



air pollution control district
SANTA BARBARA COUNTY

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

Prepared By
Charlotte Mountain

June 2019

Table of Contents

1. Introduction	1
2. Google Earth.....	1
3. AERSCREEN View	2
3.1 <i>Air Dispersion Modeling</i>	2
3.2 <i>AERSCREEN Results</i>	10
4. Calculations	12
5. HARP 2 Risk Assessment Standalone Tool.....	13
5.1 <i>Pollutant Concentrations</i>	13
5.2 <i>MEIR Cancer Risk Analysis</i>	15
5.3 <i>MEIR Chronic Non-Cancer Risk Analysis</i>	18
5.4 <i>MEIR 8-Hour Chronic Non-Cancer Risk Analysis</i>	20
5.5 <i>MEIW Cancer Risk Analysis</i>	23
5.6 <i>MEIW Chronic Non-Cancer Risk Analysis</i>	25
5.7 <i>MEIW 8-Hour Chronic Non-Cancer Risk Analysis</i>	28
5.8 <i>PMI Acute Non-Cancer Risk Analysis</i>	30
5.9 <i>Compiling the Risk Results</i>	33

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 worker¹.
 - 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.).

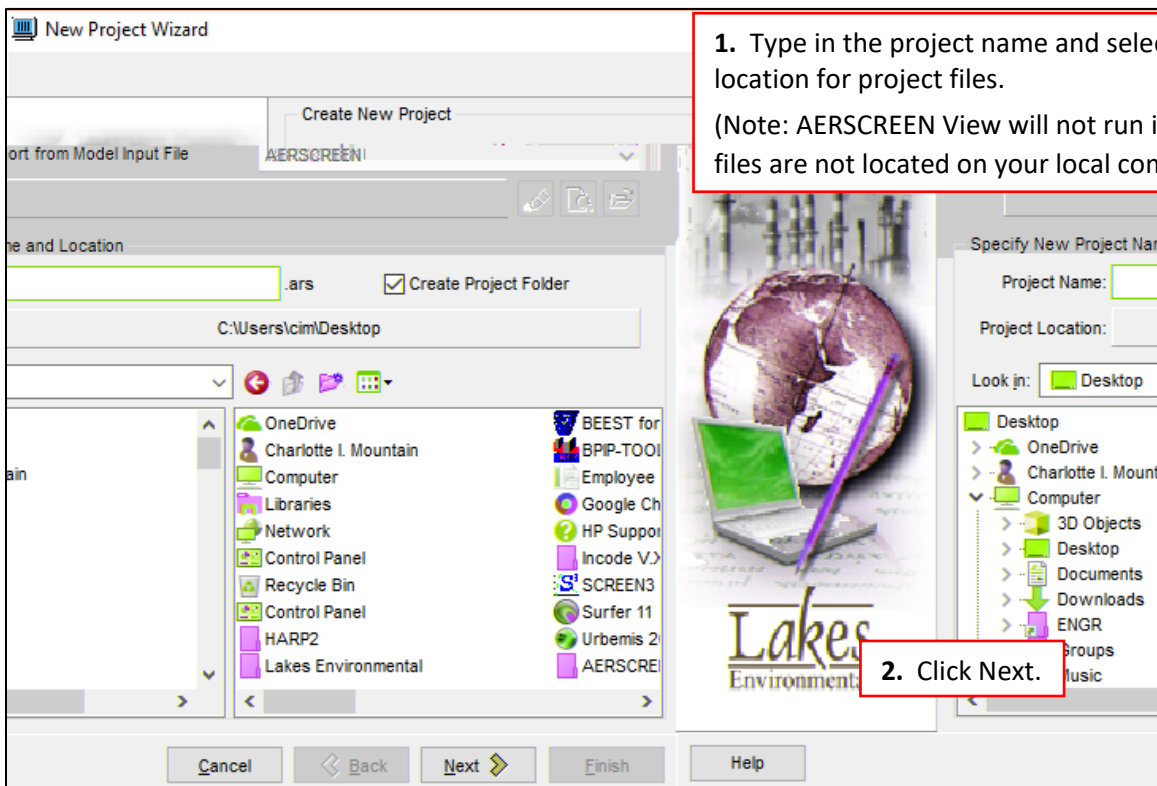
3. AERSCREEN View

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.

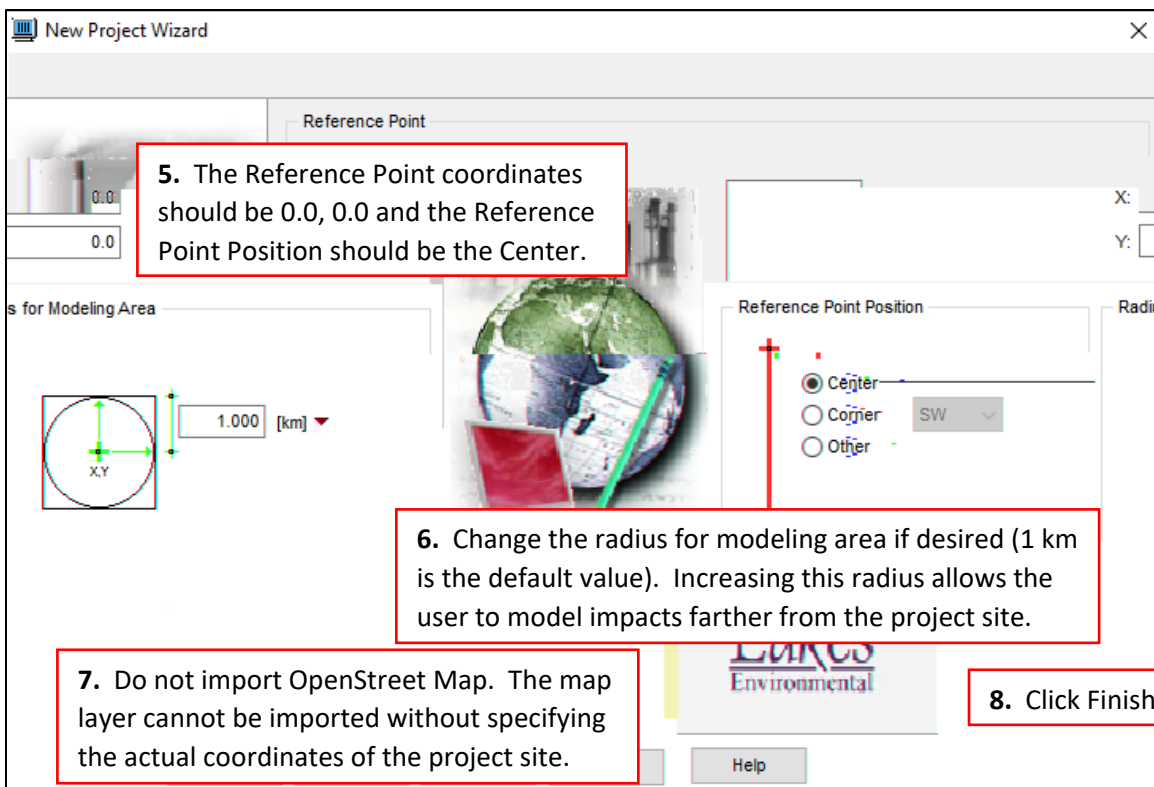
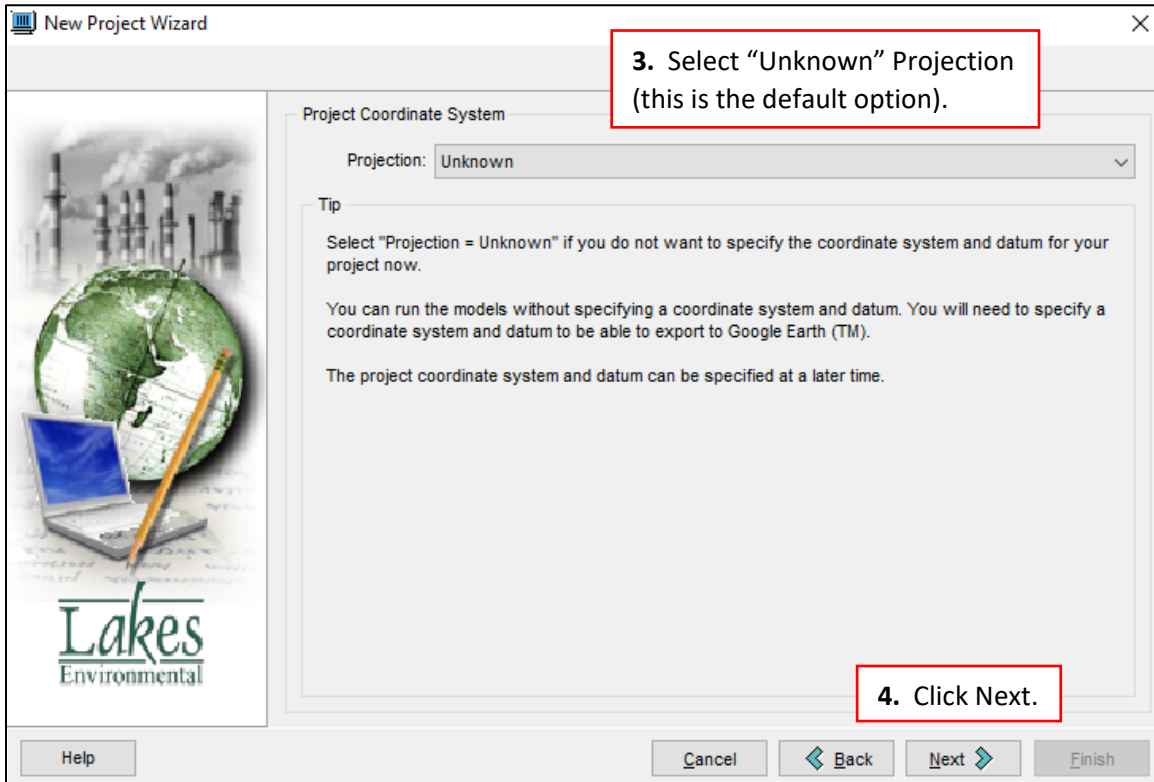
3.1 *Air Dispersion Modeling*

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>.





Click the “Source” button to enter the release parameters for the source:

1. Choose the source type (i.e., point, flare, volume, rectangular area, or circular area source).

2. Enter a description of the source if desired.

3. Enter a value of 0 for the X and Y Coordinates. The modeling domain will be centered on the location of this source.

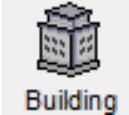
4. Leave the Base Elevation box blank.

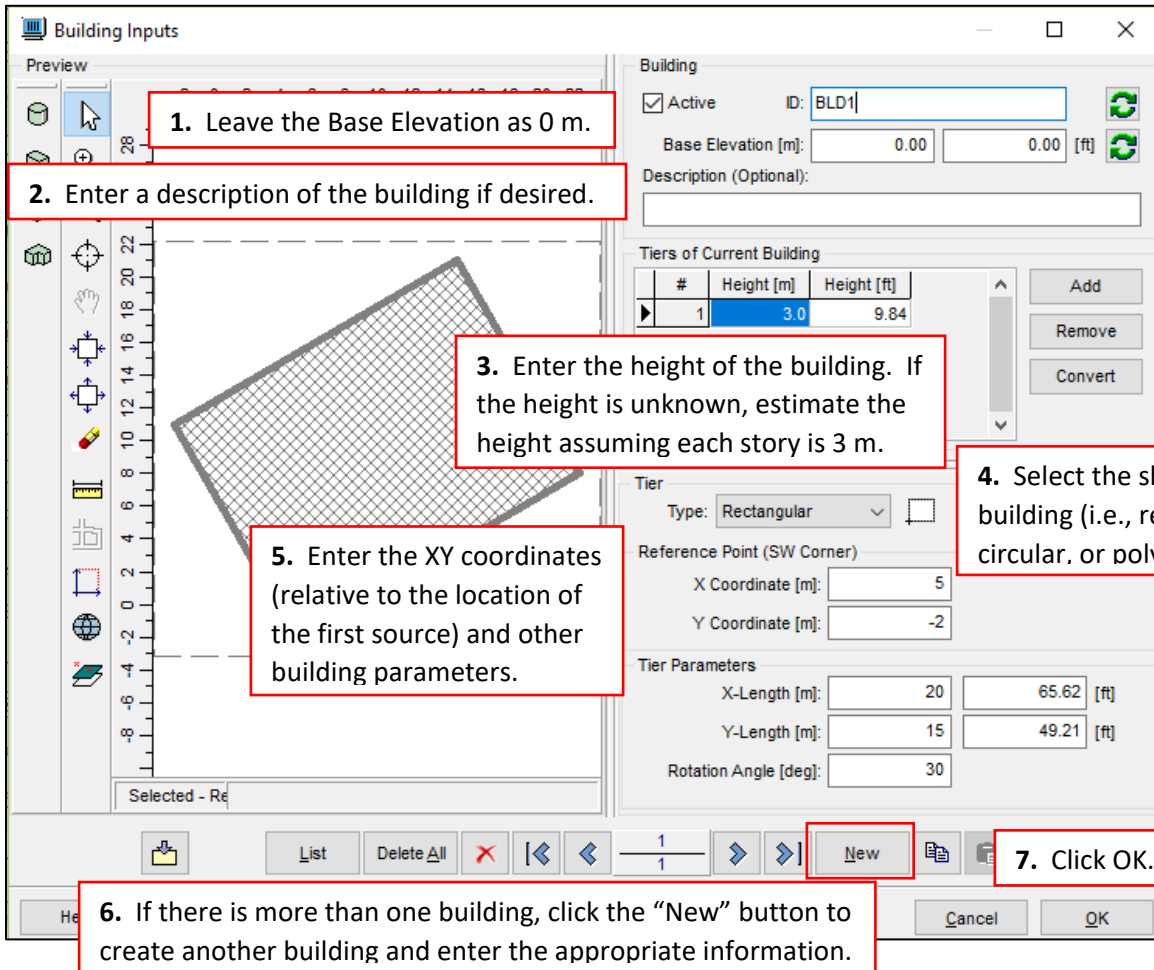
5. Enter an emission rate of 1 g/s.

6. Enter the source's release height and other release parameters in the appropriate boxes.

7. If there is more than one source, click the “New” button to create another source and enter the appropriate release parameters. *All XY coordinates should be entered relative to the position of the first source.*

8. Click OK.

- 
 Click the “Building” button to enter the building information:



The screenshot shows the 'Building Inputs' dialog box with the following callouts:

1. Leave the Base Elevation as 0 m.
2. Enter a description of the building if desired.
3. Enter the height of the building. If the height is unknown, estimate the height assuming each story is 3 m.
4. Select the shape of the building (i.e., rectangular, circular, or polygonal).
5. Enter the XY coordinates (relative to the location of the first source) and other building parameters.
6. If there is more than one building, click the “New” button to create another building and enter the appropriate information.
7. Click OK.

The dialog box includes a 'Preview' window on the left showing a grid and a building footprint. The main 'Building' section contains fields for ID (BLD1), Base Elevation (0.00 m), Description, and a table for 'Tiers of Current Building' with one tier at 3.0 m height. The 'Tier' section allows selecting a shape (Rectangular) and setting reference point coordinates (X: 5, Y: -2). The 'Tier Parameters' section includes X-Length (20 m), Y-Length (15 m), and Rotation Angle (30 deg). A 'New' button is highlighted at the bottom.

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:

$$D \geq 5L$$

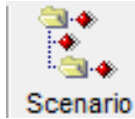
where: D = shortest distance from the exhaust stack to the building

L = lesser of the following two values:

building height and projected building width (PBW)

PBW = maximum cross – sectional length of the building;

$$\text{for rectangular buildings, } PBW = \sqrt{(\text{length}^2 + \text{width}^2)}$$



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

Scenario Wizard - [Scenario 1] 1 of 7

Scenario Options

Scenario Info

ID:

Title:

Dispersion Options

Rural Urban Population:

Create Debug File?

Yes No

1a. Enter a title for the scenario if desired.

1b. Select the rural/urban dispersion option based on your determination from Google Earth. (Note: if urban is selected, enter the population of the nearest city according to the table below).

1c. Do not create debug file.

1d. Click Next.

Help Cancel Back Next Finish

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] 2 of 7

Source Parameters

Specify Source

Source: (Select only one source from table below)

#	Select	Source ID	Source Type
1	<input checked="" type="checkbox"/>	STCK1	POINT
2	<input type="checkbox"/>	STCK2	POINT

Pollutant

Any Pollutant (No Chemistry) Pollutant NO2 (With Chemistry)

Pollutant Name: (Optional)

Emission Rate: [g/s]

Buttons: Next, Finish, Help, Cancel, Back

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.

2b. Choose "Any Pollutant (No Chemistry)."

2c. Use an emission rate of 1 g/s.

2d. Click Next.

Scenario Wizard - [Scenario 1] 3 of 7

Building Downwash

Building Downwash Options

No Downwash Specify BPIP Input File Include All Buildings Single Building (Select only one building from table below)

Building:

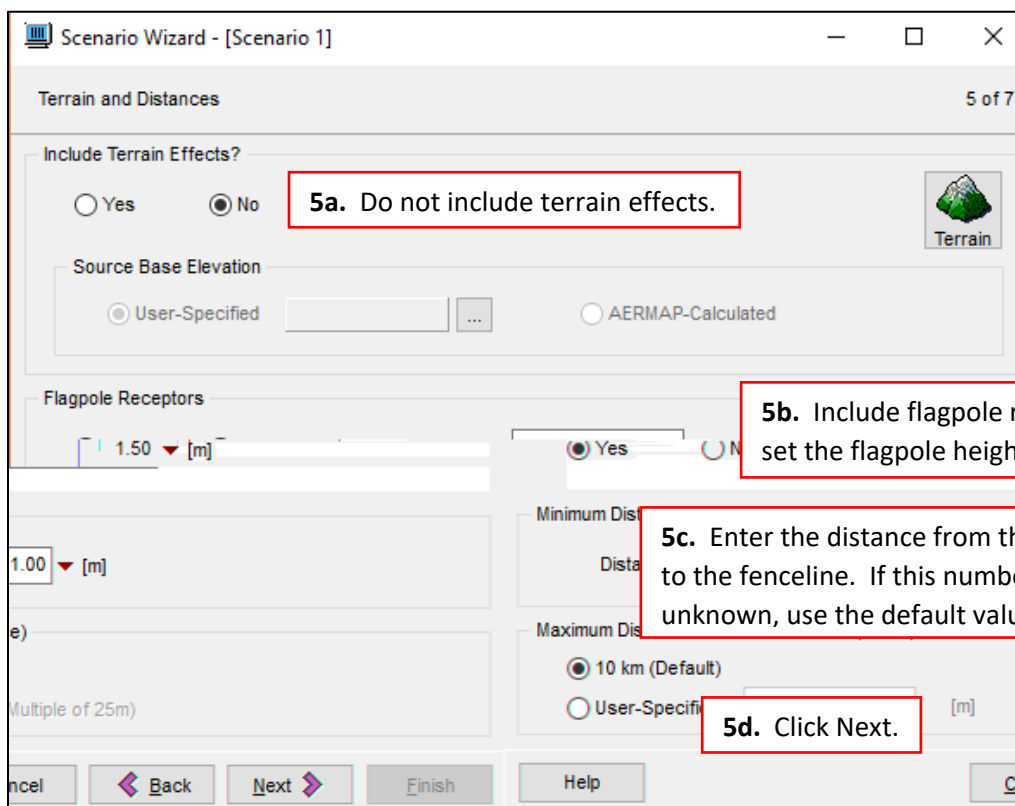
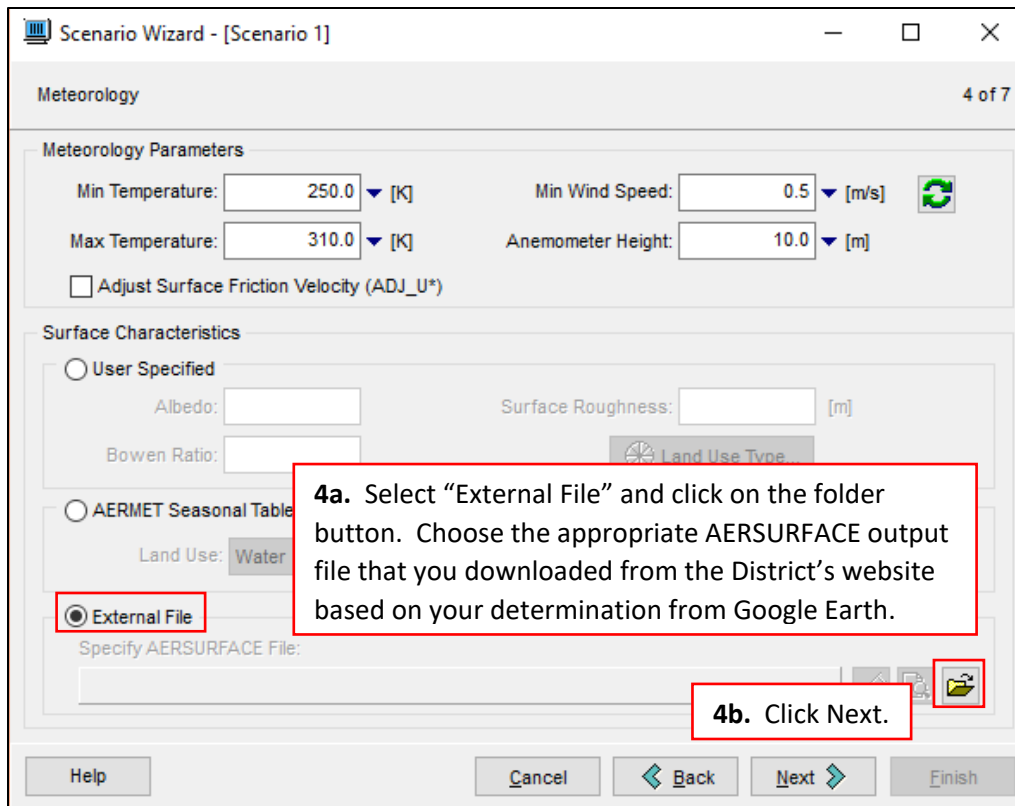
#	Select	Name	Description
1	<input type="checkbox"/>	BLD1	
2	<input type="checkbox"/>	BLD2	

Tip: Only single rectangular buildings are supported if selecting the single building option.

Buttons: Help, Cancel, Back, Next, Finish

3a. Select "No Downwash" if no buildings are present. Select "Include All Buildings" if building information was entered into the model.

3b. Click Next.



Scenario Wizard - [Scenario 1] 6 of 7

Receptors

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		

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] 7 of 7

Fumigation Options

Apply Inversion Break-up Fumigation?

Yes No

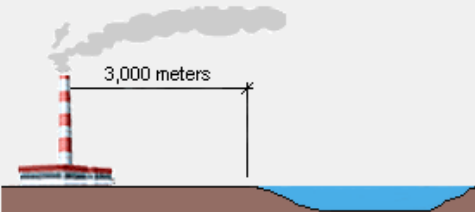
Apply Shoreline Fumigation?

Yes No

Minimum Distance to Shoreline: [m]

Optional Direction to Shoreline: [deg]

No Specific Direction:



The Shoreline Fumigation option should only be used if your source is within 3000 m of a large body of water.

7a. Use the default settings (i.e., do not apply inversion break-up fumigation or shoreline fumigation).

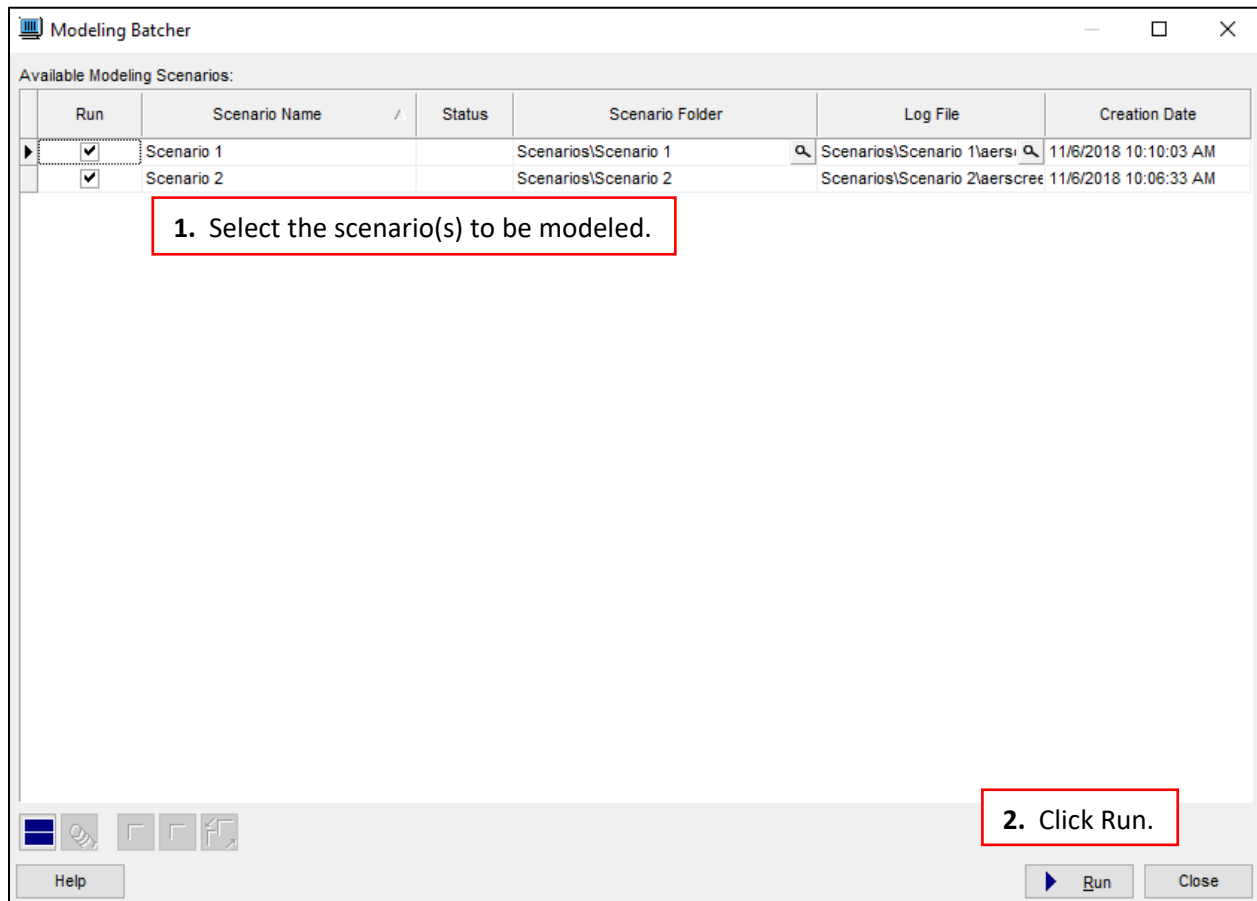
7b. Click Finish.

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
550.00	328.4	4350.00	53.40

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 ($C_{\text{hourly},i}$) for all pollutants should be calculated for the PMI; the maximum hourly concentrations from AERSCREEN ($C_{\text{AERSCREEN}}$) for the PMI is circled in purple in Section 3.2 above.

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

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

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

$E_{h,i}$ = 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 ($C_{\text{annual},i}$) for all pollutants should be calculated for the MEIR and MEIW; the maximum hourly concentrations from AERSCREEN ($C_{\text{AERSCREEN}}$) for the MEIR and MEIW are circled in green and blue, respectively, in Section 3.2 above.

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

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

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

S = scaling factor = 0.10

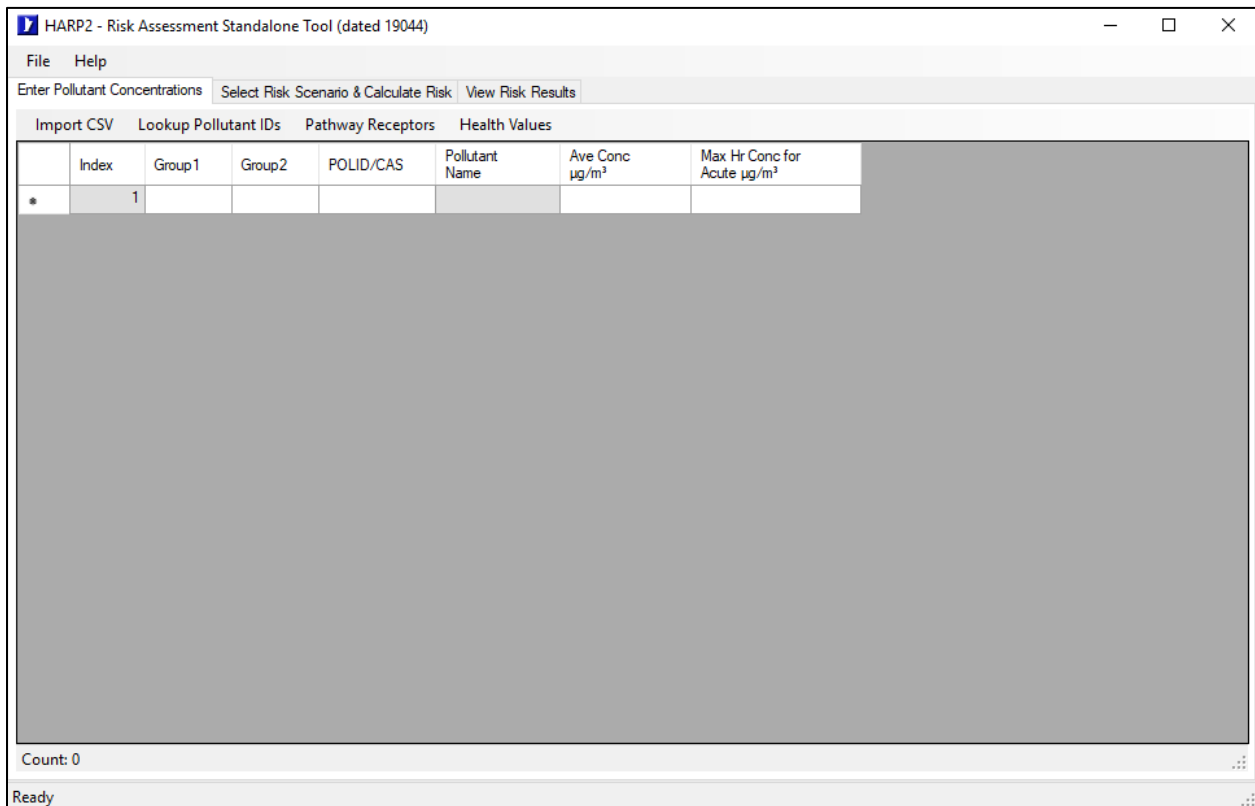
$E_{a,i}$ = average annual emission rate of pollutant i (g/s)

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.

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.

Index	Group1	Group2	POLID/CAS	Pollutant Name	Ave Conc $\mu\text{g}/\text{m}^3$	Max Hr Conc for Acute $\mu\text{g}/\text{m}^3$
*	1					

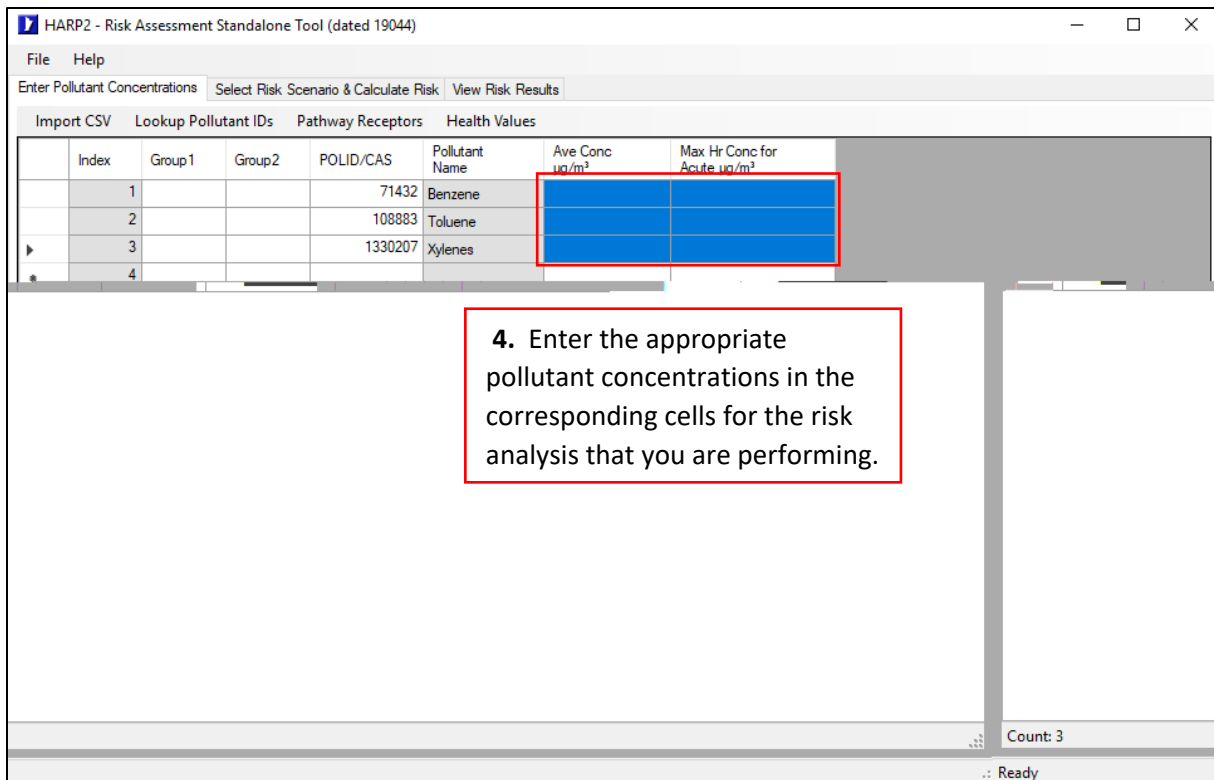
Pollutant	POLLID/CAS	Abbreviated Name	INHALATIONCANCERSLOPEFACTOR	ORALCA
		p-DiClBenzene	0.04	
		m-DinitroBenzen		
		p-DinitroBenzen		
		Ethyl Benzene	0.0087	
		Azobenzene		
		Chlorobenzn		
95501	1,2-Dichlorobenzene	1,2-DiClBenz		
95636	1,2,4-Trimethylbenzene	1,2,4TriMeBe		
98953	Nitrobenzene	Nitrobenzene		
118741	Hexachlorobenzene	HexaClBenze		
120821	1,2,4-Trichlorobenzene	1,2,4TriClBen		
122667	1,2-Diphenylhydrazine (Hydrazobenzene)	1,2-DiPhenyl		
528290	o-Dinitrobenzene	o-DinitroBenz		
541731	1,3-Dichlorobenzene	1,3-DiClBenzene		
71432	Benzene	Benzene	0.1	
82688	Pentachloronitrobenzene (Quintobenzene)	PentaClNitrBenz		

Count: 0

Ready

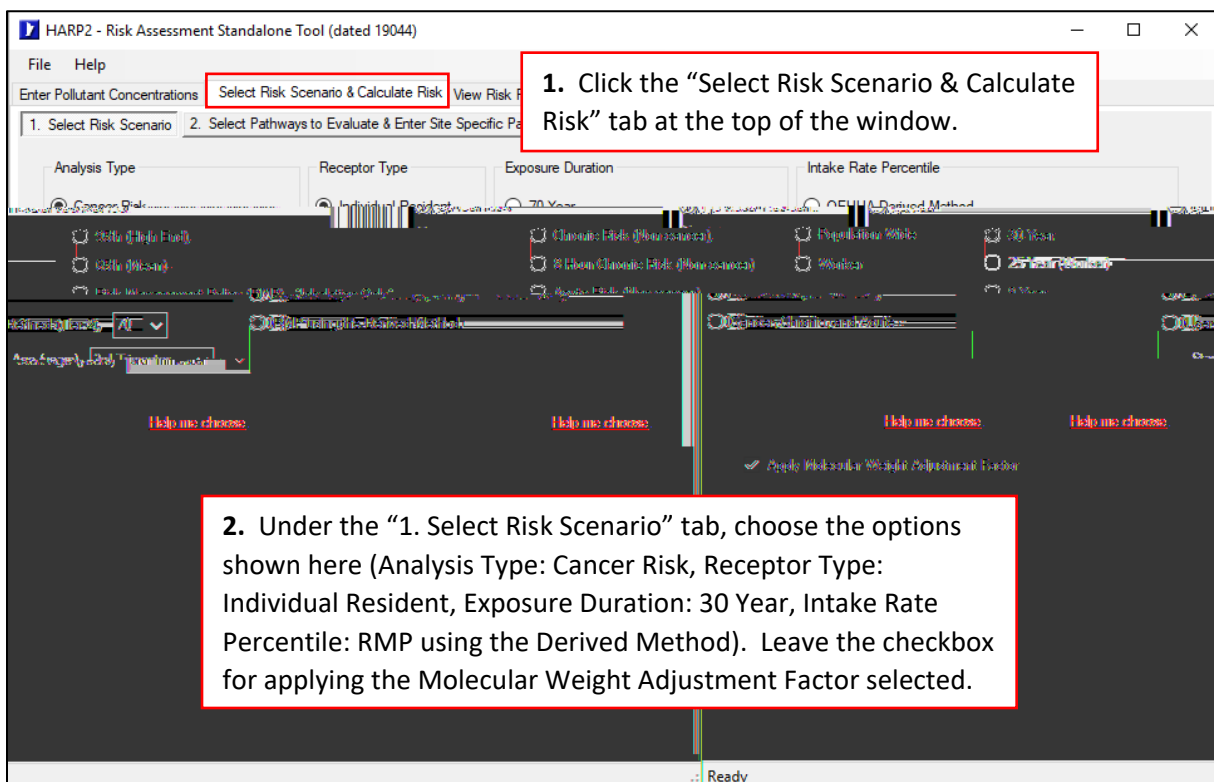
Add Pollutant

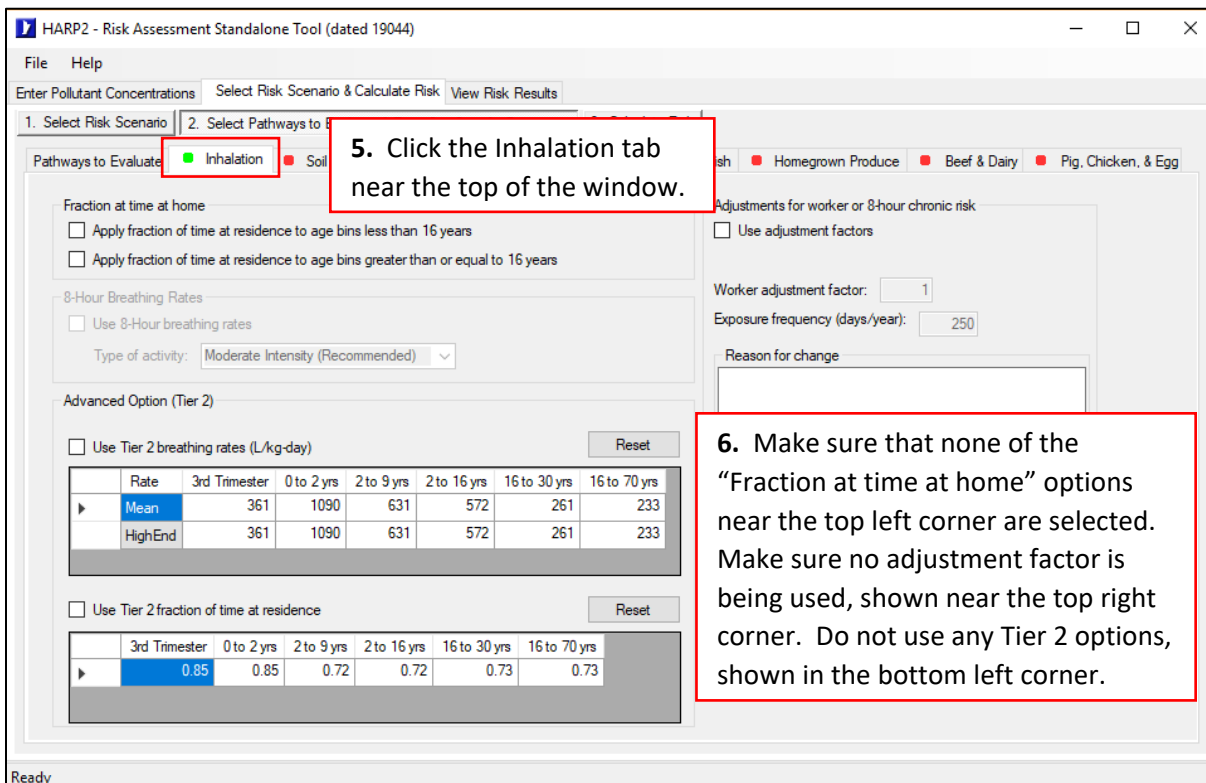
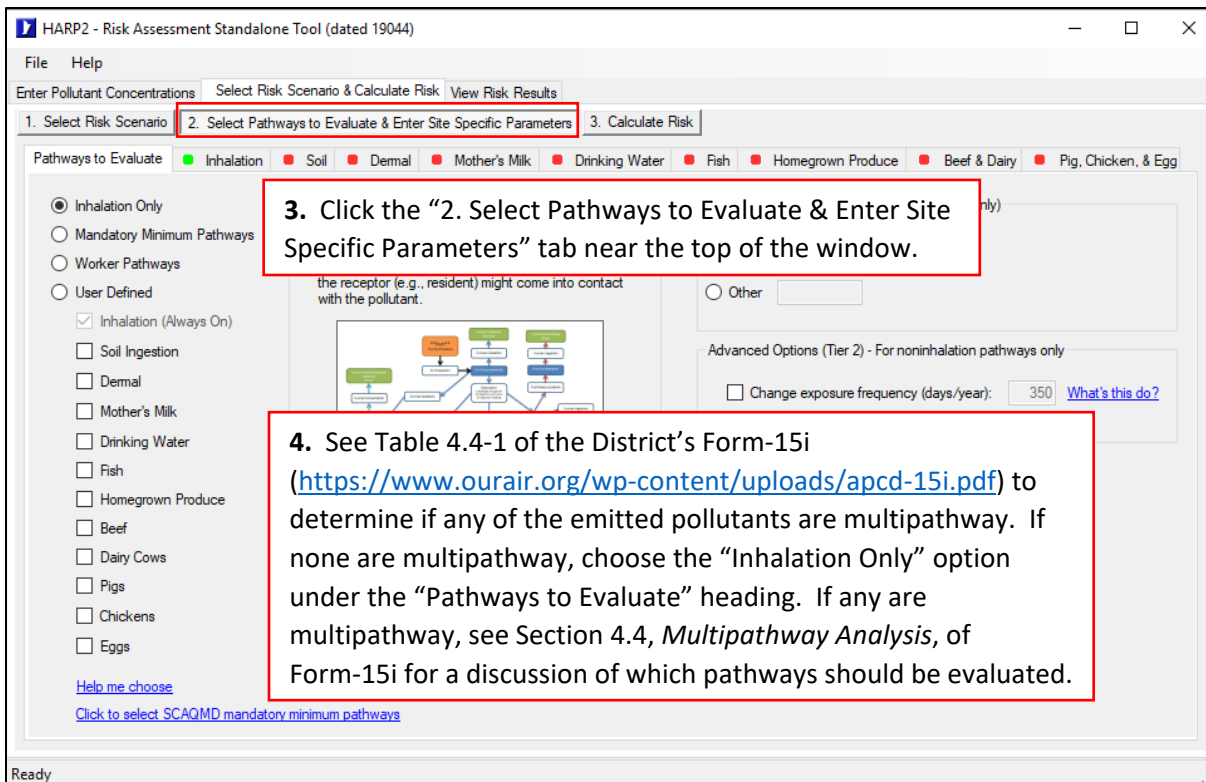
Number of Records: 22

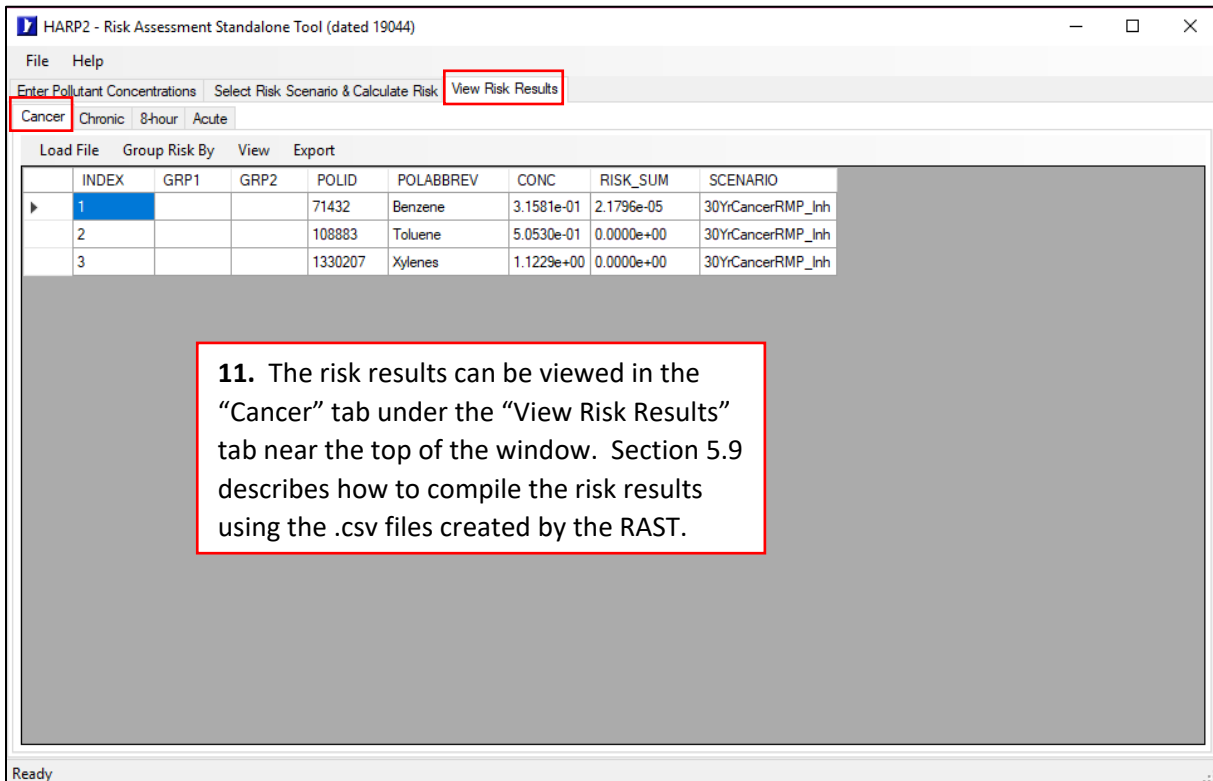
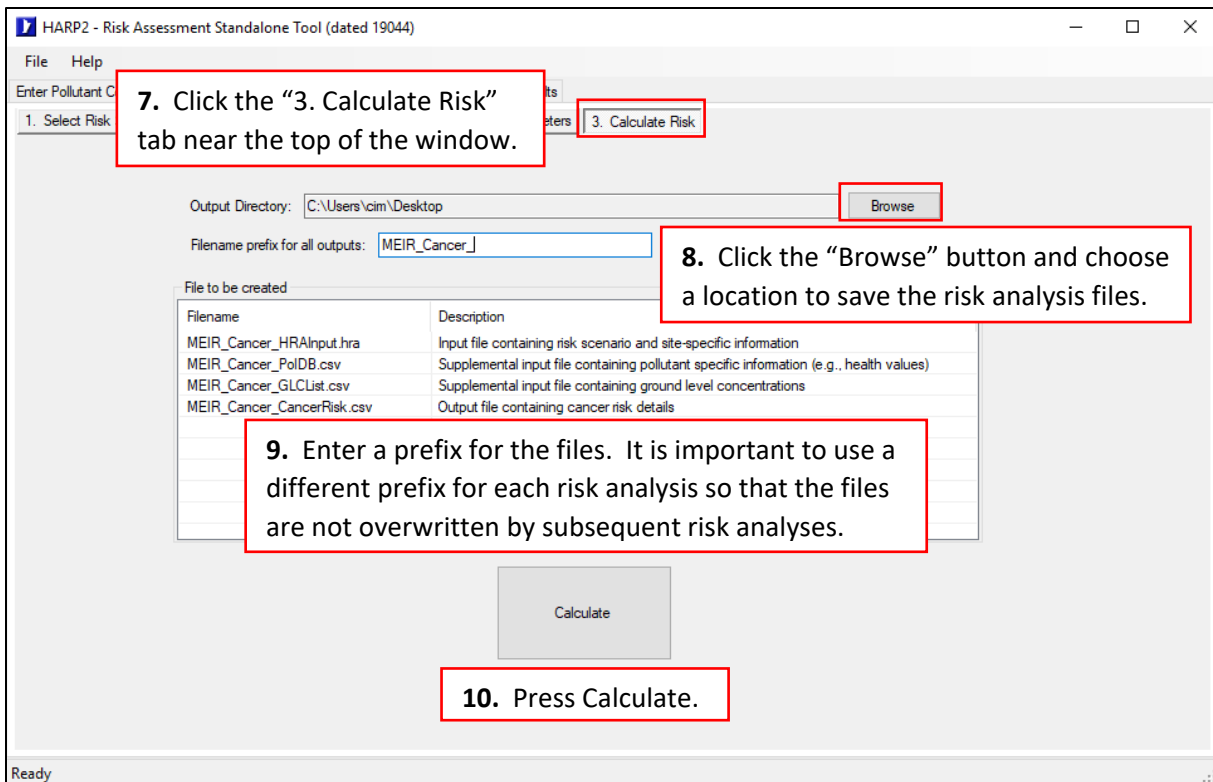


5.2 MEIR Cancer Risk Analysis

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

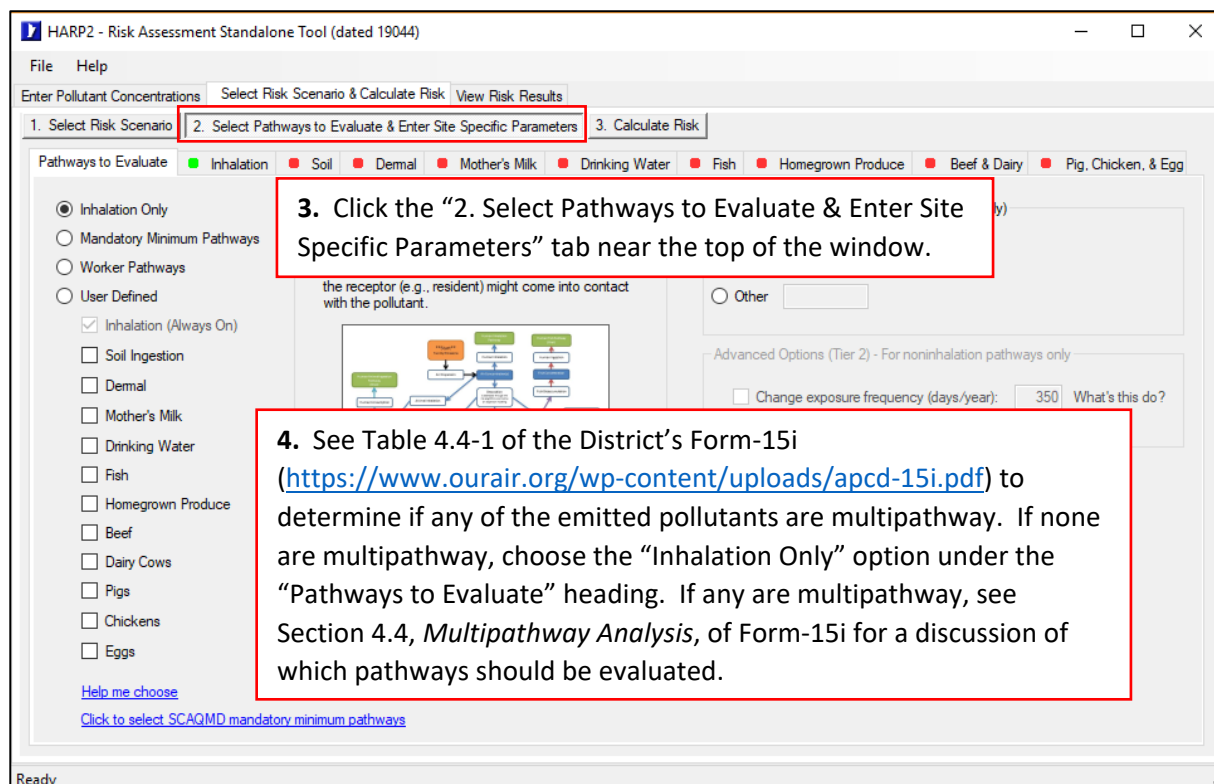
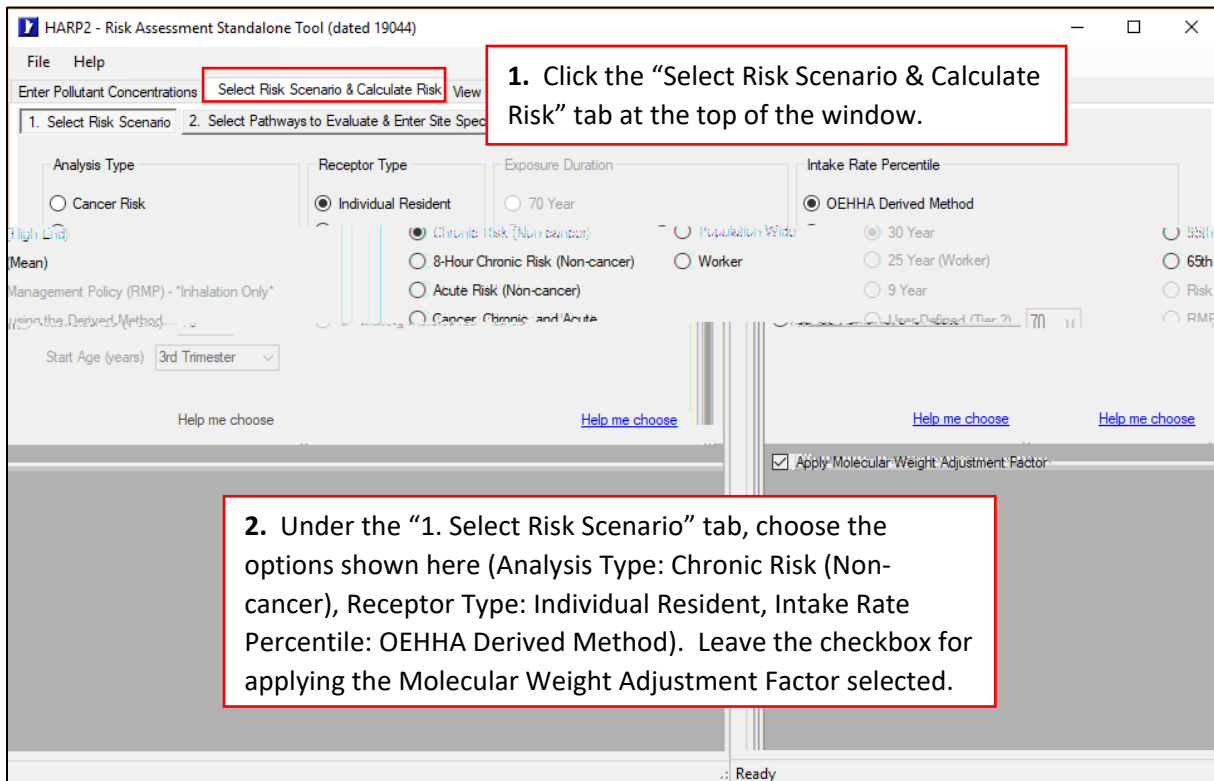


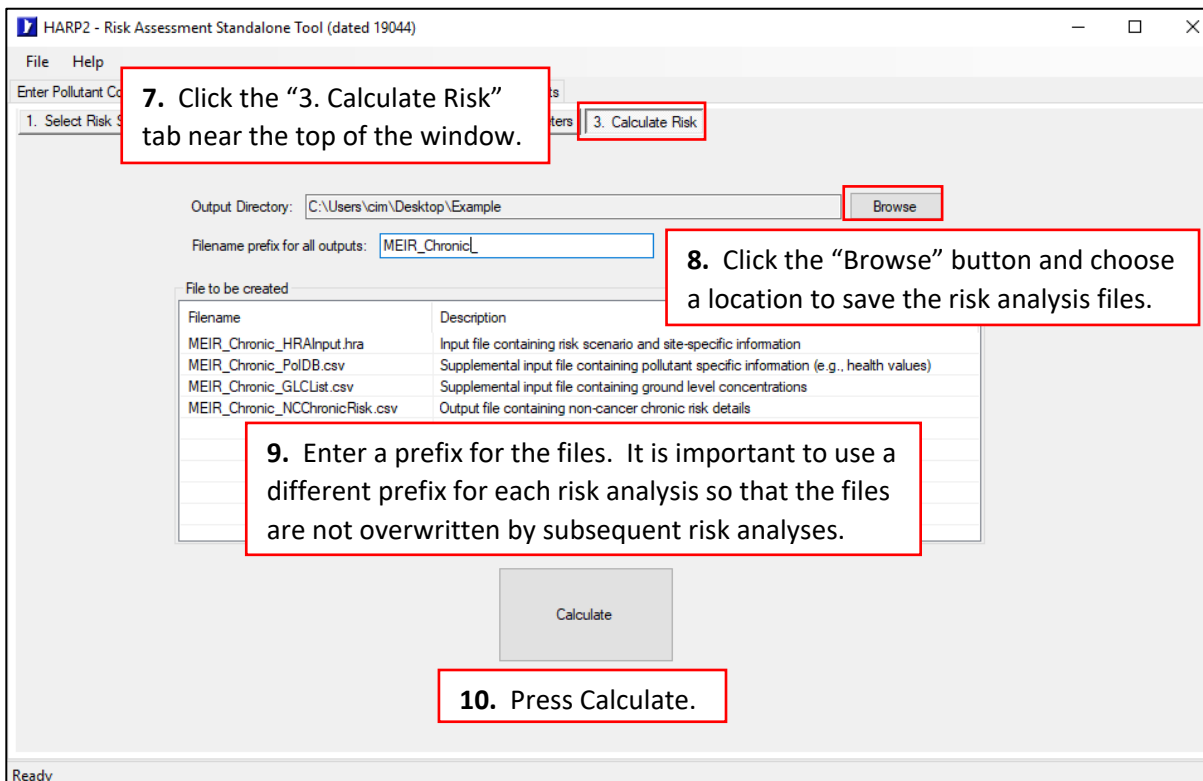
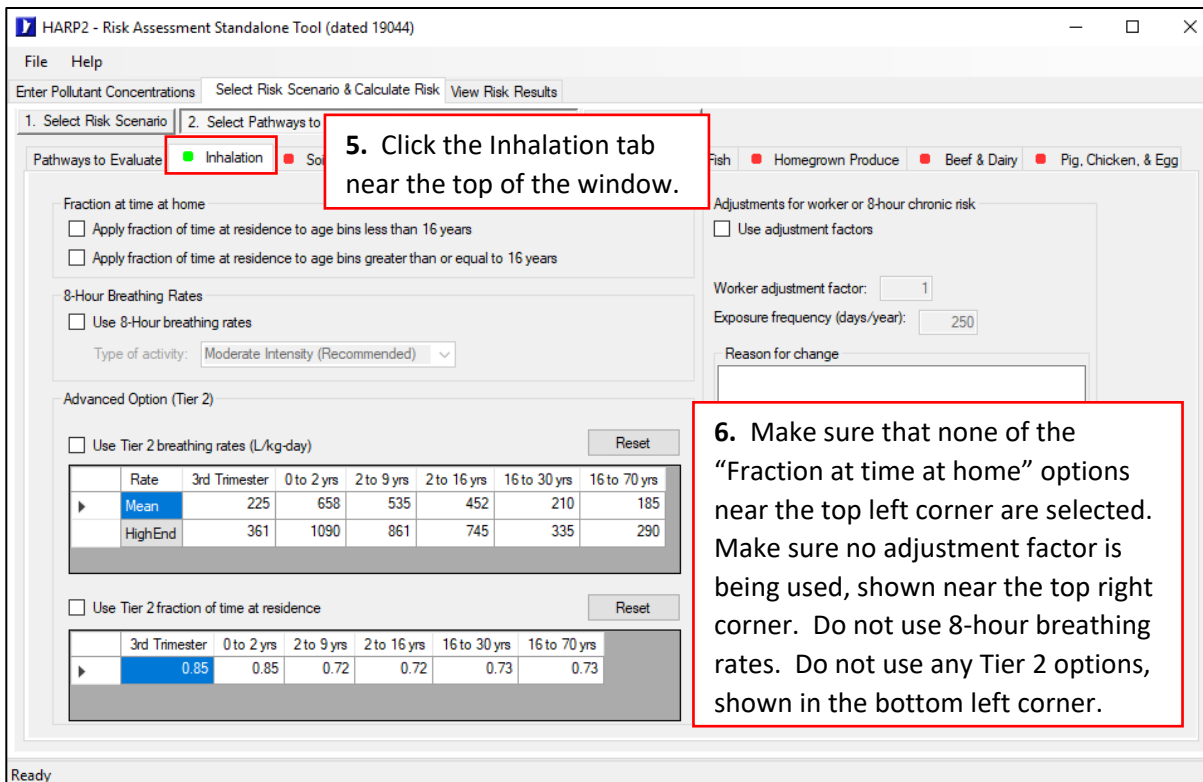


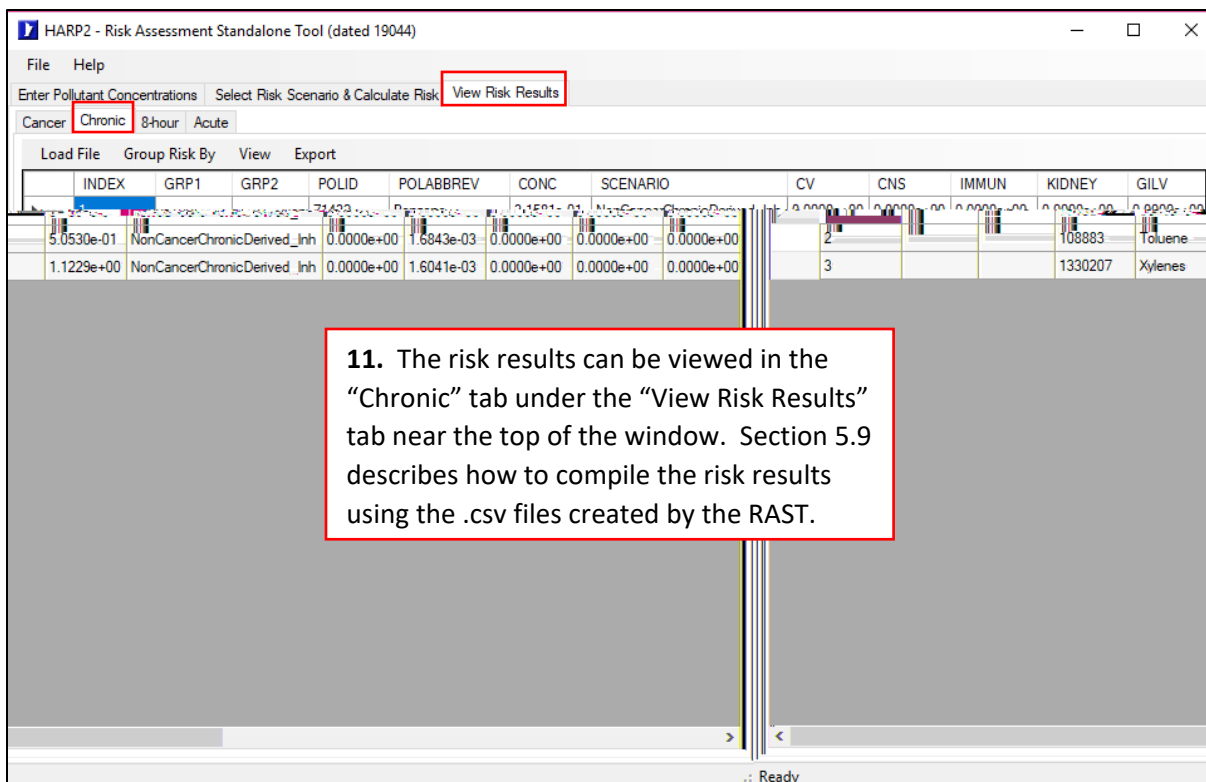


5.3 MEIR Chronic Non-Cancer Risk Analysis

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

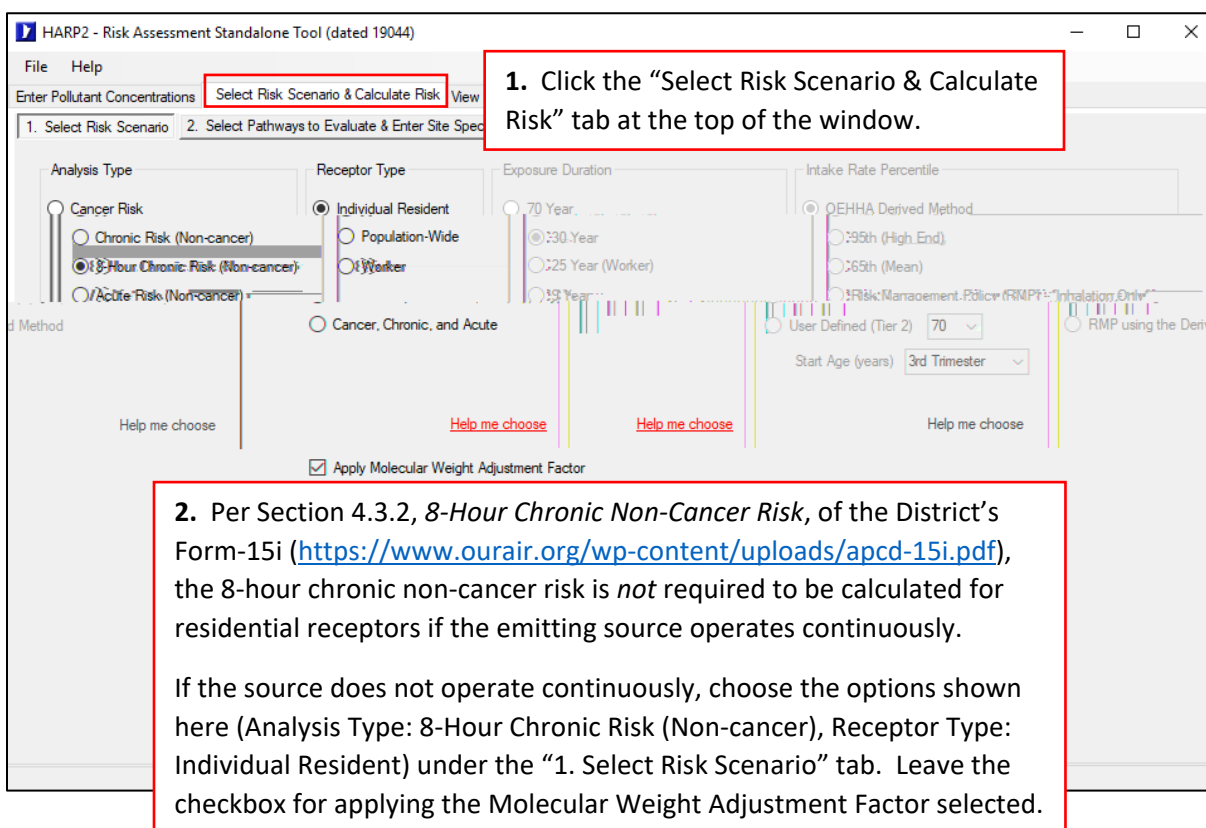


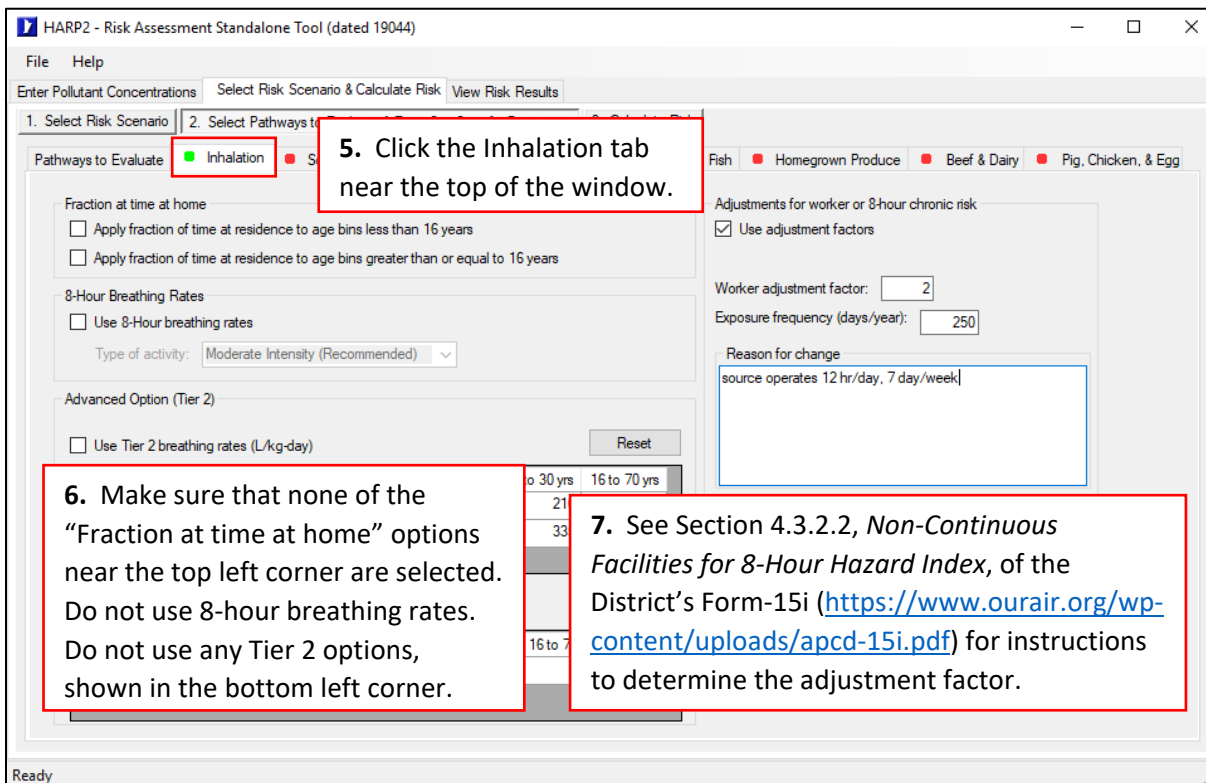
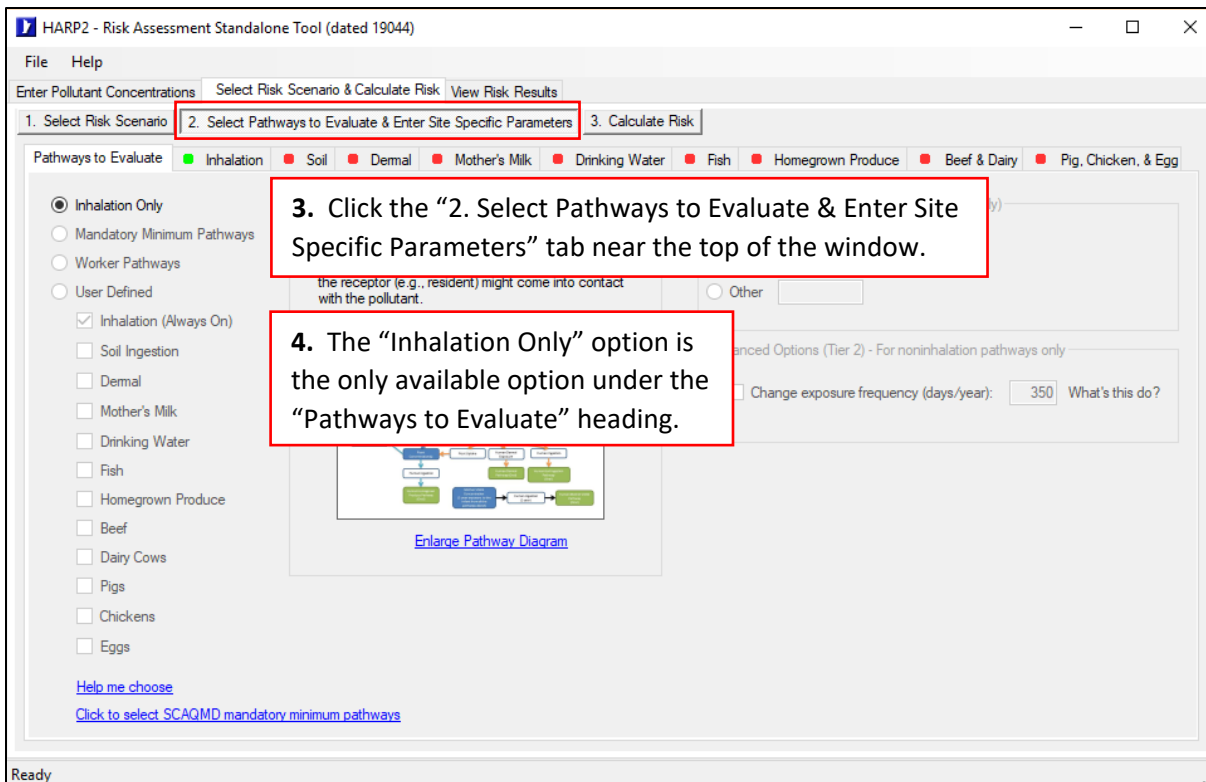


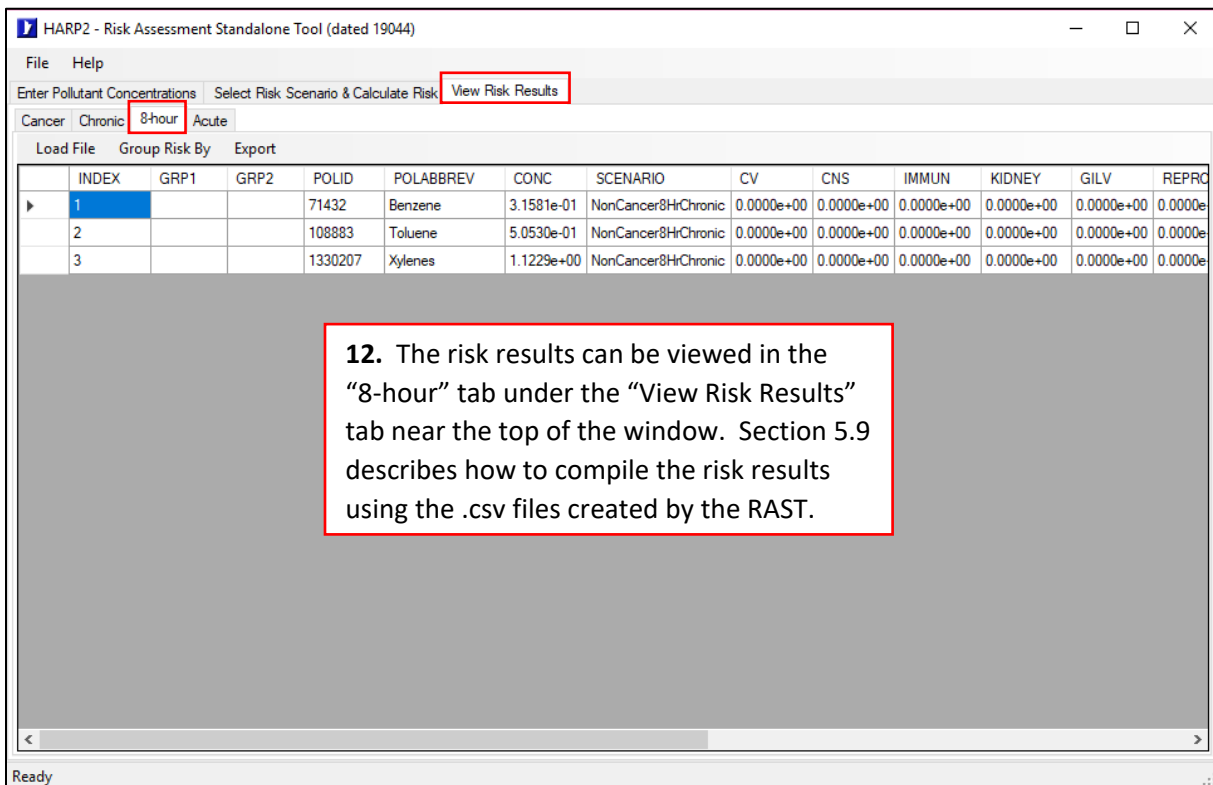
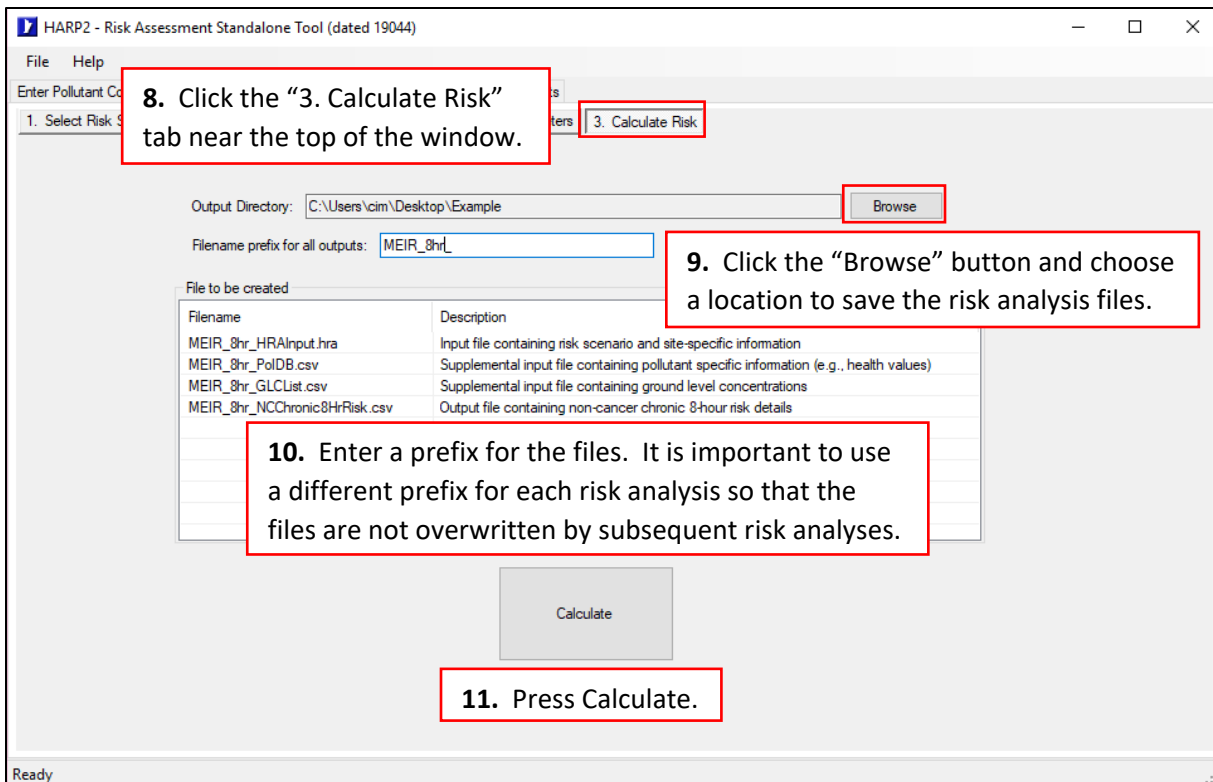


5.4 MEIR 8-Hour Chronic Non-Cancer Risk Analysis

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

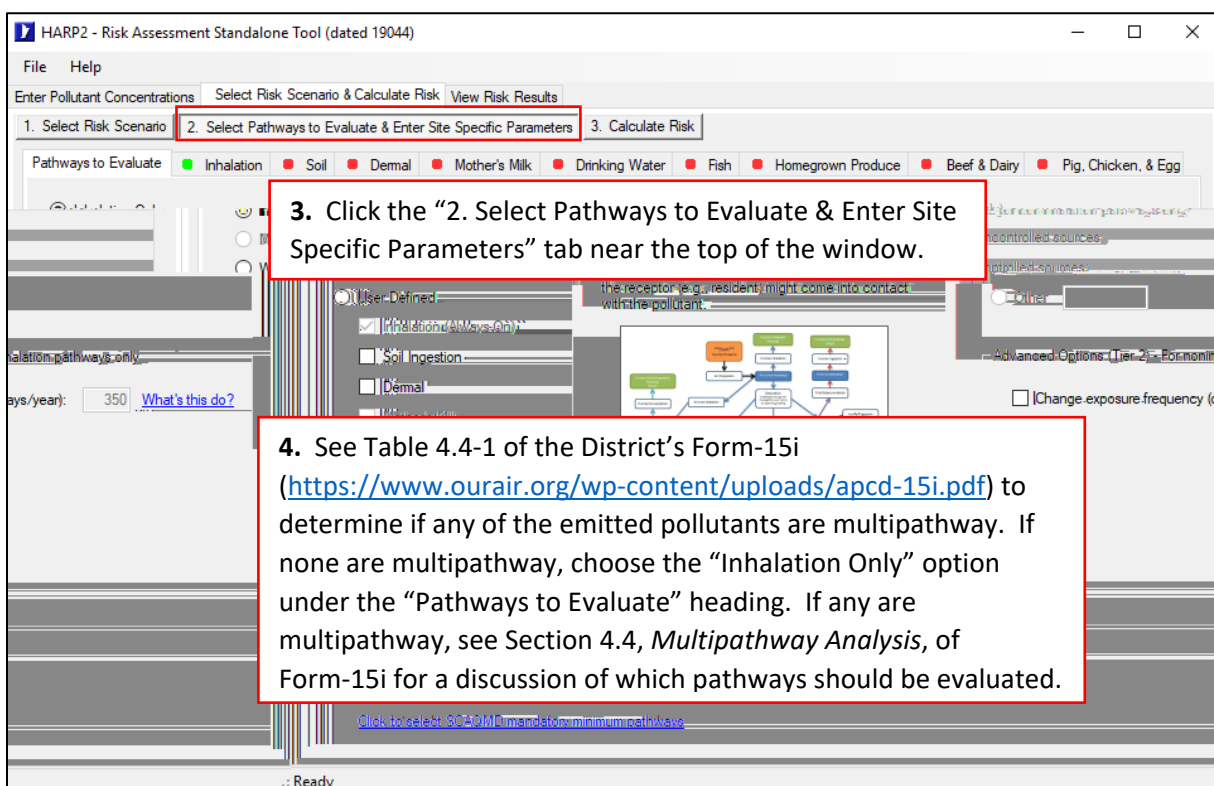
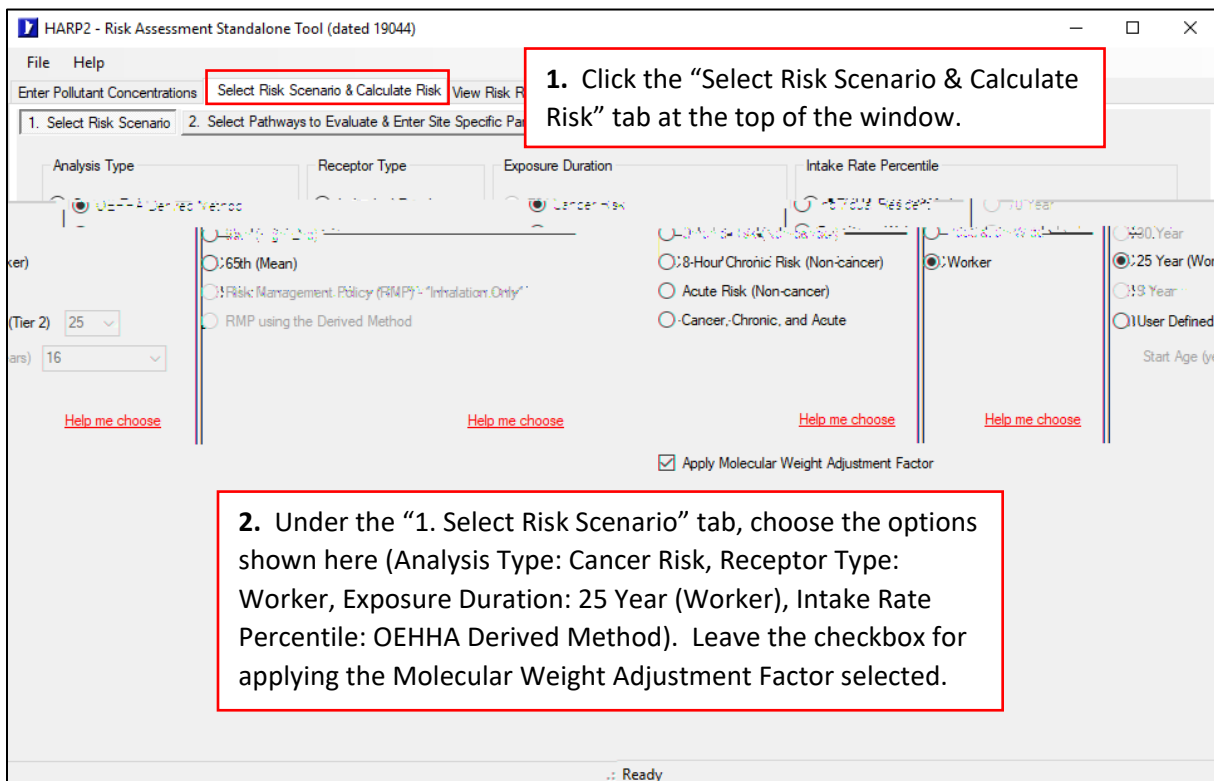


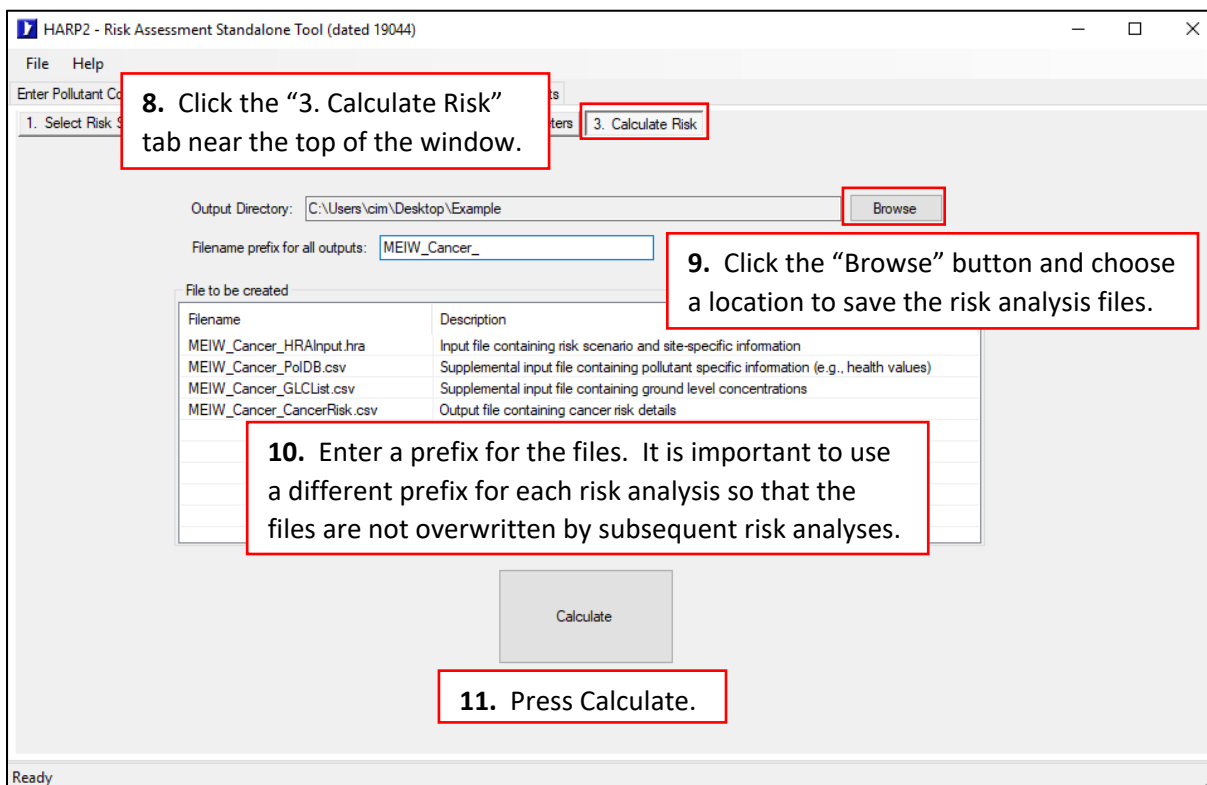
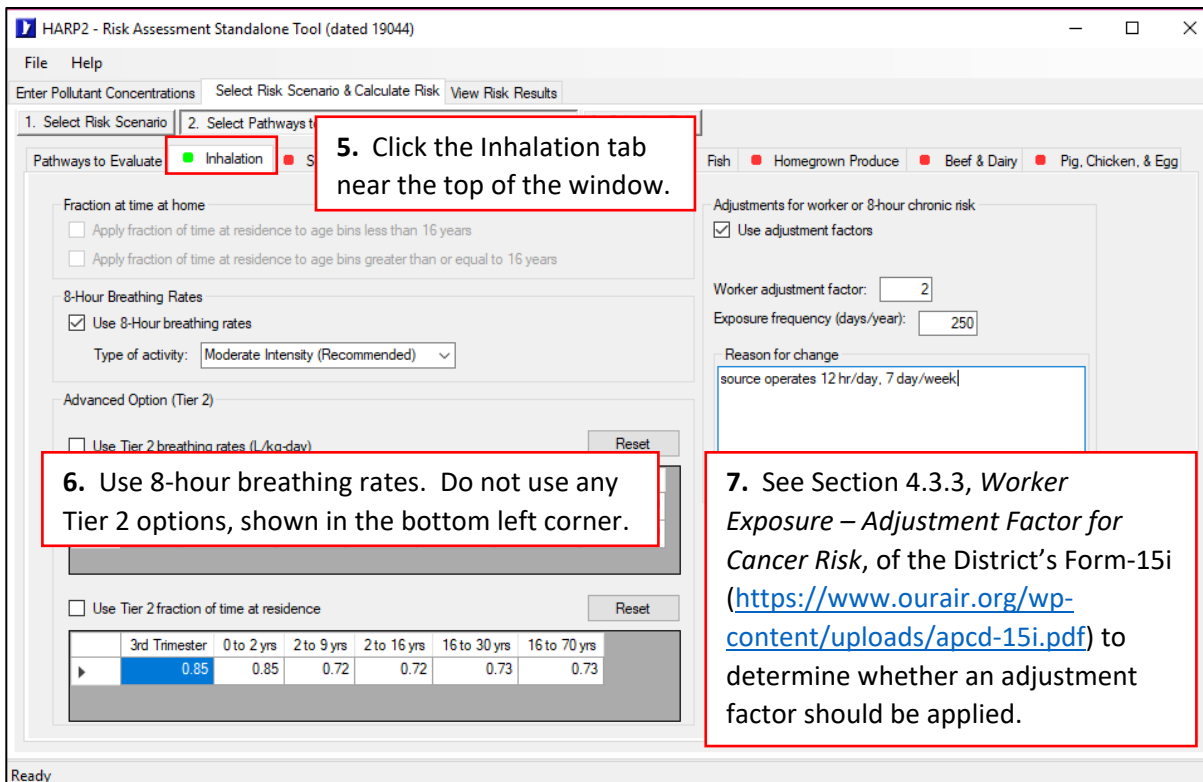


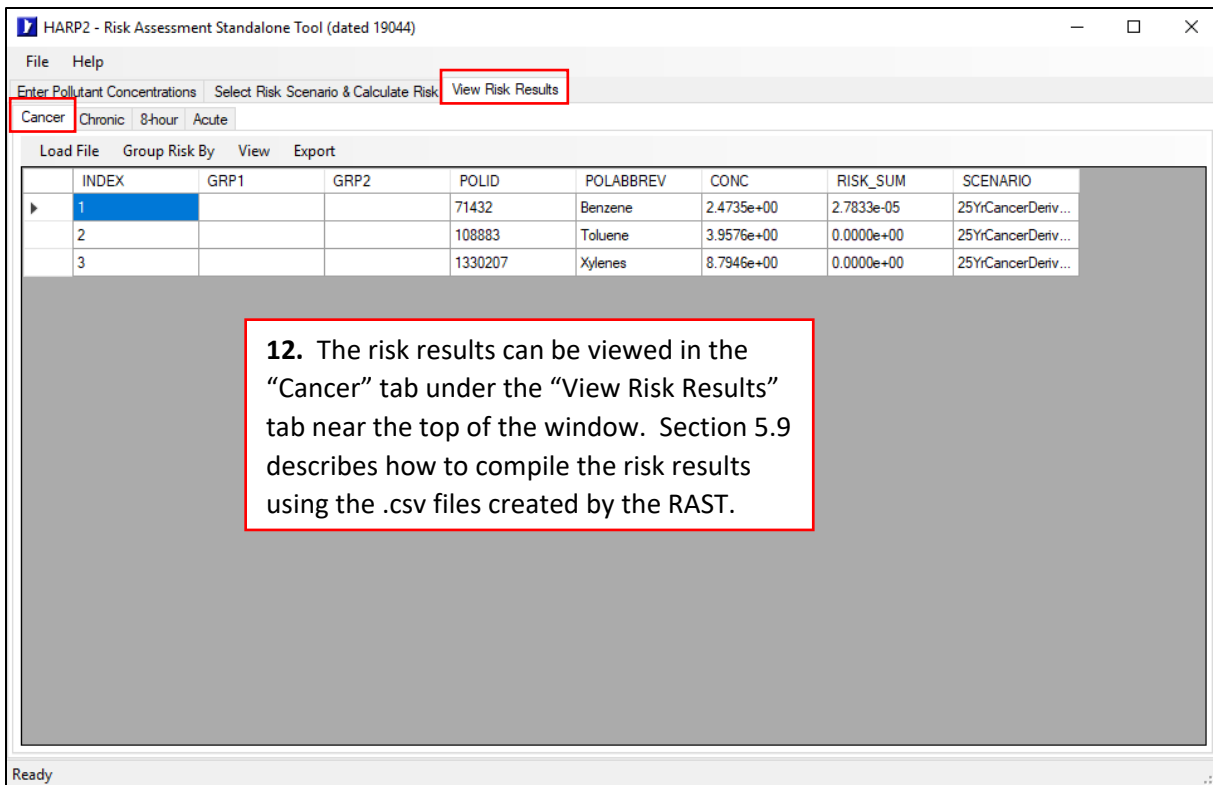


5.5 MEIW Cancer Risk Analysis

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

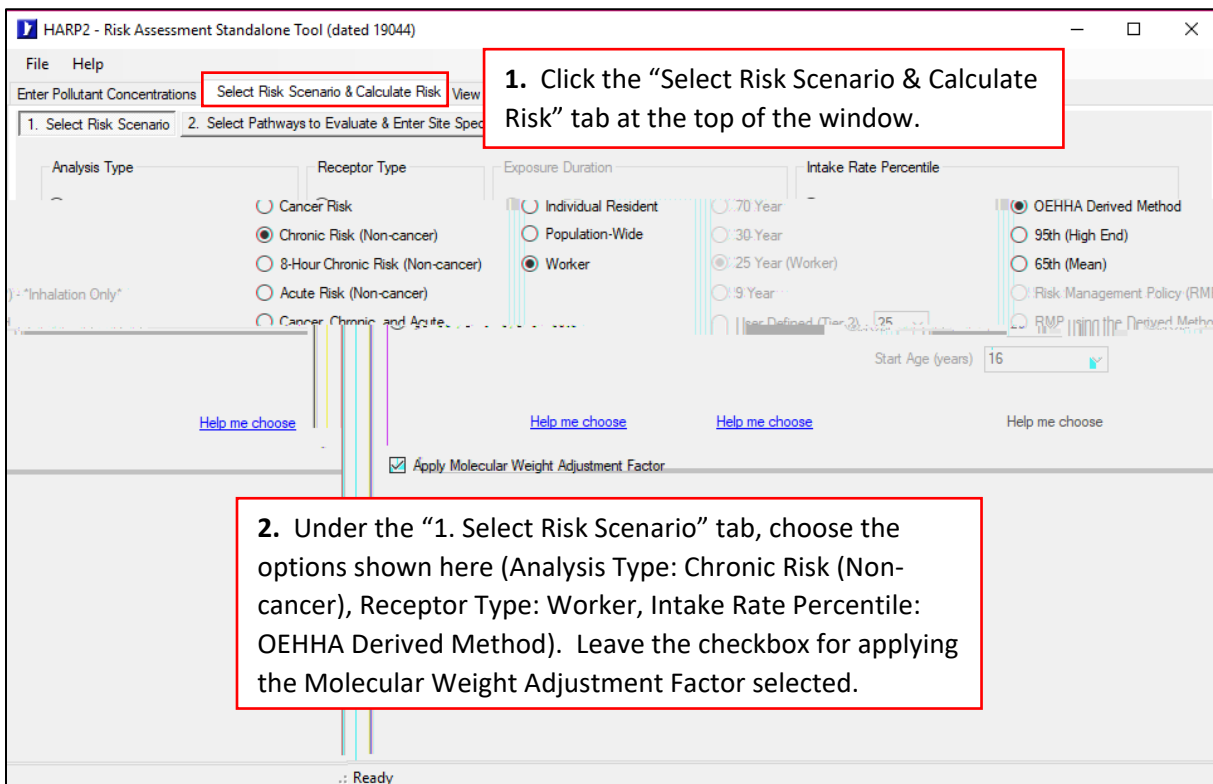


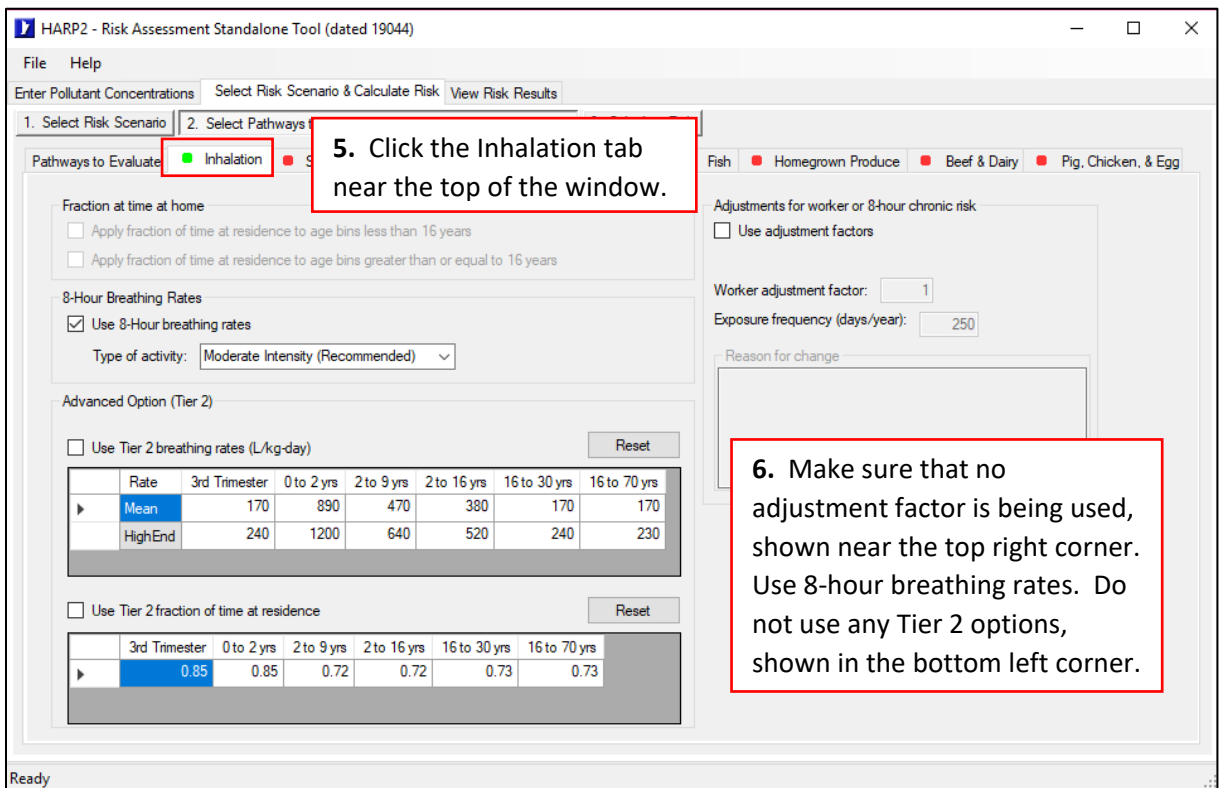
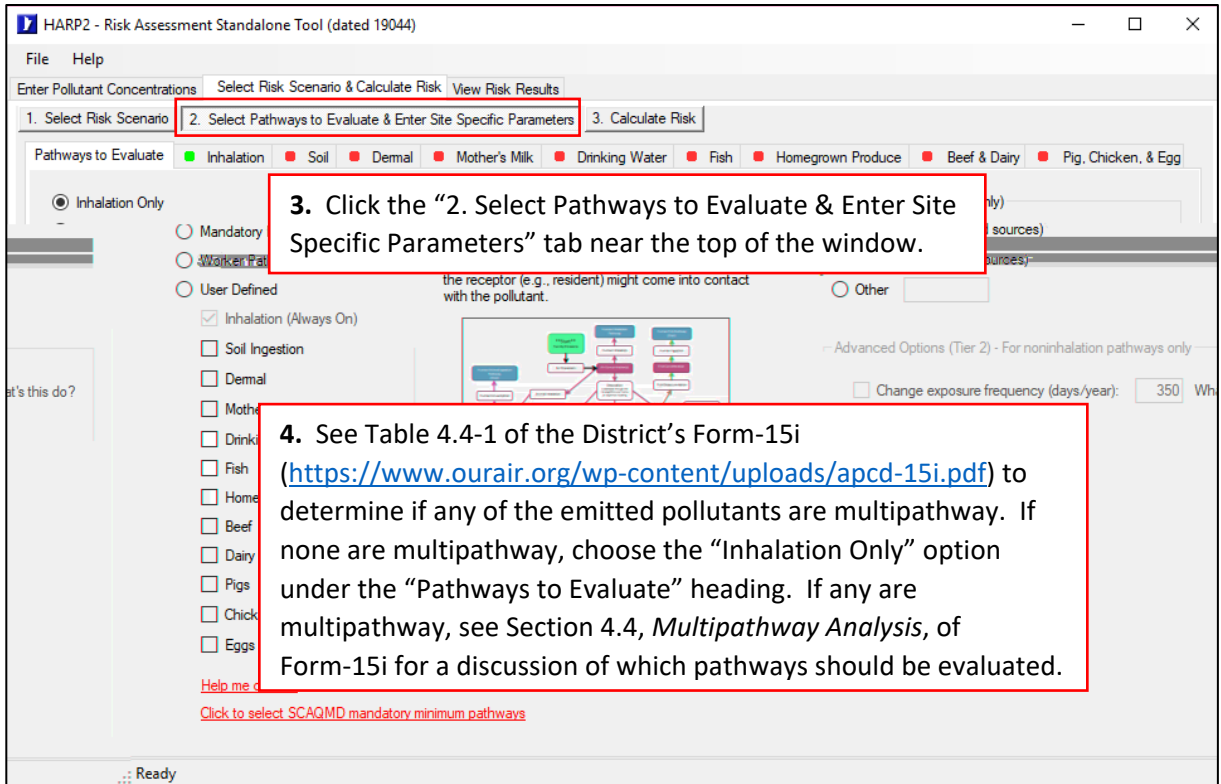


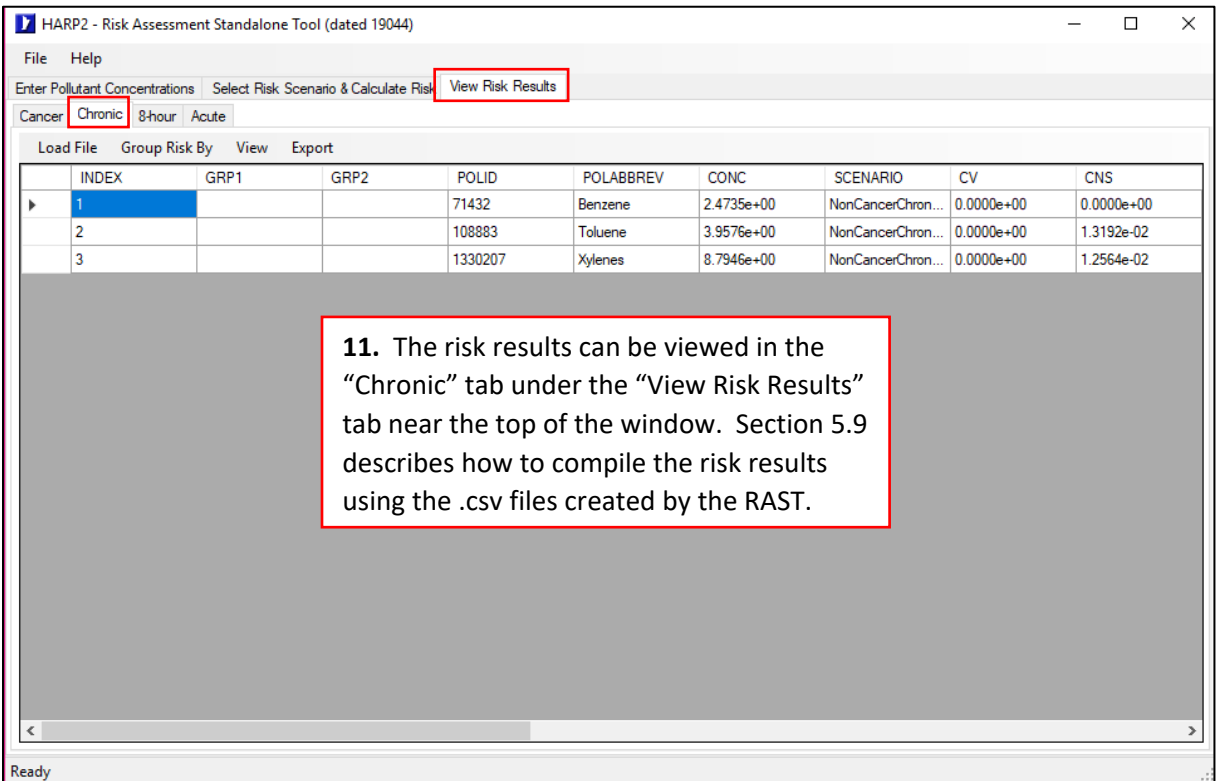
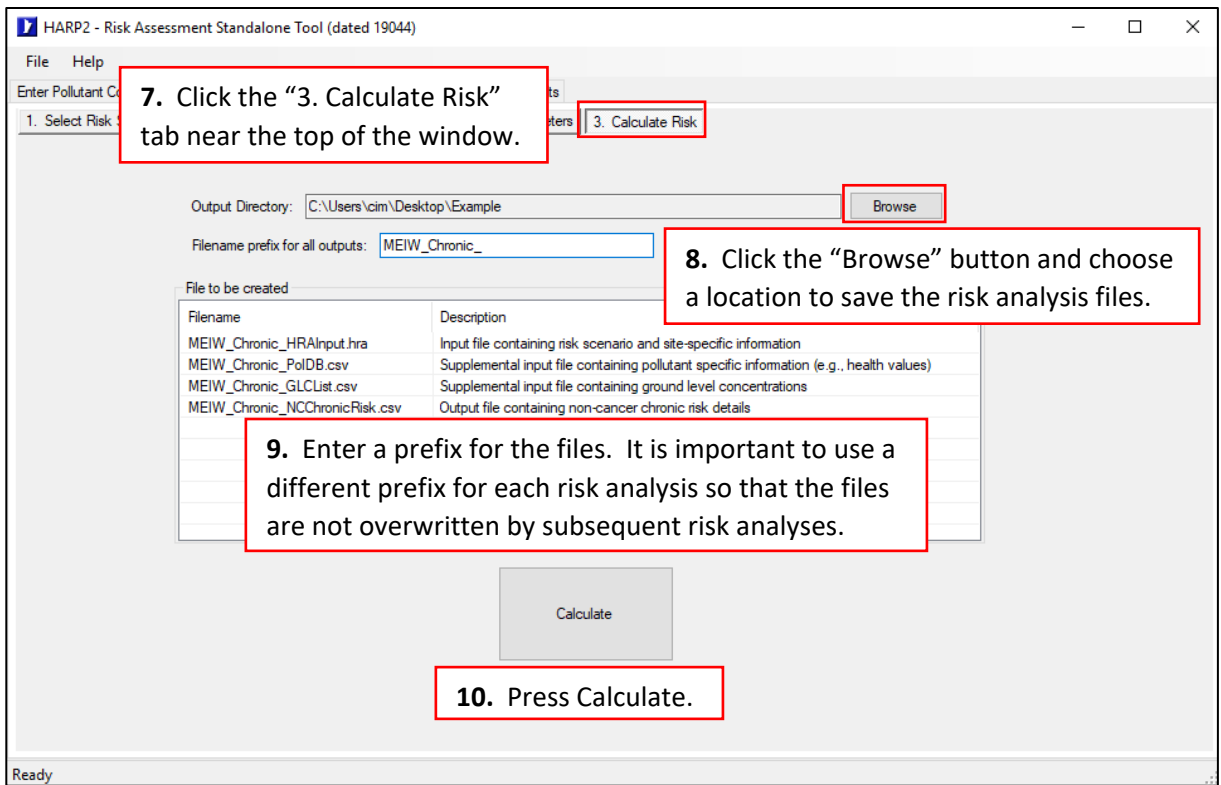


5.6 MEIW Chronic Non-Cancer Risk Analysis

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







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:

1. Click the “Select Risk Scenario & Calculate Risk” tab at the top of the window.

2. Under the “1. Select Risk Scenario” tab, choose the options shown here (Analysis Type: 8-Hour Chronic Risk (Non-cancer), Receptor Type: Worker). Leave the checkbox for applying the Molecular Weight

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. 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.

Rate	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	

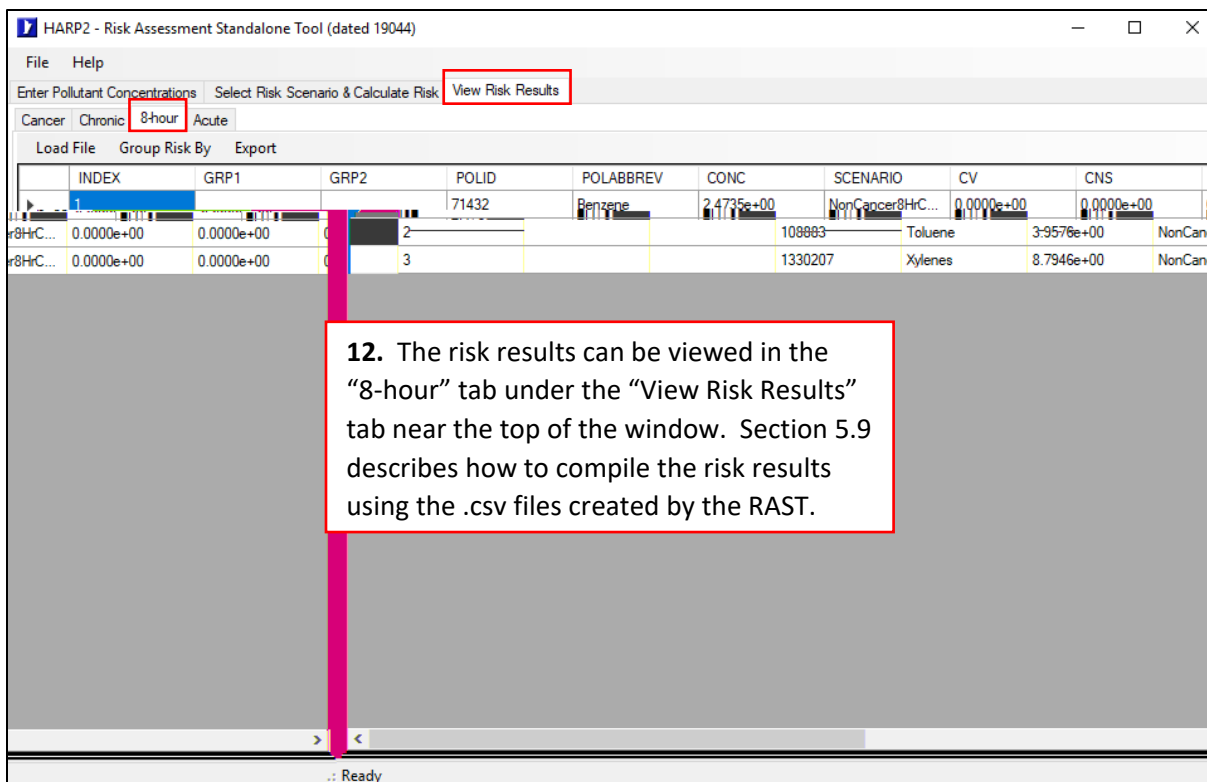
8. Click the "3. Calculate Risk" tab near the top of the window.

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.

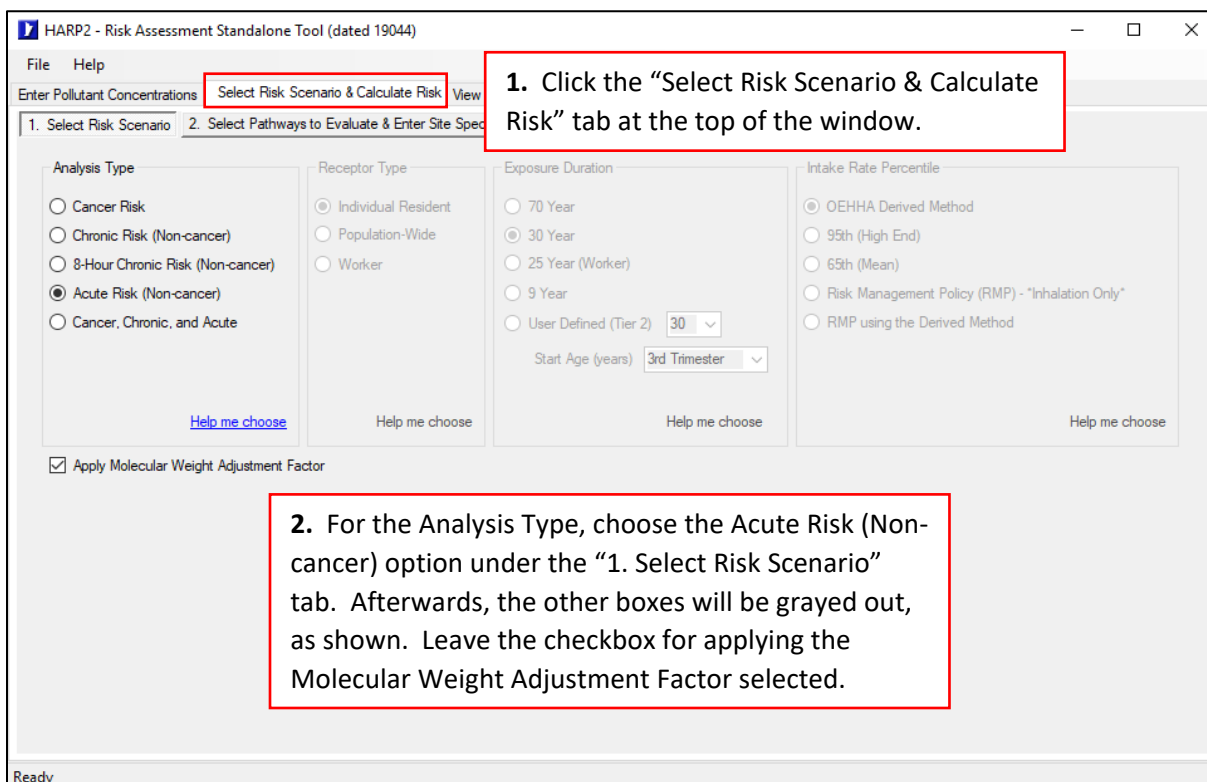
11. Press Calculate.

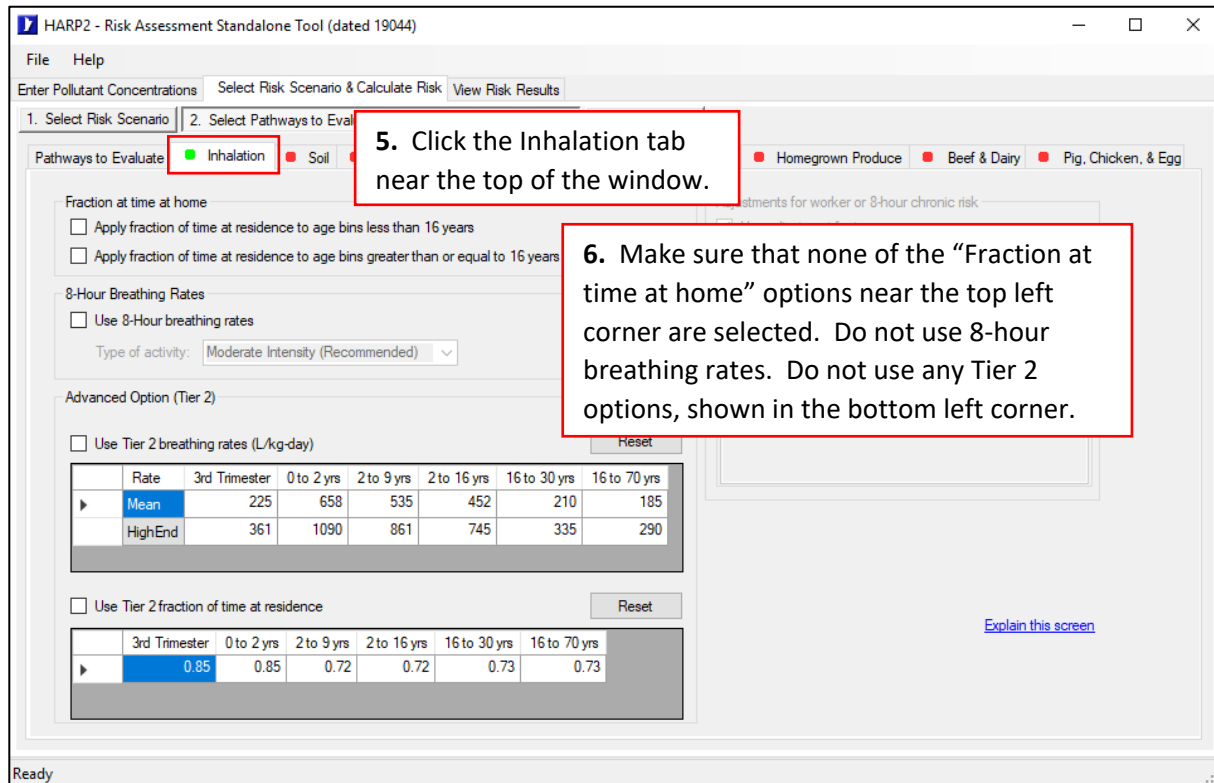
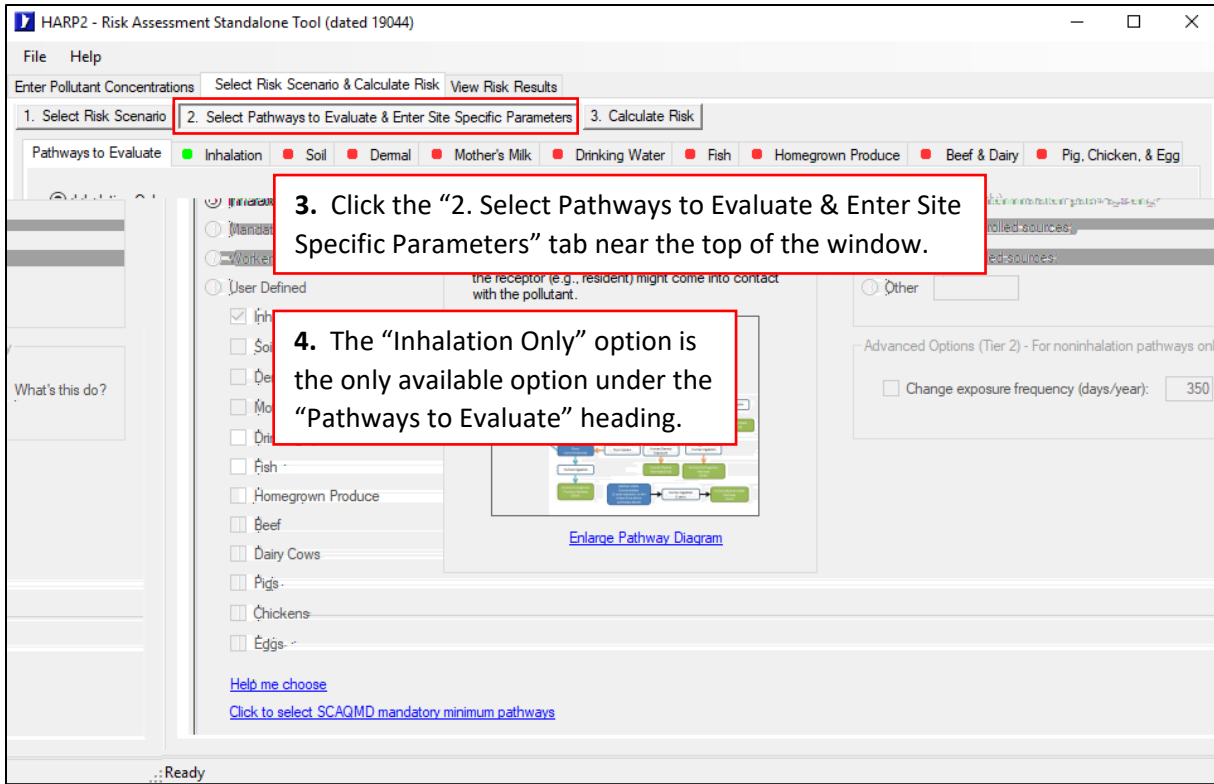
Filename	Description
MEIW_8hr_HRAInput.hra	Input file containing risk scenario and site-specific information
MEIW_8hr_PoIDB.csv	Supplemental input file containing pollutant specific information (e.g., health values)
MEIW_8hr_GLCList.csv	Supplemental input file containing ground level concentrations
MEIW_8hr_NCChronic8HrRisk.csv	Output file containing non-cancer chronic 8-hour risk details

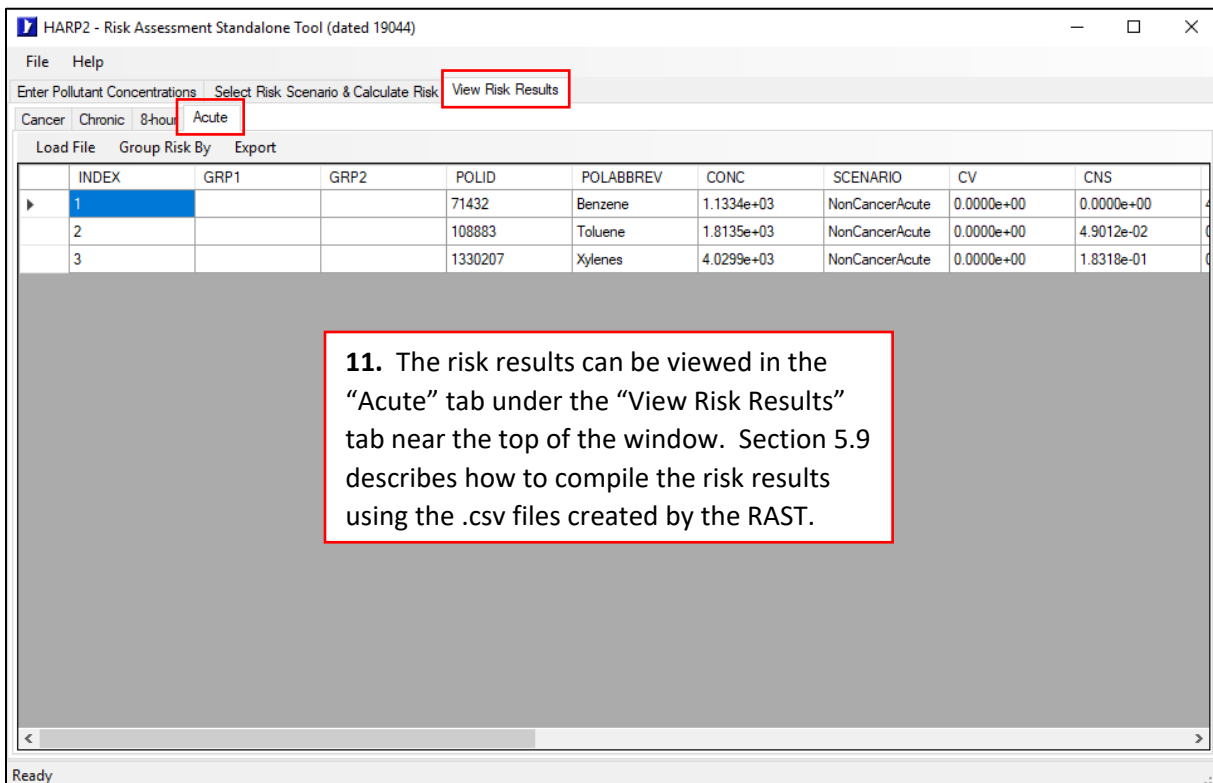
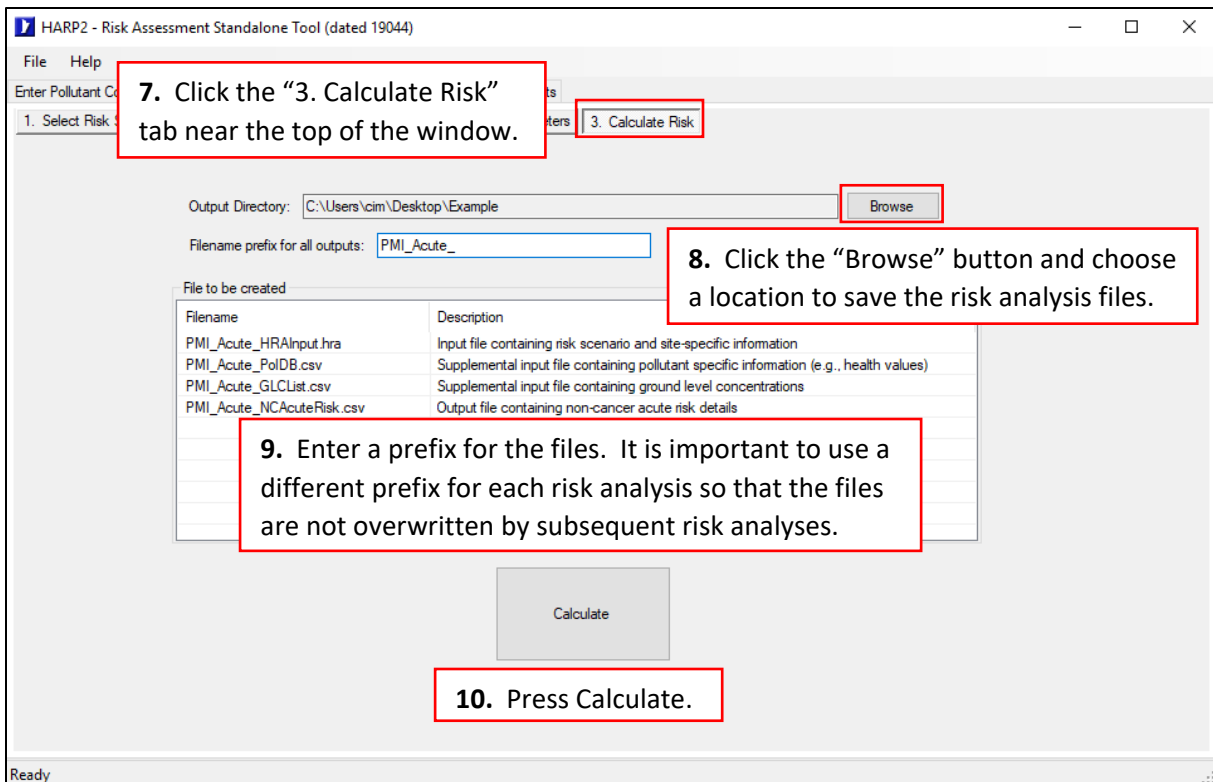


5.8 PMI Acute Non-Cancer Risk Analysis

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







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.

MEIR_Cancer_CancerRisk.csv - Excel

INDEX	GRP1	GRP2	POLID	POLABBR	CONC	RISK_SUM	SCENARIC	DETAILS	INH_RISK	SOIL_RISK	DERMAL	I	M	WA
3			1			71432	Benzene	0.315813	2.18E-05	30YrCance*				
4			2			108883	Toluene	0.505301	0.00E+00	30YrCance*				
5			3			1330207	Xylenes	1.122892	0.00E+00	30YrCance*				
												21.796		

MEIW_Cancer_CancerRisk.csv - Excel

INDEX	GRP1	GRP2	POLID	POLABBR	CONC	RISK_SUM	SCENARIC	DETAILS	INH_RISK	SOIL	DERMAL	I	M	WA
3			1			71432	Benzene	2.473494	2.78E-05	2.78E-05	2.78E-05			
4			2			108883	Toluene	3.95759	0.00E+00	0.00E+00	0.00E+00			
5			3			1330207	Xylenes	8.794645	0.00E+00	0.00E+00	0.00E+00			
												27.833		

- To determine the chronic HI at the MEIR and MEIW, open the corresponding files that end in “NCChronicRisk.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.

INDEX	GRP1	GRP2	POLID	POLABBR	CONC	SCENARIC	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DERESP	SKIN	EYE	BONE/TEE	ENDO	BLOOD	ODOR	GEN
1			71432	Benzene	0.315813	NonCancel	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
2			108883	Toluene	0.505301	NonCancel	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
3			1330207	Xylenes	1.122892	NonCancel	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
7								0	0.003288	0	0	0	0.001684	0.003288	0	0.001604	0	0	0.10527

INDEX	GRP1	GRP2	POLID	POLABBR	CONC	SCENARIC	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DERESP	SKIN	EYE	BONE/TEE	ENDO	BLOOD	ODOR	GENERAL	DETAIL
1			71432	Benzene	2.473494	NonCancel	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	*
2			108883	Toluene	3.95759	NonCancel	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	*
3			1330207	Xylenes	8.794645	NonCancel	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	*
7								0	0.025756	0	0	0	0.013192	0.025756	0	0.012564	0	0	0.8245	0

- 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.

INDEX	GRP1	GRP2	POLID	POLABBRÉ	CONC	SCENARIC	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DE	RESP	SKIN	EYE	BONE/TEE	ENDO	BLOOD	ODOR	GENERAL	
1	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	2.11E-01	0.00E+00	0.00E+00	
4	2		108883	Toluene	0.505301	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	0.00E+00	0.00E+00	
5	3		1330207	Xylenes	1.122892	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	0.00E+00	0.00E+00	
7								0	0	0	0	0	0	0	0	0	0	0	0	0	
=SUM(S3:S5)																					
																			0.21054		

INDEX	GRP1	GRP2	POLID	POLABBRÉ	CONC	SCENARIC	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DE	RESP	SKIN	EYE	BONE/TEE	ENDO	BLOOD	ODOR	GENERAL	
1	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	1.65E+00	0.00E+00	0.00E+00	
4	2		108883	Toluene	3.95759	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	0.00E+00	0.00E+00	
5	3		1330207	Xylenes	8.794645	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	0.00E+00	0.00E+00	
7								0	0	0	0	0	0	0	0	0	0	0	0	0	
=SUM(S3:S5)																					
																			1.649	0	0

- 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).

The screenshot shows an Excel spreadsheet titled "PMI_Acute_NCAcuteRisk.csv - Excel". The spreadsheet contains a table with the following data:

INDEX	GRP1	GRP2	POLID	POLABBRE	CONC	SCENARIC	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DE	RESP	SKIN	EYE	BONE/TEE	ENDO	BLOOD	ODOR	GENERAL	
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	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	
5	3			1330207	Xylenes	4029.913	NonCance	0.00E+00	1.83E-01	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	
7								0	0.232192	41.978	0	0	42.02701	0.232192	0	0.232192	0	0	41.978	0	0

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).