Radioactive Air Emissions Guide:
Demonstrating Compliance By Using CAP88 Modeling

Most licensees are approved to use either COMPLY or CAP88 modeling programs to demonstrate compliance with radioactive air emission limits. COMPLY is a screening model, which consolidates many steps in environmental transport and dosimetry to simplify the compliance process. Conservative assumptions and model parameters built into COMPLY are meant to deliberately overestimate the dose to people to ensure actual emissions are well below the regulatory limit. CAP88 incorporates more detailed atmospheric processes and requires more detailed, site-specific input data giving a more realistic, yet still conservative, dose prediction.

To use CAP88, a higher level of modeling competency is required from the licensee to ensure appropriate inputs were chosen. To help licensees use CAP88, the following steps are suggested. You are welcome to use other input parameters that better represent your site, but will need to justify that use in your application or annual report. Contact us, if you need additional guidance.

1. **Creating a new dataset file**

   - Select *File > New > dataset file* (or shortcut: Ctrl+N) to create a new dataset file for you facility.

   - If your facility has multiple buildings with stacks that emit radionuclides, create a separate dataset file for each building.

2. **Facility**

   - Enter the company name, facility address, and emission year. Include any facility information that you think may be relevant in the comments section.
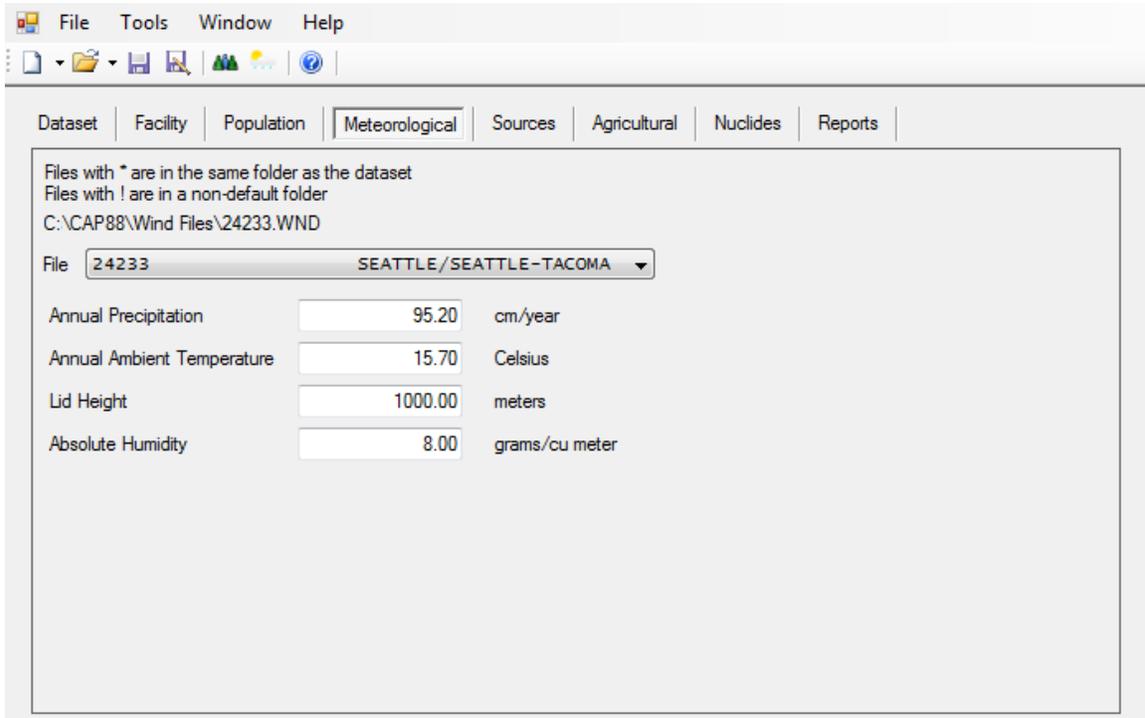
3. Population

- For **Run Type**, select *Individual* and for **Population Age,** select *Adult*. We recommend this run type because it more accurately models the definition for the maximum exposed individual (MEI) in WAC 246-247-030(15).
- Set the build-up time to 100 years – required for compliance purposes.
- Check the boxes to choose which reports you would like.
- The first midpoint will be the closest distance in meters a member of the public could be to the stack. Subsequent midpoints should be the distance to points of interest near the facility, such as parking lots, restaurants, or apartments. Justify how many locations you will evaluate in your application and/or annual report. Auto-determining the MEI location is preferred, but you should be able to justify using an alternate location, if the model chose a direction and midpoint in a restricted area of your facility.
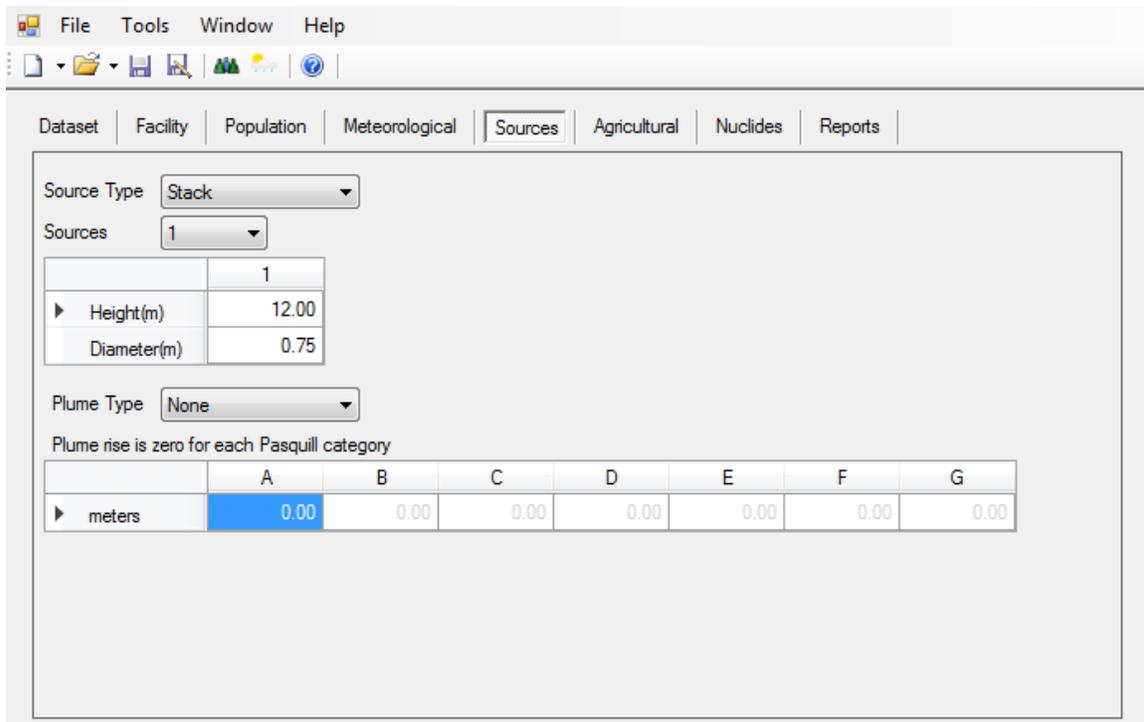
4. Meteorological

- If you do not have a custom wind file that accurately reflects your local meteorology, you may use one of the wind files provided in CAP88. This file will need to be from the closest airport or National Weather Service station to your facility.
- Values for the average annual precipitation and temperature can be found on the Internet. Be sure to input values with the correct units. Lid height and absolute humidity may be left at their default values unless the actual values for your facility location are known. For all of these values, you should cite where you found this information.

5. Sources

- Under **Sources,** select *Stack* for the *Source Type* and select the number of stacks. The stack height and diameter should be the same as what is in your license. All sources are modeled as being at the same point. If there are emission stacks on multiple buildings, a separate dataset file will need to be created for each building.

- The appropriate *Plume Type* setting is determined by these factors:
  - It should be set to *None* if the stack height is less than or equal to 2.5 times your building height or the height of any building in a 100-meter radius. This is to account for downwash due to building wake effects.
  - If your facility is not in an urban area and the MEI is greater than 100 meters away, your receptor is outside the near-wake region of the building. In this case, you may use the *Momentum* setting and provide the stack exit velocity.
  - The *Momentum* setting can also be used if the stack height is greater than 2.5 times the height of all buildings in the surrounding area.

- CAP88 has a known limitation for modeling dispersion very close to the stack. If the auto-determined MEI is less than two stack heights away, ambient air monitoring will need to be considered for determining compliance, instead of computer models.

6. Agricultural

- Select the most appropriate choice for **Food Source**. If unsure, select *Local* as assuming all food is produced at the MEI location is often the most conservative option for modeling radionuclide ingestion.
- Select *Washington* for the **Agriculture State**.

7. Nuclides

- Add a row for each nuclide in your license. If prompted to add the daughters to the decay chain, you are not required to do so unless your license requires you to monitor for decay progeny.
- Set the **Chain Length** to *max*. If you receive an error indicating you have exceeded the maximum total nuclide count, change the chain length to the largest acceptable length.
- You may leave the **Chemical Form, Type,** and **Size** at their default values unless you know these values based on your facility's radioactive materials use and operations. If you use the values specific to your facility, you should provide supporting documentation.
- Enter the release rate in curies per year for each nuclide in the **RR1** column. The release rate for each nuclide should be determined by the method approved in WAC 246-247-030(21) or an alternate method specified in your license.
- Nuclides with no chemical form have no internal dose coefficient. This means that the model will only calculate an external dose from these nuclides. If you emit one of these nuclides, you should contact us for guidance.
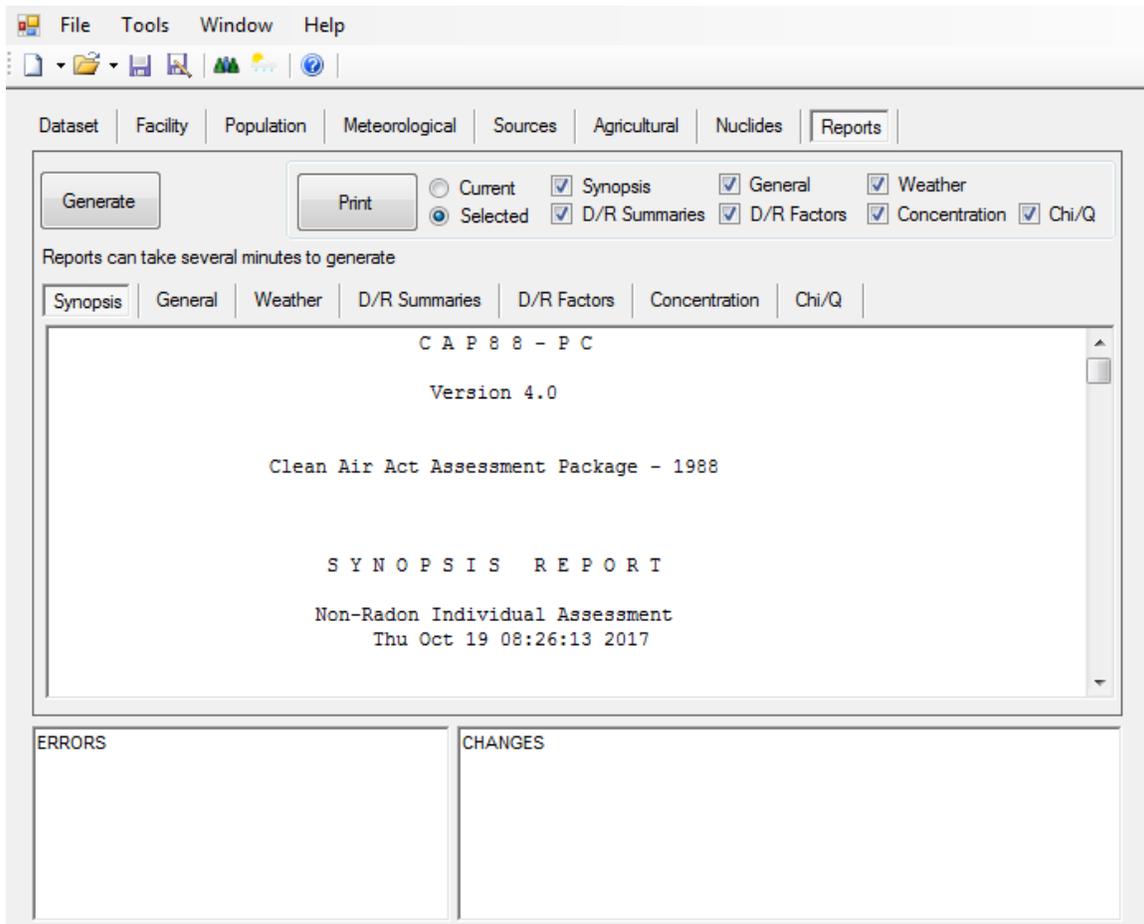
8. Reports

- You must save your dataset file and address any items that appear in the **Errors** section at the bottom of the window prior to generating reports.
- Click *Generate* to perform the dose assessment. After the program is finished, select the reports and click *Print*. These reports will also be available in the location you saved your dataset file. Each report is saved as a unique file extension, such as *.syn* for the synopsis and *.sum* for dose/risk summaries reports. You should be able to view and print these files using any word-processing program.
- Submit all of the assessment reports with any relevant supporting documentation as part of your application and/or annual report.

References

- National Council on Radiation Protection and Measurements (NCRP), "Screening Models for Releases of Radionuclides to Atmosphere, Surface Water, and Ground," NCRP, Bethesda, MD, January 22, 1996, NCRP Report No. 123 I-II.

- National Council on Radiation Protection and Measurements (NCRP), "Uncertainty in NCRP Screening Models Relating to Atmospheric Transport, Deposition and Uptake By Humans," NCRP, Bethesda, MD, September 1, 1993, NCRP Commentary No. 8.

- Trinity Engineering Associates, Inc., "CAP88-PC Version 4.0 User Guide," U.S. Environmental Protection Agency, Washington, DC, September 20