins greater than or equal to 16 years
8-Hour Breathing Rates
Use 8-Hour breathing rates
Type of activity:
Moderate Intensity (Recommended)
Advanced Option (Tier 2)
Use Tier 2 breathing rates (L/kg-day)
Reset
Use Tier 2 fraction of time at residence
Reset
3rd Trimester
0 to 2 yrs
2 to 9 yrs
2 to 16 yrs
16 to 30 yrs
16 to 70 yrs
0.85
0.85
0.72
0.72
0.73
0.73
Adjustments for worker or 8-hour chronic risk
Use adjustment factors
Worker adjustment factor:
2
Exposure frequency (days/year):
250
Reason for change
source operates 12 hr/day, 7 day/week
Ready
5. Click the Inhalation tab near the top of the window.
6. Use 8-hour breathing rates. Do not use any Tier 2 options, shown in the bottom left corner.
7. See Section 4.3.3, Worker Exposure – Adjustment Factor for Cancer Risk, of the District's Form-15i (https://www.ourair.org/wp-content/uploads/apcd-15i.pdf) to determine whether an adjustment factor should be applied.

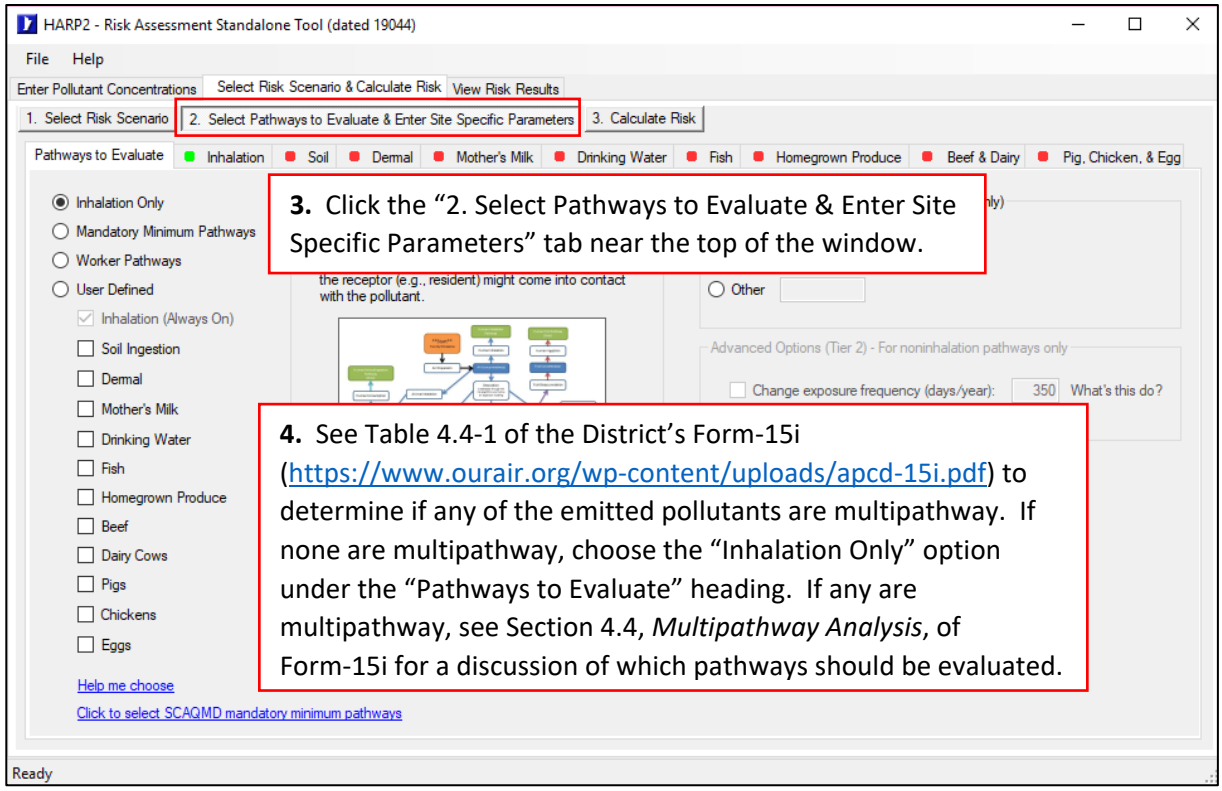

HARP2 - Risk Assessment Standalone Tool (dated 19044)
File
Help
3. Calculate Risk
Output Directory:
C:\Users\cim\Desktop\Example
Browse
Filename prefix for all outputs:
MEIW_Cancer_
File to be created
Filename
Description
MEIW_Cancer_HRAInput.hra
Input file containing risk scenario and site-specific information
MEIW_Cancer_PolDB.csv
Supplemental input file containing pollutant specific information (e.g., health values)
MEIW_Cancer_GLCList.csv
Supplemental input file containing ground level concentrations
MEIW_Cancer_CancerRisk.csv
Output file containing cancer risk details
Calculate
Ready
8. Click the "3. Calculate Risk" tab near the top of the window.
9. Click the "Browse" button and choose a location to save the risk analysis files.
10. Enter a prefix for the files. It is important to use a different prefix for each risk analysis so that the files are not overwritten by subsequent risk analyses.
11. Press Calculate.



5.6 *MEIW Chronic Non-Cancer Risk Analysis*

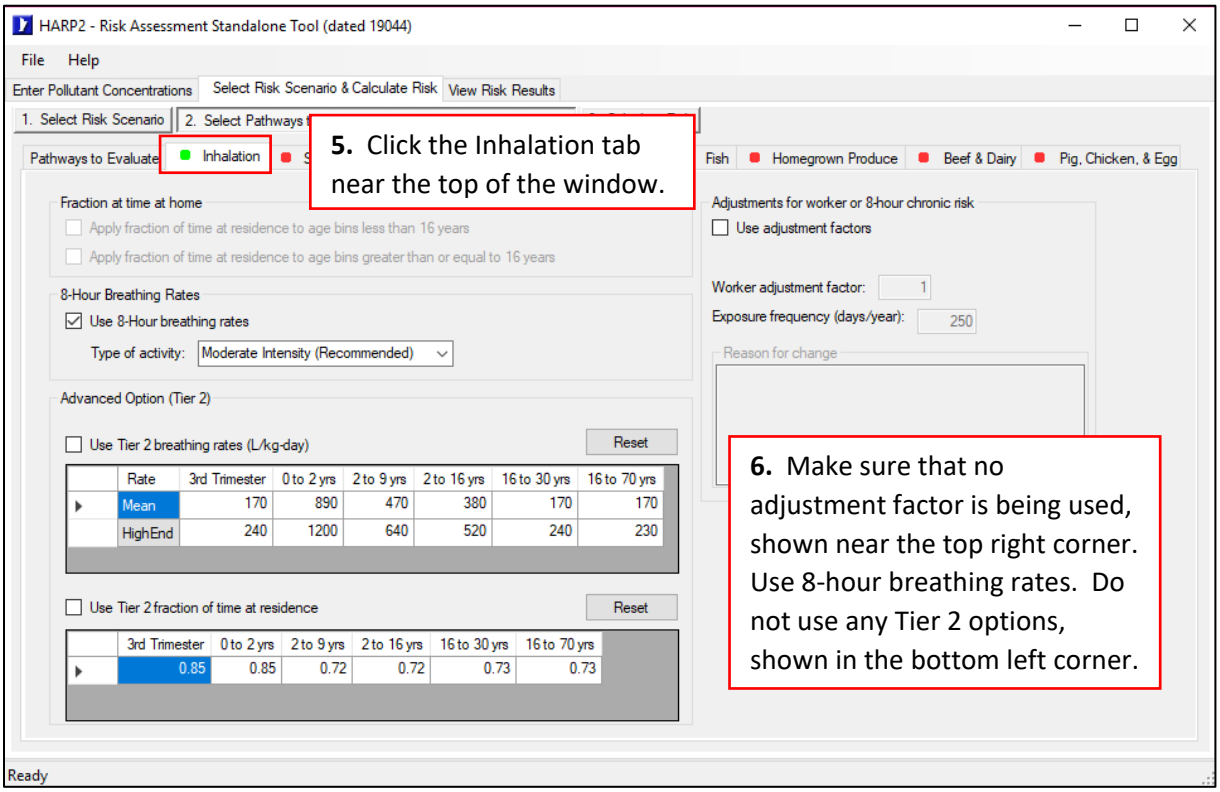
Follow the steps below to perform the chronic non-cancer risk analysis for the MEIW:





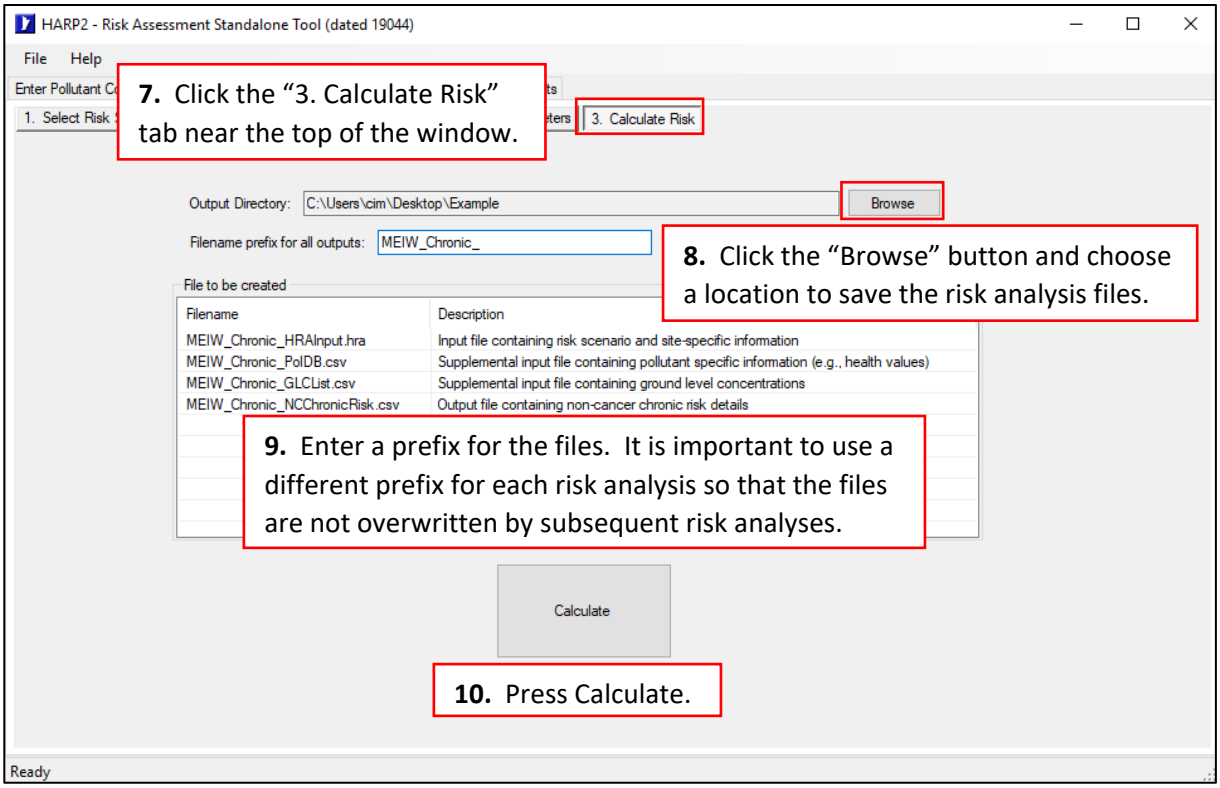
3. Click the "2. Select Pathways to Evaluate & Enter Site Specific Parameters" tab near the top of the window.

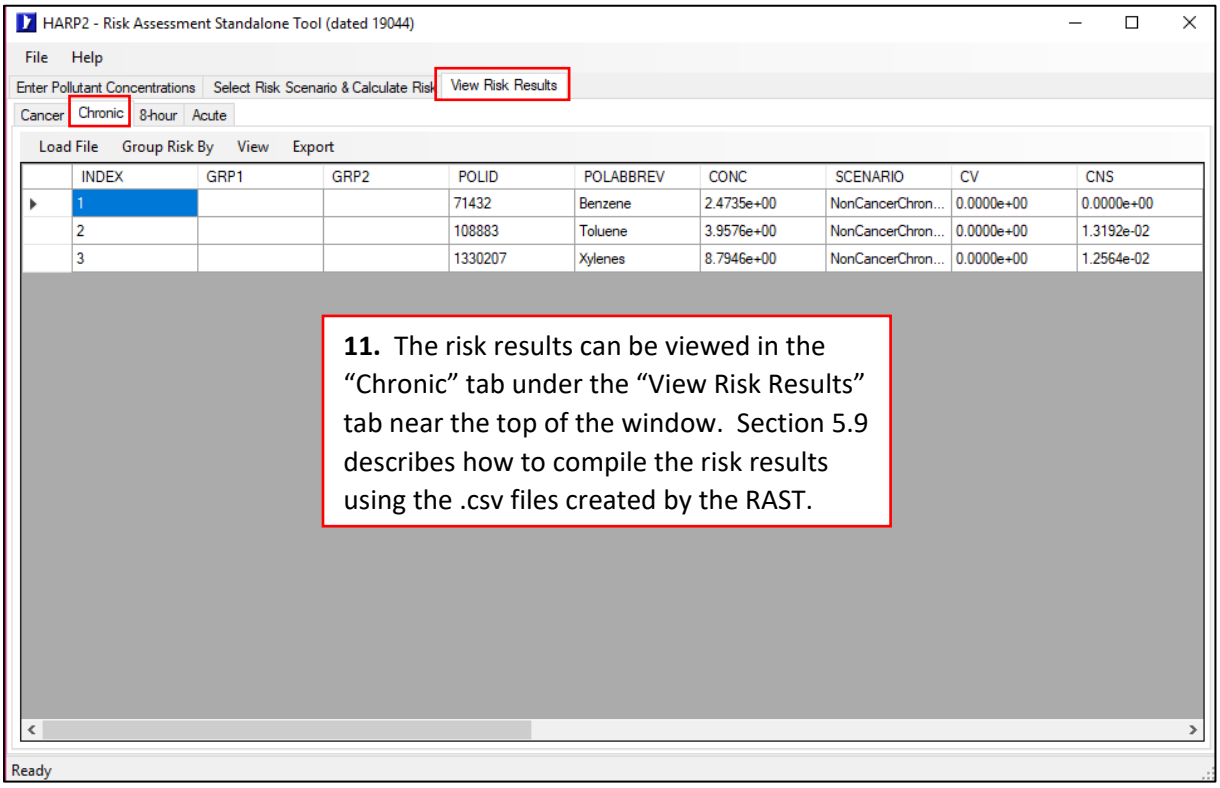
4. See Table 4.4-1 of the District's Form-15i (https://www.ourair.org/wp-content/uploads/apcd-15i.pdf) to determine if any of the emitted pollutants are multipathway. If none are multipathway, choose the "Inhalation Only" option under the "Pathways to Evaluate" heading. If any are multipathway, see Section 4.4, *Multipathway Analysis*, of Form-15i for a discussion of which pathways should be evaluated.



5. Click the Inhalation tab near the top of the window.

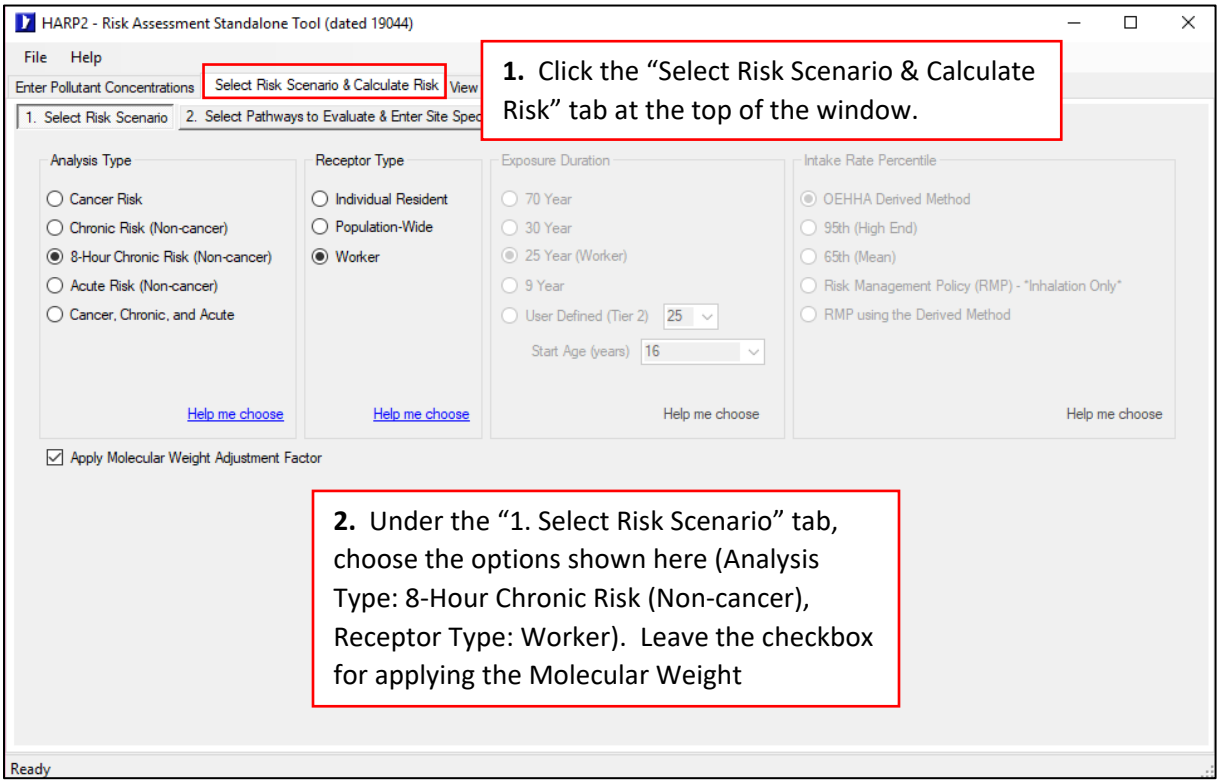
6. Make sure that no adjustment factor is being used, shown near the top right corner. Use 8-hour breathing rates. Do not use any Tier 2 options, shown in the bottom left corner.

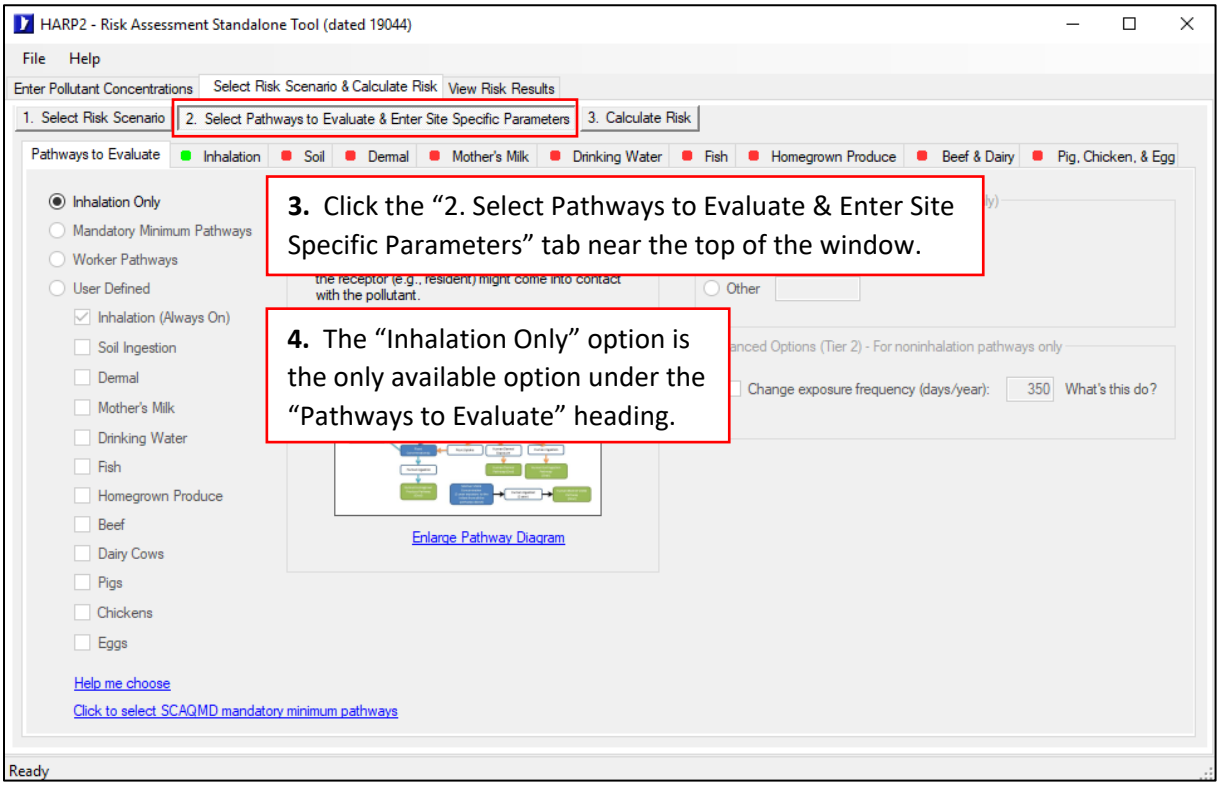

HARP2 - Risk Assessment Standalone Tool (dated 19044)
File
Help
1. Select Risk
3. Calculate Risk
7. Click the "3. Calculate Risk" tab near the top of the window.
Output Directory:
C:\Users\cim\Desktop\Example
Browse
Filename prefix for all outputs:
MEIW_Chronic_
8. Click the "Browse" button and choose a location to save the risk analysis files.
File to be created
Filename
Description
MEIW_Chronic_HRAInput.hra
Input file containing risk scenario and site-specific information
MEIW_Chronic_PolDB.csv
Supplemental input file containing pollutant specific information (e.g., health values)
MEIW_Chronic_GLCList.csv
Supplemental input file containing ground level concentrations
MEIW_Chronic_NCChronicRisk.csv
Output file containing non-cancer chronic risk details
9. Enter a prefix for the files. It is important to use a different prefix for each risk analysis so that the files are not overwritten by subsequent risk analyses.
Calculate
10. Press Calculate.
Ready

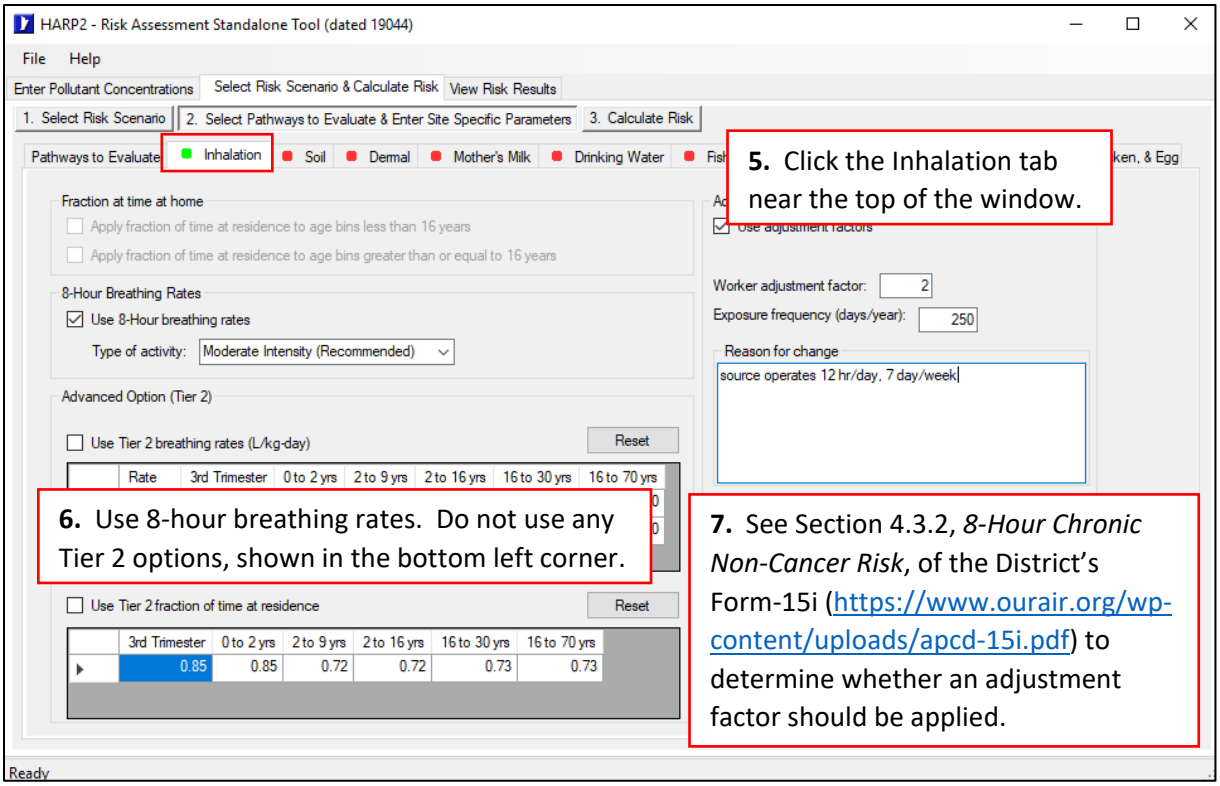

HARP2 - Risk Assessment Standalone Tool (dated 19044)
File
Help
Enter Pollutant Concentrations
Select Risk Scenario & Calculate Risk
View Risk Results
Cancer
Chronic
8-hour
Acute
Load File
Group Risk By
View
Export
INDEX
GRP1
GRP2
POLID
POLABBREV
CONC
SCENARIO
CV
CNS
1
71432
Benzene
2.4735e+00
NonCancerChron...
0.0000e+00
0.0000e+00
2
108883
Toluene
3.9576e+00
NonCancerChron...
0.0000e+00
1.3192e-02
3
1330207
Xylenes
8.7946e+00
NonCancerChron...
0.0000e+00
1.2564e-02
11. The risk results can be viewed in the "Chronic" tab under the "View Risk Results" tab near the top of the window. Section 5.9 describes how to compile the risk results using the .csv files created by the RAST.
Ready

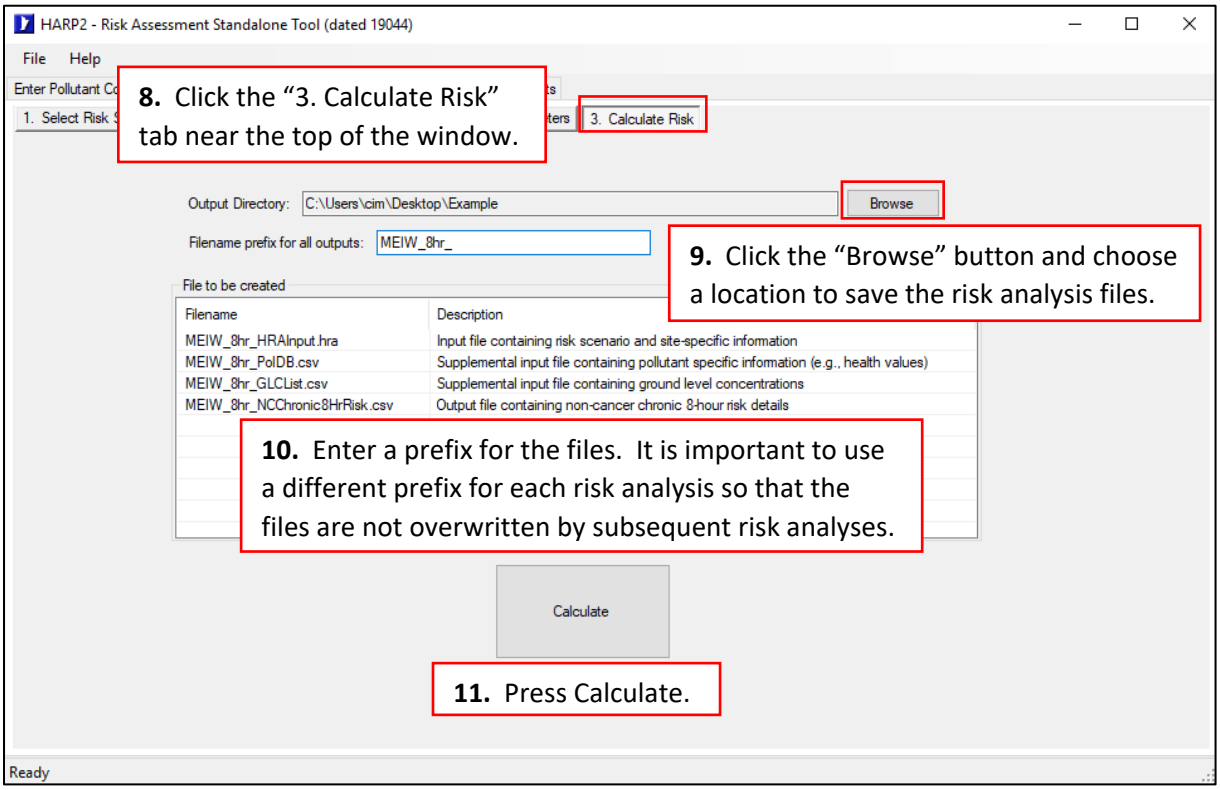
5.7 MEIW 8-Hour Chronic Non-Cancer Risk Analysis

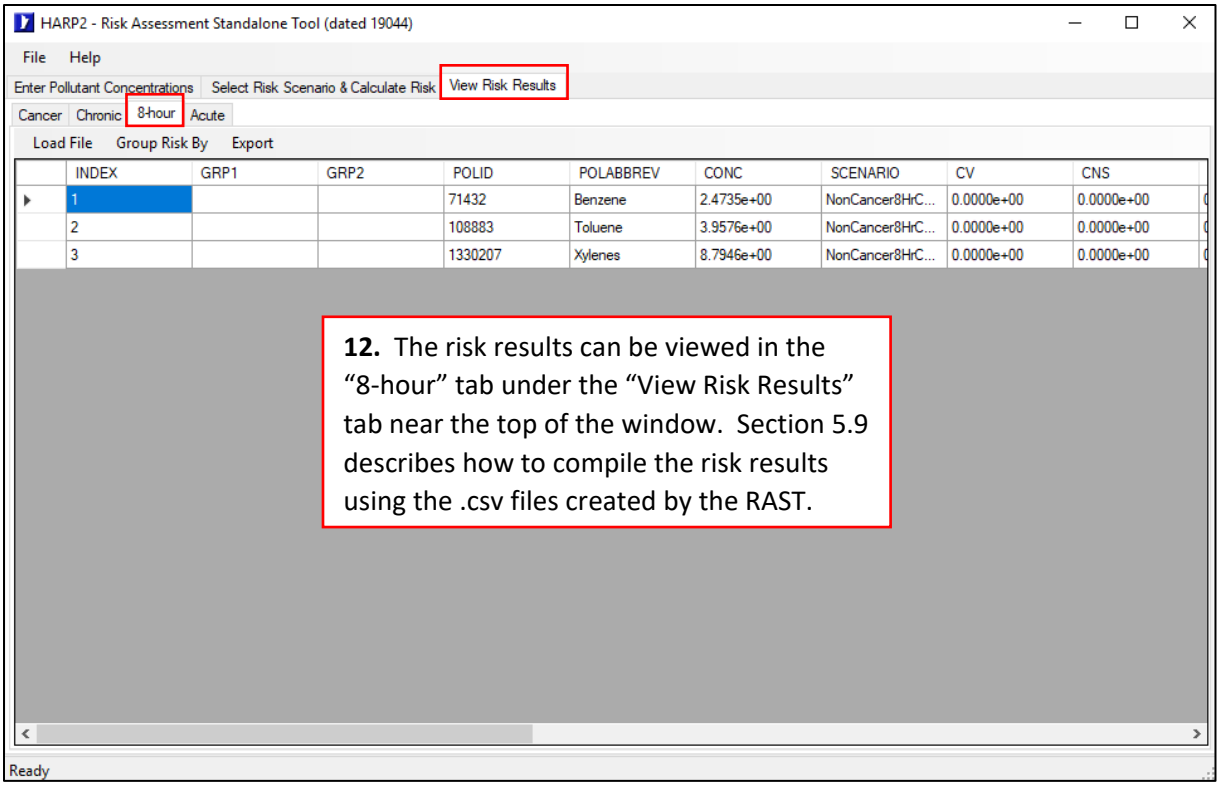
Follow the steps below to perform the 8-hour chronic non-cancer risk analysis for the MEIW:





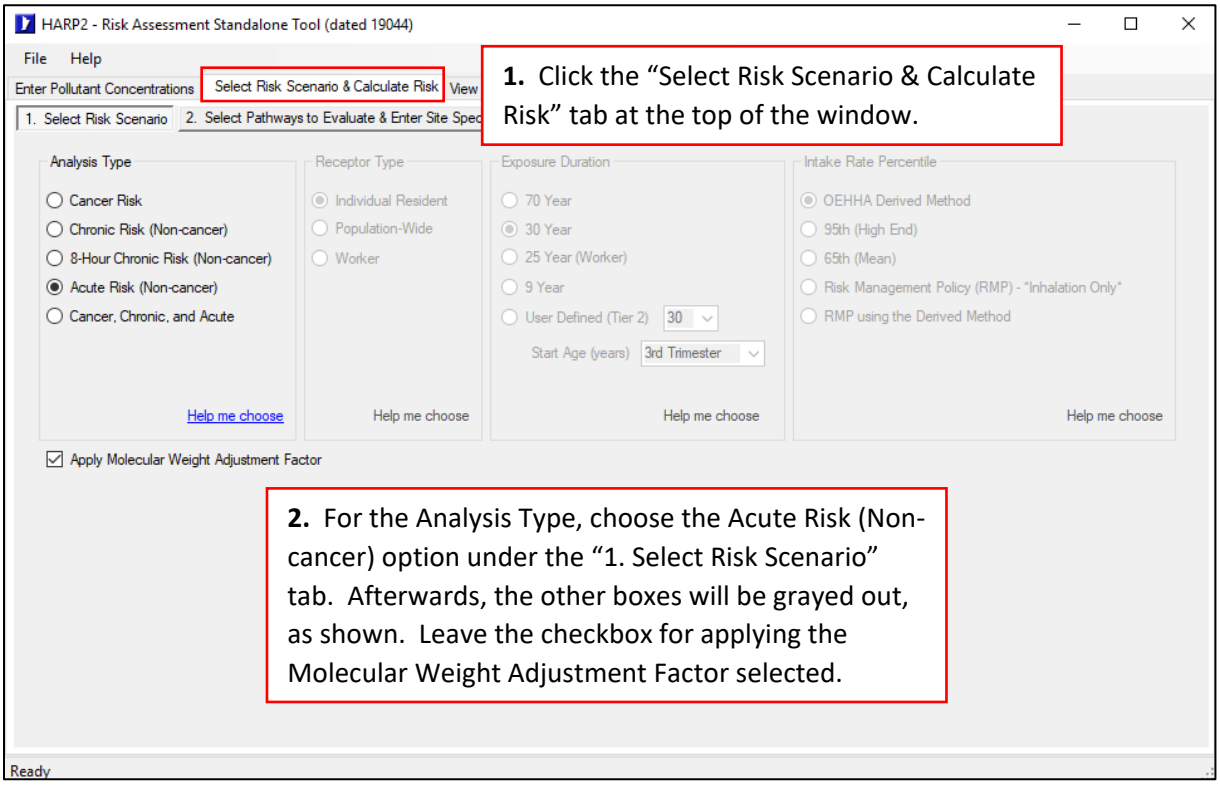

HARP2 - Risk Assessment Standalone Tool (dated 19044)
File
Help
Enter Pollutant Concentrations
Select Risk Scenario & Calculate Risk
View Risk Results
1. Select Risk Scenario
2. Select Pathways to Evaluate & Enter Site Specific Parameters
3. Calculate Risk
Pathways to Evaluate
Inhalation
Soil
Dermal
Mother's Milk
Drinking Water
Fraction at time at home
Apply fraction of time at residence to age bins less than 16 years
Apply fraction of time at residence to age bins greater than or equal to 16 years
8-Hour Breathing Rates
Use 8-Hour breathing rates
Type of activity:
Moderate Intensity (Recommended)
Advanced Option (Tier 2)
Use Tier 2 breathing rates (L/kg-day)
Reset
Rate
3rd Trimester
0 to 2 yrs
2 to 9 yrs
2 to 16 yrs
16 to 30 yrs
16 to 70 yrs
Use Tier 2 fraction of time at residence
Reset
0.85
0.85
0.72
0.72
0.73
0.73
Worker adjustment factor:
2
Exposure frequency (days/year):
250
Reason for change
source operates 12 hr/day, 7 day/week
Ready
5. Click the Inhalation tab near the top of the window.
6. Use 8-hour breathing rates. Do not use any Tier 2 options, shown in the bottom left corner.
7. See Section 4.3.2, 8-Hour Chronic Non-Cancer Risk, of the District's Form-15i (https://www.ourair.org/wp-content/uploads/apcd-15i.pdf) to determine whether an adjustment factor should be applied.

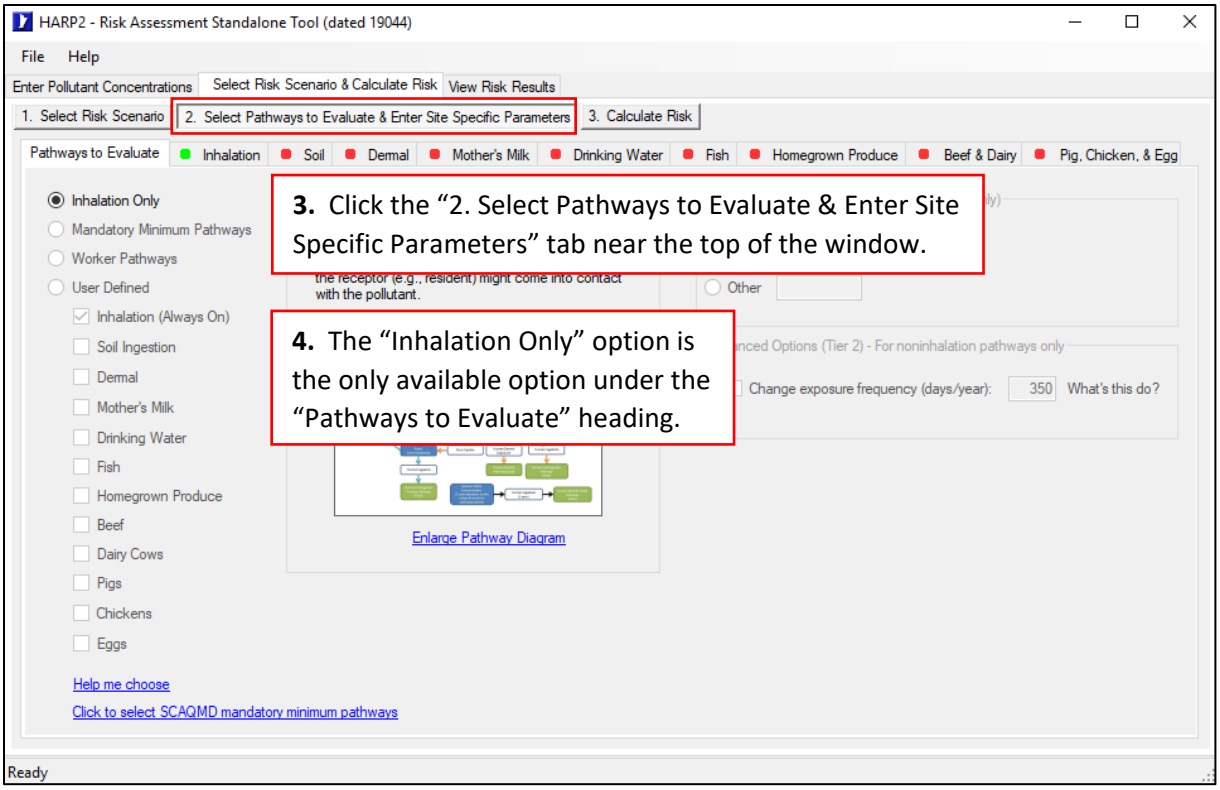

HARP2 - Risk Assessment Standalone Tool (dated 19044)
File
Help
3. Calculate Risk
Output Directory:
C:\Users\cim\Desktop\Example
Browse
Filename prefix for all outputs:
MEIW_8hr_
File to be created
Filename
Description
MEIW_8hr_HRAInput.hra
Input file containing risk scenario and site-specific information
MEIW_8hr_PolDB.csv
Supplemental input file containing pollutant specific information (e.g., health values)
MEIW_8hr_GLCList.csv
Supplemental input file containing ground level concentrations
MEIW_8hr_NCChronic8HrRisk.csv
Output file containing non-cancer chronic 8-hour risk details
Calculate
Ready
8. Click the "3. Calculate Risk" tab near the top of the window.
9. Click the "Browse" button and choose a location to save the risk analysis files.
10. Enter a prefix for the files. It is important to use a different prefix for each risk analysis so that the files are not overwritten by subsequent risk analyses.
11. Press Calculate.



5.8 *PMI Acute Non-Cancer Risk Analysis*

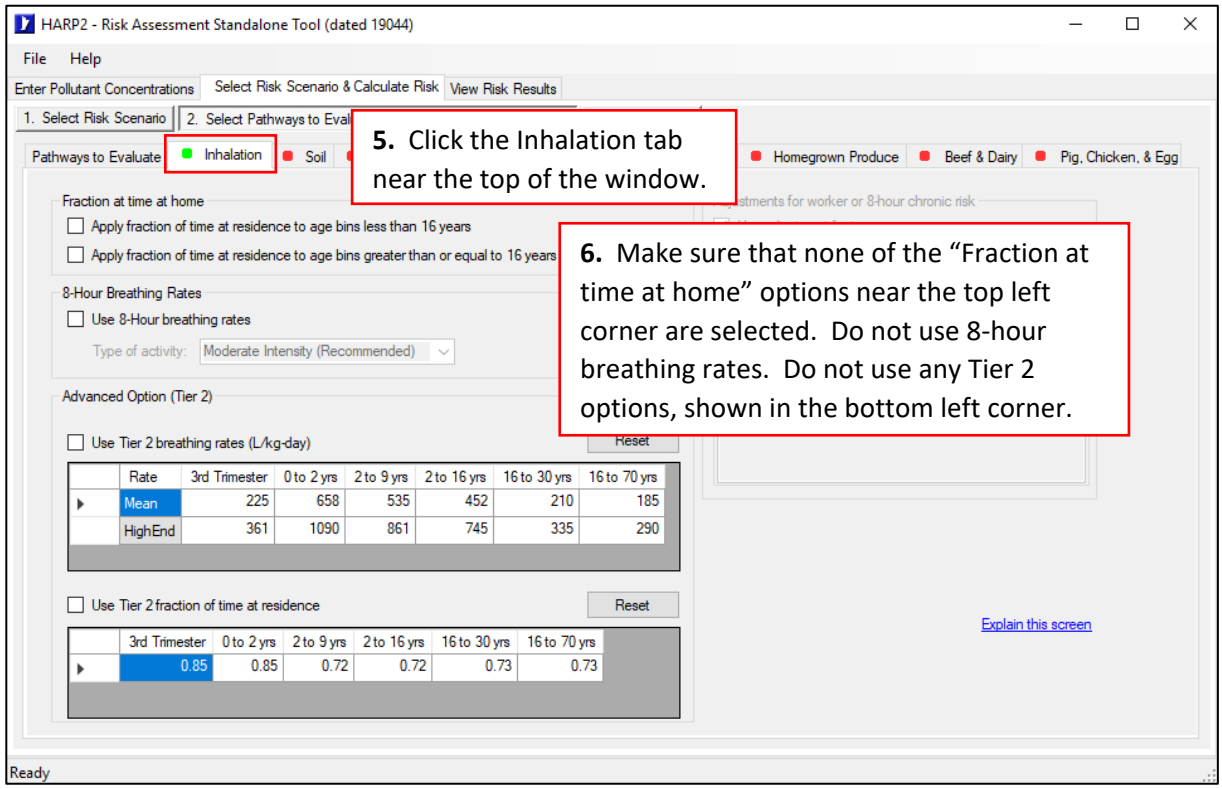
Follow the steps below to perform the acute non-cancer risk analysis for the PMI:





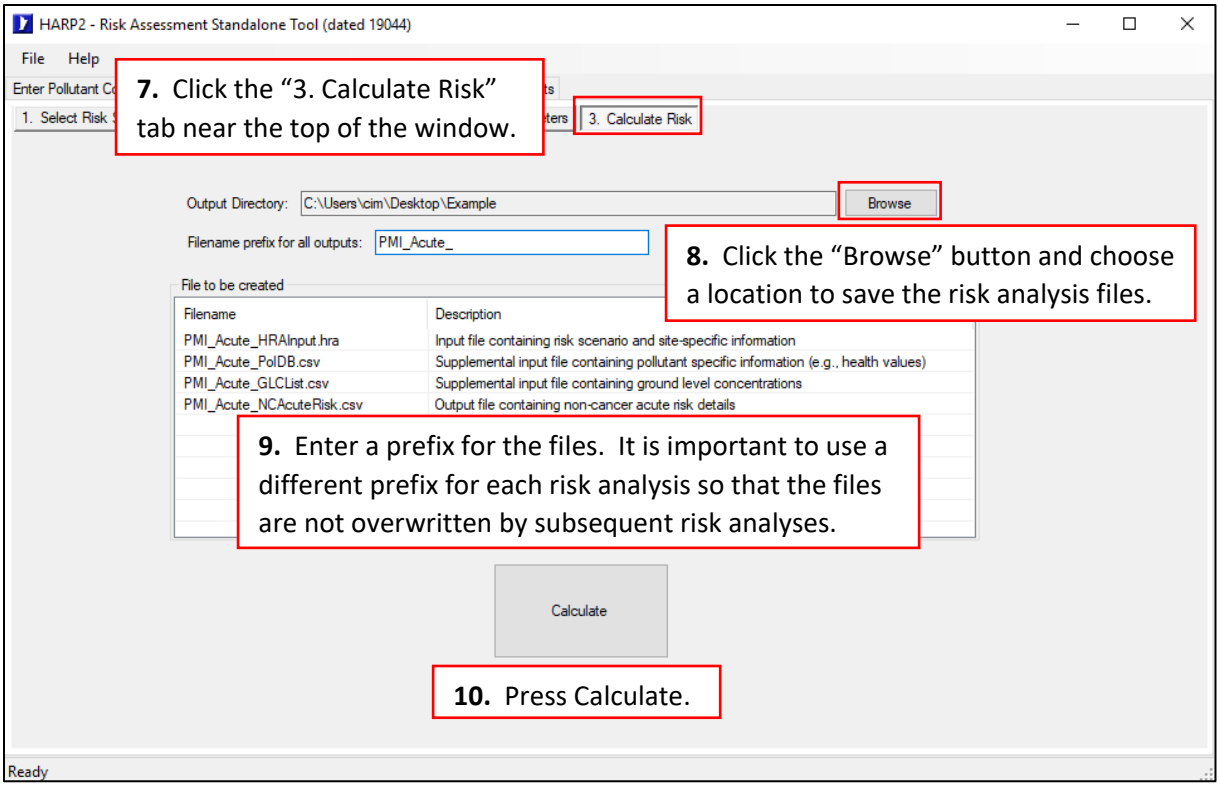
3. Click the "2. Select Pathways to Evaluate & Enter Site Specific Parameters" tab near the top of the window.

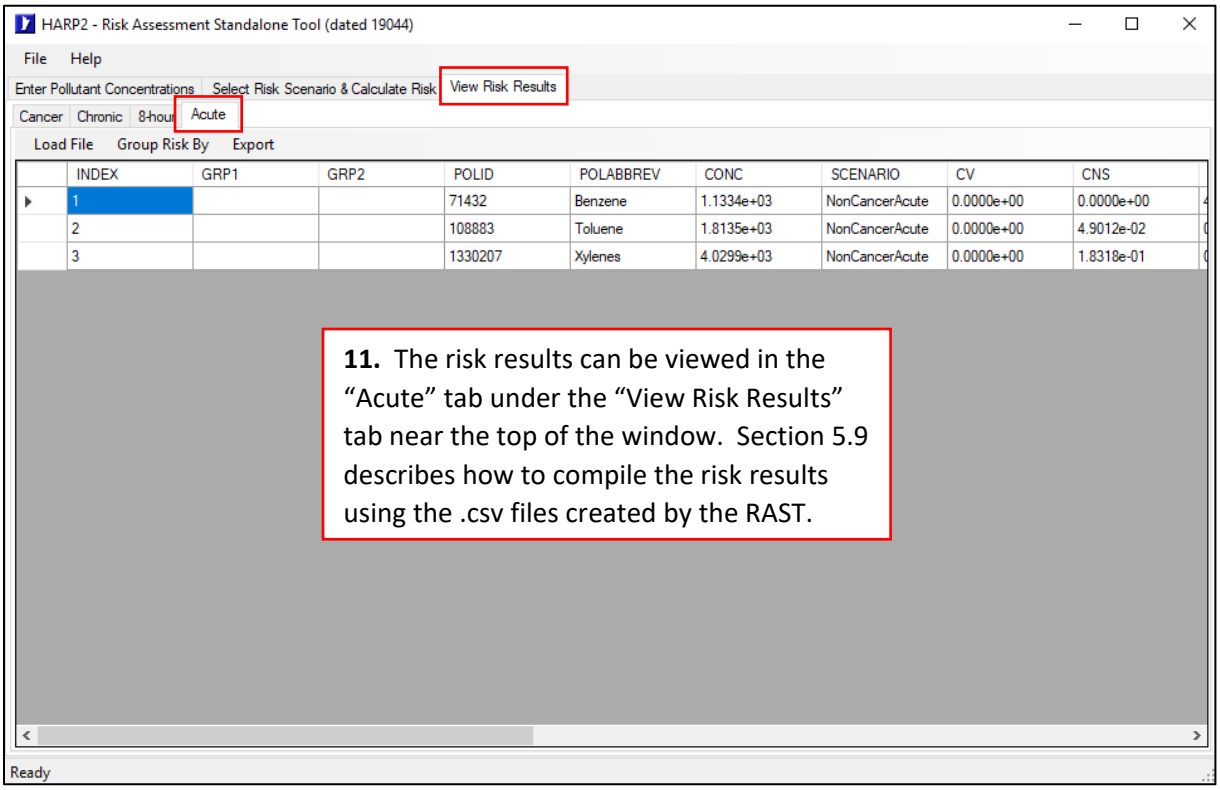
4. The "Inhalation Only" option is the only available option under the "Pathways to Evaluate" heading.



5. Click the Inhalation tab near the top of the window.

6. Make sure that none of the "Fraction at time at home" options near the top left corner are selected. Do not use 8-hour breathing rates. Do not use any Tier 2 options, shown in the bottom left corner.


HARP2 - Risk Assessment Standalone Tool (dated 19044)
File
Help
Enter Pollutant Co
1. Select Risk
3. Calculate Risk
7. Click the "3. Calculate Risk" tab near the top of the window.
Output Directory:
C:\Users\cim\Desktop\Example
Browse
Filename prefix for all outputs:
PMI_Acute_
8. Click the "Browse" button and choose a location to save the risk analysis files.
File to be created
Filename
Description
PMI_Acute_HRAInput.hra
Input file containing risk scenario and site-specific information
PMI_Acute_PolDB.csv
Supplemental input file containing pollutant specific information (e.g., health values)
PMI_Acute_GLCList.csv
Supplemental input file containing ground level concentrations
PMI_Acute_NCAcuteRisk.csv
Output file containing non-cancer acute risk details
9. Enter a prefix for the files. It is important to use a different prefix for each risk analysis so that the files are not overwritten by subsequent risk analyses.
Calculate
10. Press Calculate.
Ready

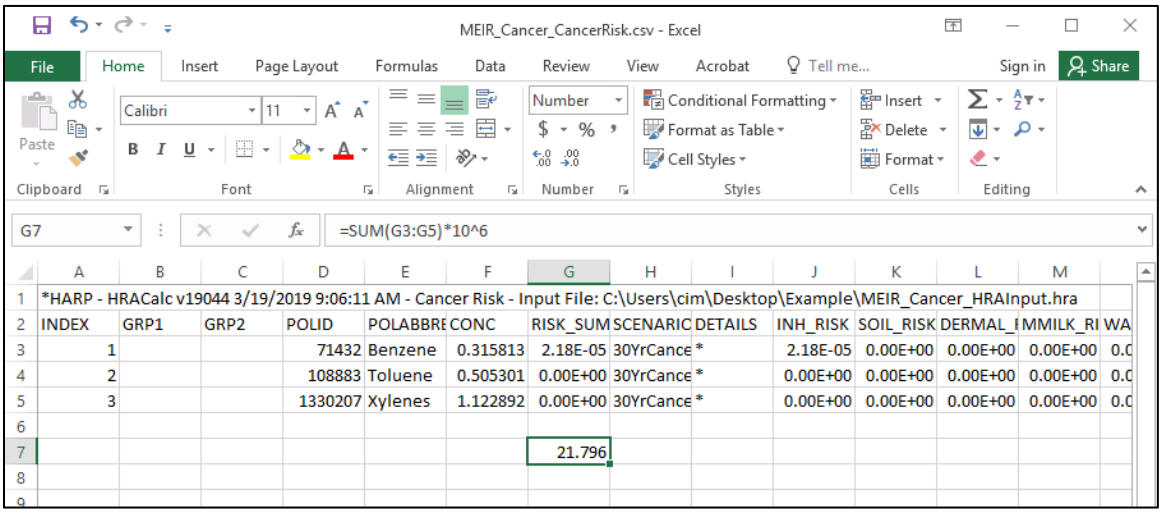

HARP2 - Risk Assessment Standalone Tool (dated 19044)
File
Help
Enter Pollutant Concentrations
Select Risk Scenario & Calculate Risk
View Risk Results
Cancer
Chronic
8-hour
Acute
Load File
Group Risk By
Export
INDEX
GRP1
GRP2
POLID
POLABBREV
CONC
SCENARIO
CV
CNS
1
71432
Benzene
1.1334e+03
NonCancerAcute
0.0000e+00
0.0000e+00
2
108883
Toluene
1.8135e+03
NonCancerAcute
0.0000e+00
4.9012e-02
3
1330207
Xylenes
4.0299e+03
NonCancerAcute
0.0000e+00
1.8318e-01
11. The risk results can be viewed in the "Acute" tab under the "View Risk Results" tab near the top of the window. Section 5.9 describes how to compile the risk results using the .csv files created by the RAST.
Ready

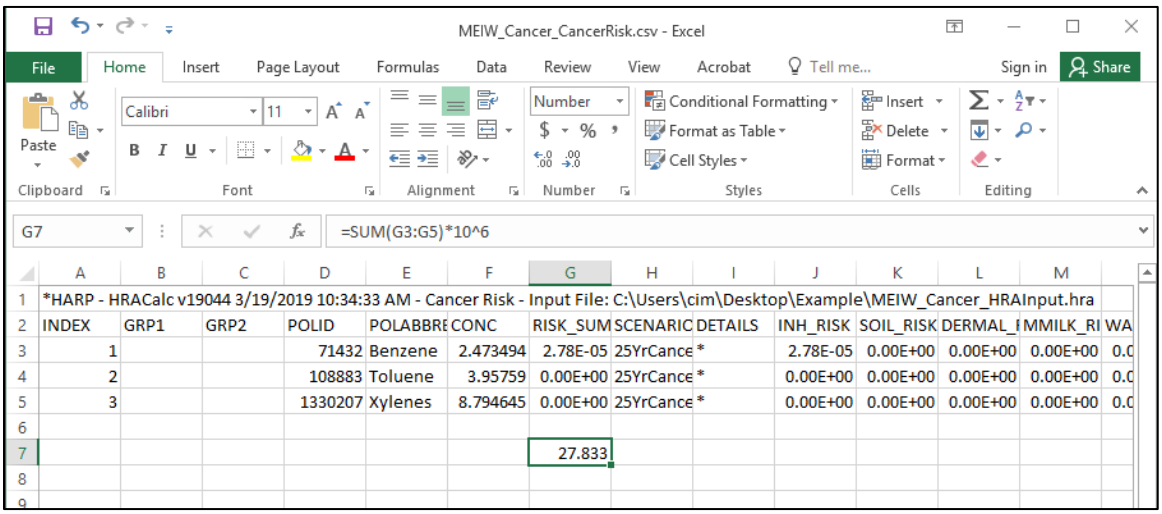
5.9 Compiling the Risk Results

The risk results can be compiled by using Microsoft Excel to format the .csv files created by the RAST. The user should be aware that the files created by the RAST are formatted differently than the Air Dispersion Modeling and Risk Tool of HARP 2. After locating the folder where the risk analysis files are saved, follow the steps below:

- To determine the cancer risk results at the MEIR and MEIW, open the corresponding files that end in "CancerRisk.csv." Sum all of the values under the "RISK_SUM" header in column G. This sums the risk contribution from each pollutant to calculate the total cancer risk at the MEIR or MEIW for the source. Determine the total cancer risk for both the MEIR and MEIW. The higher of these two cancer risks (MEIR and MEIW) should be reported.

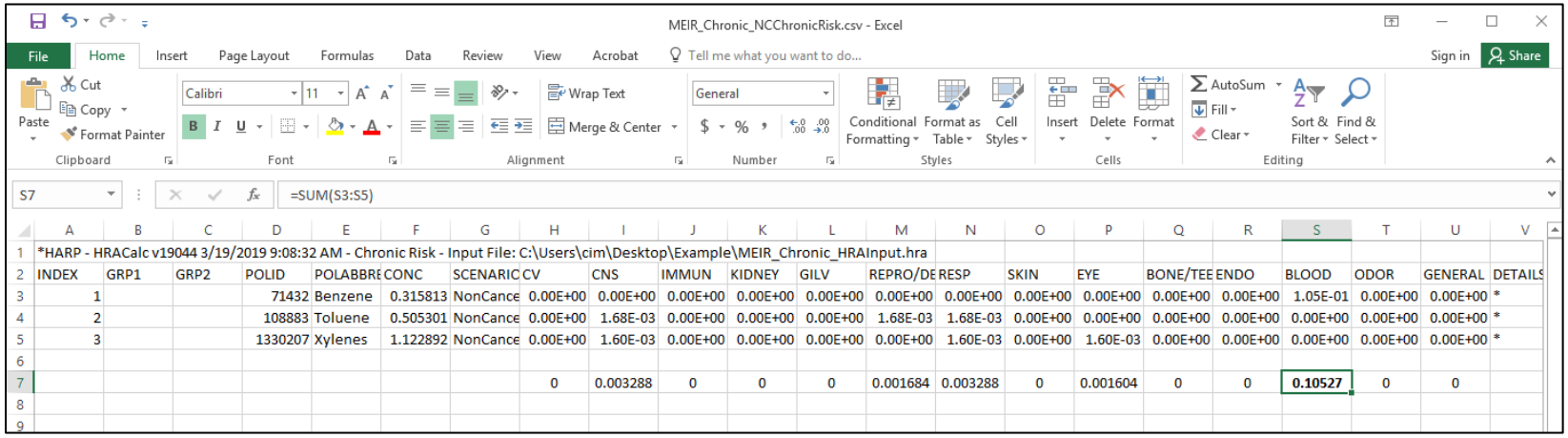
  Example: The cancer risk at the MEIR is 21.8 in a million and the cancer risk at the MEIW is 27.8 in a million. The cancer risk at the MEIW should be reported.





- To determine the chronic HI at the MEIR and MEIW, open the corresponding files that end in "NCChronicRick.csv." Sum all of the values in each of the columns from H to U (a total of 14 sums should be calculated, one for each column). Each sum is equal to the chronic HI for one health endpoint, which is why the **columns should not be added together**. Determine the endpoint with the highest HI for both the MEIR and MEIW. The higher of the two chronic HIs (MEIR and MEIW) should be reported.

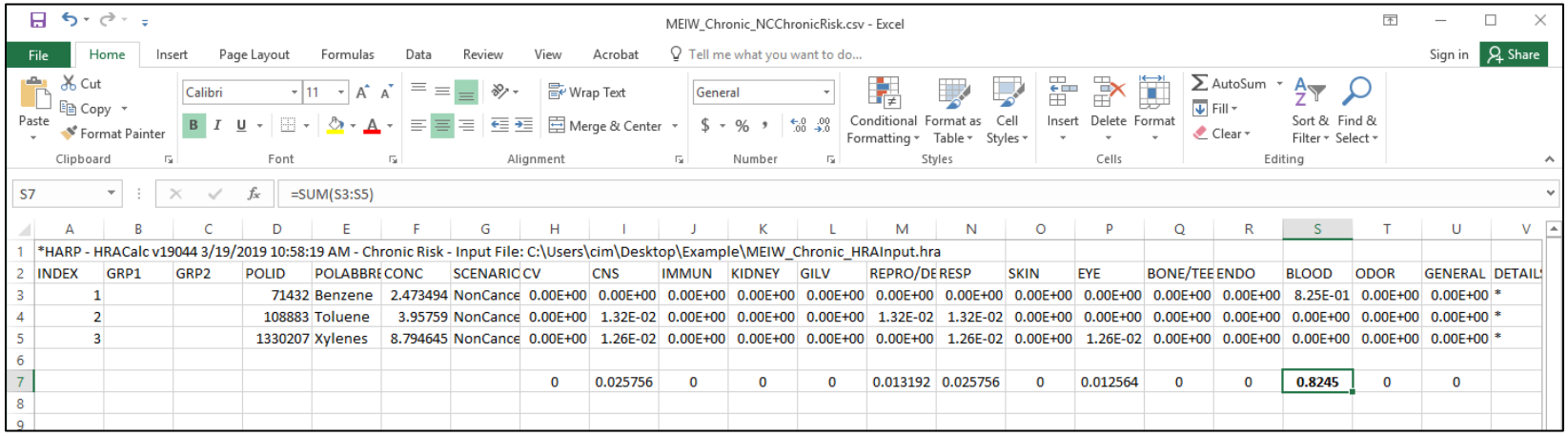
  Example: The chronic HI at the MEIR is 0.105 (endpoint: blood) and the chronic HI at the MEIW is 0.825 (endpoint: blood). The chronic HI at the MEIW should be reported.



MEIR_Chronic_NCChronicRisk.csv - Excel

S7 =SUM(S3:S5)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	*HARP - HRACalc v19044 3/19/2019 9:08:32 AM - Chronic Risk - Input File: C:\Users\cim\Desktop\Example\MEIR_Chronic_HRAInput.hra																					
2	INDEX	GRP1	GRP2	POLID	POLABBRE	CONC	SCENARIC	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DE	RESP	SKIN	EYE	BONE/TEE	ENDO	BLOOD	ODOR	GENERAL	DETAILS
3	1			71432	Benzene	0.315813	NonCance	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-01	0.00E+00	0.00E+00	*
4	2			108883	Toluene	0.505301	NonCance	0.00E+00	1.68E-03	0.00E+00	0.00E+00	0.00E+00	1.68E-03	1.68E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	*
5	3			1330207	Xylenes	1.122892	NonCance	0.00E+00	1.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.60E-03	0.00E+00	1.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	*
6																						
7								0	0.003288	0	0	0	0.001684	0.003288	0	0.001604	0	0	**0.10527**	0	0	
8																						
9																						



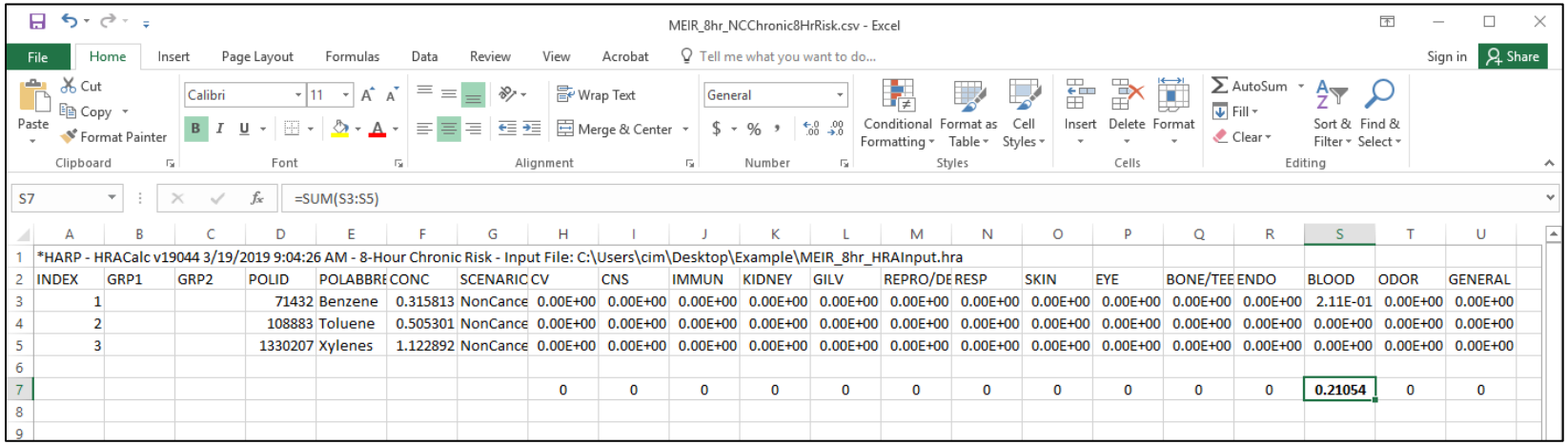
MEIW_Chronic_NCChronicRisk.csv - Excel

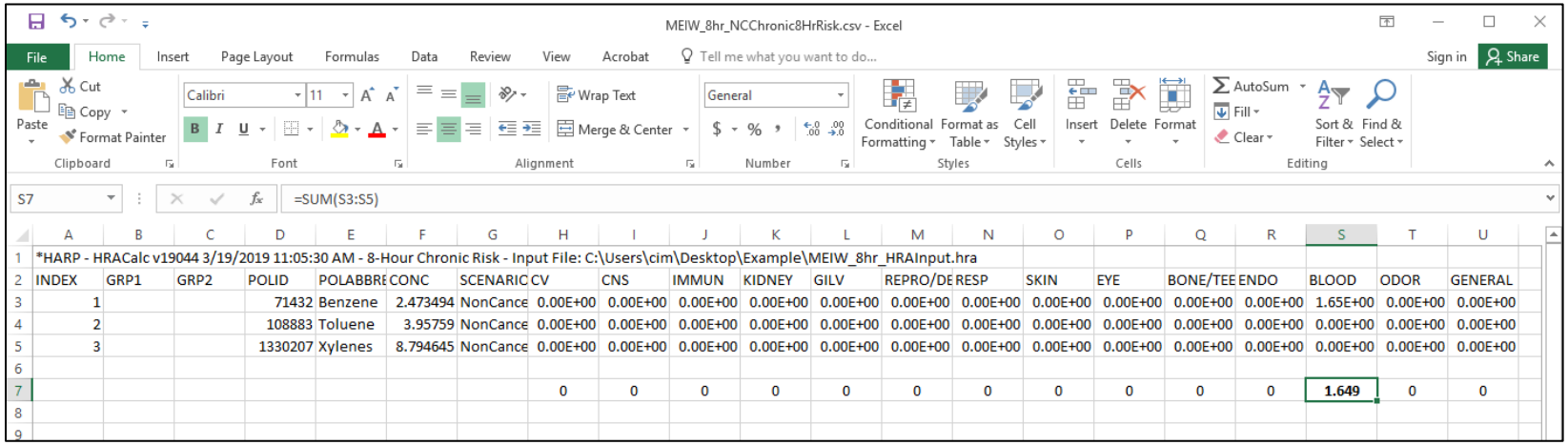
S7 =SUM(S3:S5)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	*HARP - HRACalc v19044 3/19/2019 10:58:19 AM - Chronic Risk - Input File: C:\Users\cim\Desktop\Example\MEIW_Chronic_HRAInput.hra																					
2	INDEX	GRP1	GRP2	POLID	POLABBRE	CONC	SCENARIC	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DE	RESP	SKIN	EYE	BONE/TEE	ENDO	BLOOD	ODOR	GENERAL	DETAILS
3	1			71432	Benzene	2.473494	NonCance	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.25E-01	0.00E+00	0.00E+00	*
4	2			108883	Toluene	3.95759	NonCance	0.00E+00	1.32E-02	0.00E+00	0.00E+00	0.00E+00	1.32E-02	1.32E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	*
5	3			1330207	Xylenes	8.794645	NonCance	0.00E+00	1.26E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.26E-02	0.00E+00	1.26E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	*
6																						
7								0	0.025756	0	0	0	0.013192	0.025756	0	0.012564	0	0	**0.8245**	0	0	
8																						
9																						

- To determine the 8-hour HI at the MEIR and MEIW, open the corresponding files that end in "NCChronic8HrRisk.csv." Sum all of the values in each of the columns from H to U (a total of 14 sums should be calculated, one for each column). Each sum is equal to the 8-hour HI for one health endpoint, which is why the **columns should not be added together**. Determine the endpoint with the highest HI for both the MEIR and MEIW. The higher of the two 8-hour HIs (MEIR and MEIW) should be reported.

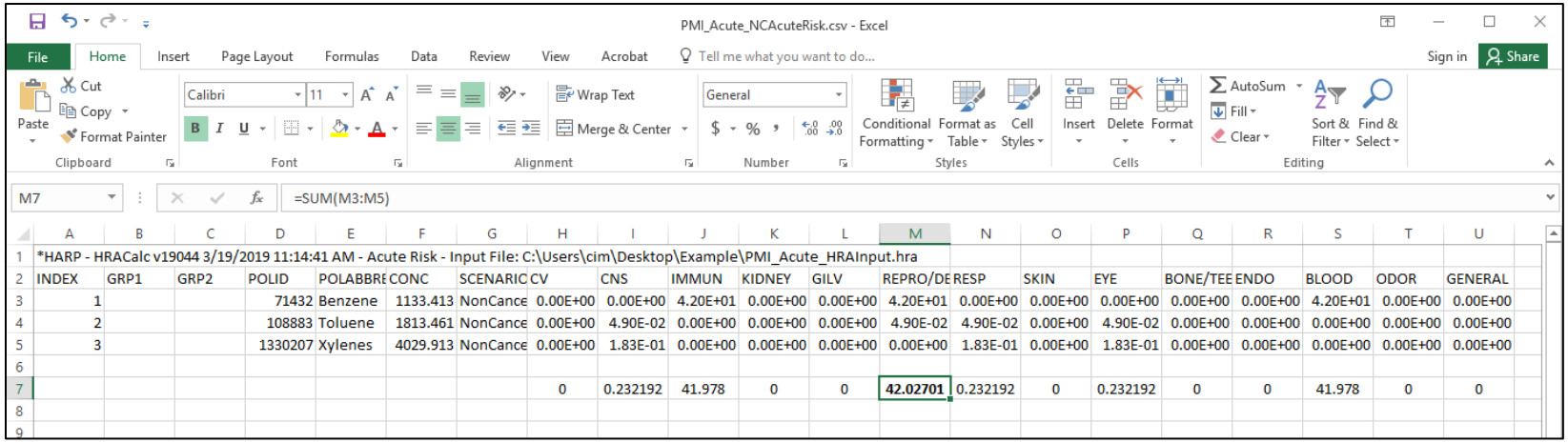
  Example: The 8-hour HI at the MEIR is 0.211 (endpoint: blood) and the 8-hour HI at the MEIW is 1.65 (endpoint: blood). The 8-hour HI at the MEIW should be reported.





- To determine the acute HI at the PMI, open the corresponding file that ends in "NCAcuteRisk.csv." Sum all of the values in each of the columns from H to U (a total of 14 sums should be calculated, one for each column). Each sum is equal to the acute HI for one health endpoint, which is why the **columns should not be added together**. The highest HI should be reported.

  Example: The acute HI at the PMI is 42.0 (endpoint: reproductive/developmental system).



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	*HARP - HRACalc v19044 3/19/2019 11:14:41 AM - Acute Risk - Input File: C:\Users\cim\Desktop\Example\PMI_Acute_HRAInput.hra																				
2	INDEX	GRP1	GRP2	POLID	POLABBRE	CONC	SCENARIC	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DE	RESP	SKIN	EYE	BONE/TEE	ENDO	BLOOD	ODOR	GENERAL
3	1			71432	Benzene	1133.413	NonCance	0.00E+00	0.00E+00	4.20E+01	0.00E+00	0.00E+00	4.20E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.20E+01	0.00E+00	0.00E+00
4	2			108883	Toluene	1813.461	NonCance	0.00E+00	4.90E-02	0.00E+00	0.00E+00	0.00E+00	4.90E-02	4.90E-02	0.00E+00	4.90E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
5	3			1330207	Xylenes	4029.913	NonCance	0.00E+00	1.83E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.83E-01	0.00E+00	1.83E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
6																					
7								0	0.232192	41.978	0	0	**42.02701**	0.232192	0	0.232192	0	0	41.978	0	0
8																					
9																					

It is important to note that in the examples above, the cancer, chronic and 8-hour non-cancer risks were higher at the MEIW than the MEIR, and all of the pollutant concentrations were also higher at the MEIW than at the MEIR; **this is coincidental and is not always the case**. Differences in the methodologies for calculating residential and worker risks can yield different results even with identical pollutant concentrations, especially for multipathway risk analyses. Do not assume that the receptor with higher pollutant concentrations will always have higher risk results.

If the cancer risk is 10.0 in a million or greater, or any of the non-cancer HIs are above 1.0, modifications to the project and/or a refined HRA may be required. Contact the District for details via e-mail (HarrisD@sbcapcd.org) or phone (805-961-8824).