

# CAP88-PC V4 TRAINING

## Module 1.3

### Downloading, Installing, and Running the CAP88-PC V4



# DOWNLOADING, INSTALLING, AND RUNNING CAP88-PC, VERSION 4.0

- Downloading CAP88-PC, Version 4.0
- Installing CAP88-PC, Version 4.0
- Using the Migration Utility
- Running the Code
  - Entering Input Parameters
  - Generating Output Reports
- File Structures



# DOWNLOADING CAP88-PC

- Download .NET Framework 4 from Microsoft (if not already installed)

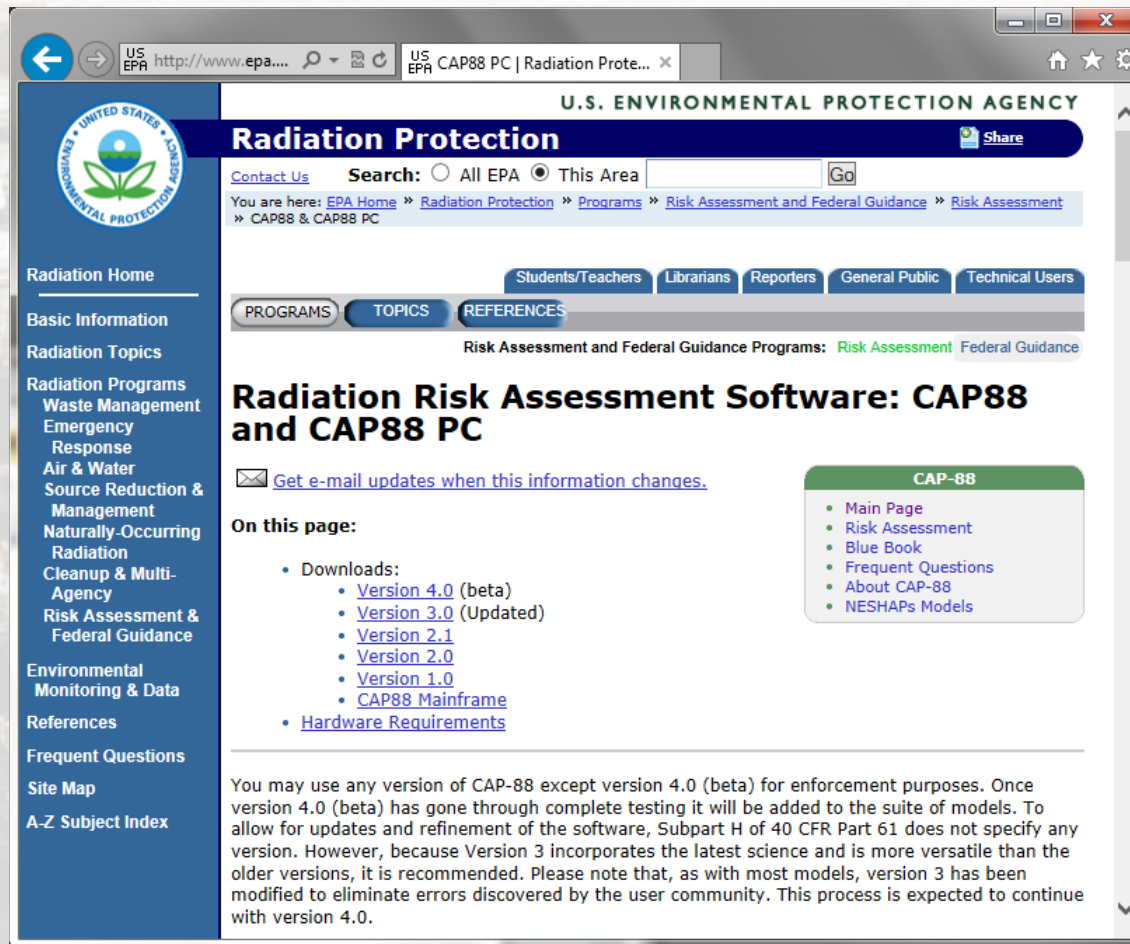
<http://www.microsoft.com/net/download>

- Download CAP88-PC Version 4.0 from the EPA's website

<http://www.epa.gov/rpdweb00/assessment/CAP88/>



# DOWNLOADING CAP88, VERSION 4.0



The screenshot shows a web browser window displaying the U.S. Environmental Protection Agency's Radiation Protection page. The browser's address bar shows the URL <http://www.epa.gov/rad/rad88/>. The page title is "U.S. ENVIRONMENTAL PROTECTION AGENCY Radiation Protection". The main heading is "Radiation Risk Assessment Software: CAP88 and CAP88 PC". A sidebar on the left contains navigation links such as "Radiation Home", "Basic Information", "Radiation Topics", "Radiation Programs", "Waste Management", "Emergency Response", "Air & Water", "Source Reduction & Management", "Naturally-Occurring Radiation", "Cleanup & Multi-Agency", "Risk Assessment & Federal Guidance", "Environmental Monitoring & Data", "References", "Frequent Questions", "Site Map", and "A-Z Subject Index". The main content area features a search bar, a breadcrumb trail, and a list of download links for CAP88 software versions: Version 4.0 (beta), Version 3.0 (Updated), Version 2.1, Version 2.0, Version 1.0, CAP88 Mainframe, and Hardware Requirements. A "CAP-88" box on the right lists links for Main Page, Risk Assessment, Blue Book, Frequent Questions, About CAP-88, and NESHAPs Models. A disclaimer at the bottom states that version 4.0 (beta) is not for enforcement purposes and that version 3 is recommended.

U.S. ENVIRONMENTAL PROTECTION AGENCY  
**Radiation Protection**

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Students/Teachers Librarians Reporters General Public Technical Users

PROGRAMS TOPICS REFERENCES

Radiation Risk Assessment Software: CAP88 and CAP88 PC

Get e-mail updates when this information changes.

On this page:

- Downloads:
  - [Version 4.0](#) (beta)
  - [Version 3.0](#) (Updated)
  - [Version 2.1](#)
  - [Version 2.0](#)
  - [Version 1.0](#)
  - [CAP88 Mainframe](#)
- [Hardware Requirements](#)

CAP-88

- [Main Page](#)
- [Risk Assessment](#)
- [Blue Book](#)
- [Frequent Questions](#)
- [About CAP-88](#)
- [NESHAPs Models](#)

You may use any version of CAP-88 except version 4.0 (beta) for enforcement purposes. Once version 4.0 (beta) has gone through complete testing it will be added to the suite of models. To allow for updates and refinement of the software, Subpart H of 40 CFR Part 61 does not specify any version. However, because Version 3 incorporates the latest science and is more versatile than the older versions, it is recommended. Please note that, as with most models, version 3 has been modified to eliminate errors discovered by the user community. This process is expected to continue with version 4.0.



# INSTALLING CAP88-PC, VERSION 4.0

1. Install Microsoft .NET 4 Framework (Follow instructions provided by Microsoft).
2. Extract files from the compressed (ZIP) file
3. Right click the file “CAP88PC.Setup.msi” and select “Install”
4. Click “Run”



# RUNNING CAP88-PC, V4 THE FIRST TIME

1. After installing CAP88-PC, run the “Migration Utility” from the “Tool” menu:
  - Check “Copy v4 default ...” if this is the first time the CAP88 is being run by that user.
  - Click “Run” (This step creates the user folders)
2. Select “Options” from the “Tool” menu:
  1. Click “Advanced”
  2. Click “Refresh FORTRAN”



# INSTALLING CAP88-PC, VERSION 4.0

- Installation of CAP88-PC requires Administrator rights
- Different major versions of CAP88-PC (e.g. V4.0 & V3.1) can be installed and run on the same machine simultaneously
- CAP88-PC can be installed to allow multiple users to run the code, but only one instance of the code can be run at a time, and only by one user at a time



# ENTERING THE INPUT PARAMETERS

- Dataset
- Facility Information
- Population
- Meteorological
- Sources
- Agricultural
- Nuclides
- Reports



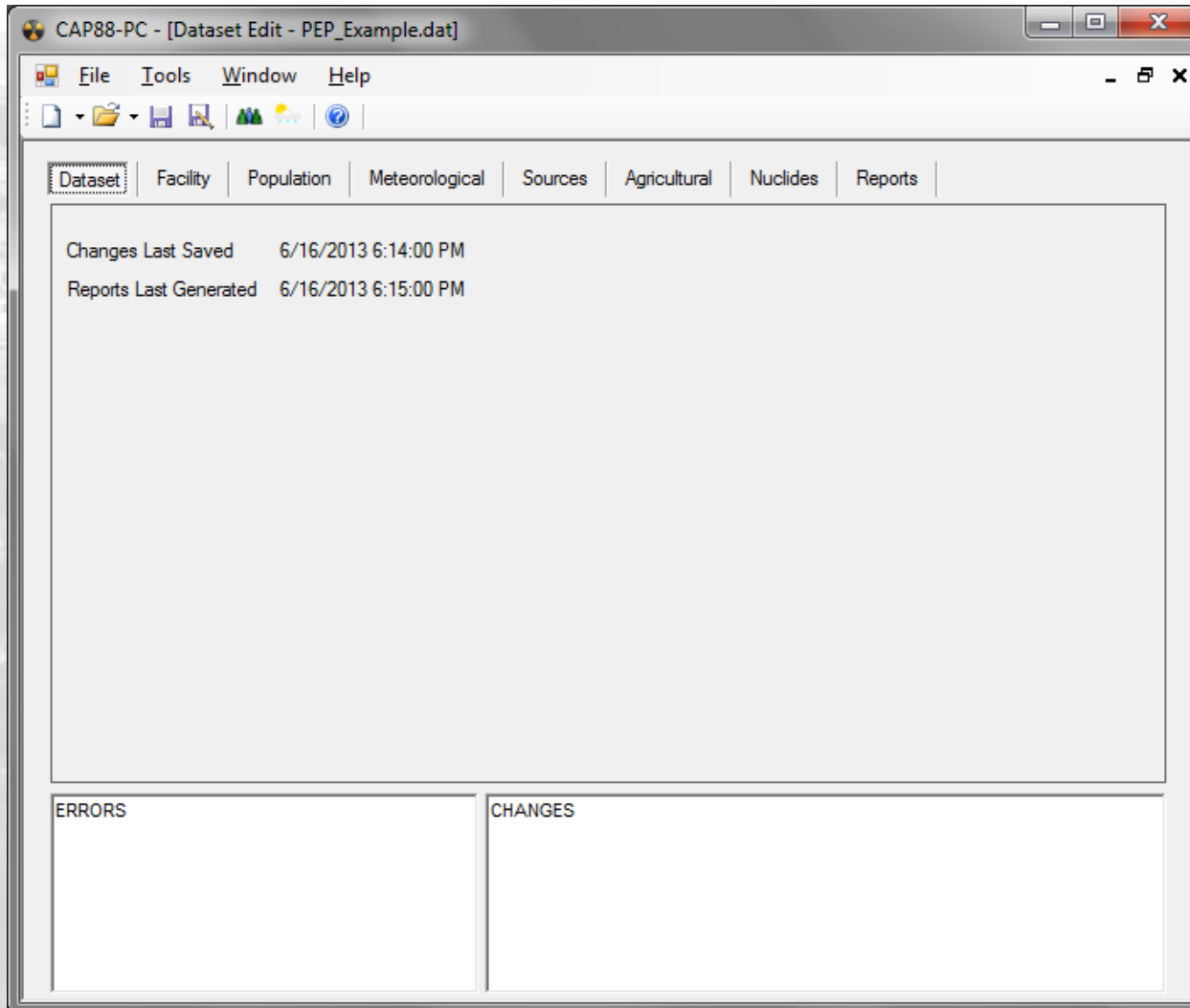


# DATASET TAB

- Shows when the dataset was last saved
- Shows when reports were last generated



# DATASET TAB EXAMPLE



# FACILITY TAB

The user enters the following information:

- Name of Facility (Optional)
- Address, City, and Zip Code of Facility (Optional)
- Emission Year (1949 to five years in the future)
- Source Category (Optional)
- Two Comments (Optional)

Note that the State is entered on the Agricultural Tab



# FACILITY TAB EXAMPLE

CAP88-PC - [Dataset Edit - PEP\_Example.dat]

File Tools Window Help

Dataset **Facility** Population Meteorological Sources Agricultural Nuclides Reports

Name Springfield Nuclear Power Plant Emission Year 2013

Address 100 Industrial Way Source Category

City Springfield

Zip 83277 (Note: State is found on the Agricultural tab)

Comments Intended for Software Testing Purposes Only  
Version 4.0, Release Candidate 3

ERRORS CHANGES



# POPULATION TAB

- The user enters the Run Type (Population or Individual)
  - For Population Type runs, the user selects the name of the population file from a drop-down menu
  - For Individual Type runs, the user enters between 1 and 20 midpoint locations for the receptor
- The user can specify the location of the Maximum Exposed Individual (MEI) or allow the code to determine the location.
- The user specifies the age of the receptor(s). This is new in Version 4



# POPULATION TAB (CONTINUED)

- The user can change the buildup time. (Note that 100 years is required to demonstrate compliance with 40 CFR 61.
- The user can select the following reports to generate:
  - Dose and risk summaries
  - Dose and risk factors
  - Concentration tables
  - Chi/Q tables



# POPULATION TAB EXAMPLE

CAP88-PC - [Dataset Edit - PEP\_Example.dat]

File Tools Window Help

Dataset Facility **Population** Meteorological Sources Agricultural Nuclides Reports

Run Type: Individual Population Age: Five Build up time: 100 years

Create dose and risk summaries  
 Create dose and risk factors  
 Create concentration table  
 Create Chi/Q table

Midpoints 12

1 - 5	1000.00	2000.00	3000.00	4000.00	5000.00
6-10	6000.00	7000.00	8000.00	9000.00	10000.00
11-15	15000.00	20000.00	0.00	0.00	0.00
16-20	0.00	0.00	0.00	0.00	0.00

Maximum Exposed Individual  
Direction: S Midpoint index: 3  Auto-determine

ERRORS

CHANGES



# METEOROLOGICAL TAB

- The user selects the wind file from a drop-down menu
- The user can enter the annual precipitation (must be between 0.01 and 500 cm  $y^{-1}$ )
- The user can enter the annual ambient temperature (must be between -100 and 100 °C)
- The user can enter the lid height (must be between 25 and 10,000 m)
- The user can enter the absolute humidity (must be between 0.01 and 30 g  $m^{-3}$ )





# METEOROLOGICAL TAB EXAMPLE

Files with \* are in the same folder as the dataset  
Files with ! are in a non-default folder  
C:\Users\CAP88 User\Documents\CAP88\Wind Files\SPRG2000.wnd

File: SPRG2000      Springfield

Annual Precipitation	<input type="text" value="100.00"/>	cm/year
Annual Ambient Temperature	<input type="text" value="10.00"/>	Celsius
Lid Height	<input type="text" value="1000.00"/>	meters
Absolute Humidity	<input type="text" value="8.00"/>	grams/cu meter

ERRORS

CHANGES



# SOURCES TAB

- The user selects the Source Type from a drop-down menu (Stack or Area)
- The user selects the number of sources (up to 6)
  - For each stack source, the user enters the height and diameter of each source
  - For each area source, the user enters the height and area of each source



# SOURCES TAB (CONTINUED)

- The user selects the Plume Type from a drop-down menu (Buoyant, Momentum, Fixed, or None)
  - For “Buoyant” plumes, the user enters the heat release rate of each source
  - For “Momentum” plumes, the user enters the exit velocity of each source
  - For “Fixed” plume types, the user enters the plume rise for each Pasquill category
  - For “None” plume types, the plume rise for each Pasquill category is set to zero



# SOURCES TAB EXAMPLE

CAP88-PC - [Dataset Edit - PEP\_Example.dat]

File Tools Window Help

Dataset Facility Population Meteorological Sources Agricultural Nuclides Reports

Source Type Stack

Sources 4

	1	2	3	4
Height(m)	5.00	10.00	8.00	2.00
Diameter(m)	2.00	1.00	1.50	1.20

Plume Type Buoyant

Enter the heat release rate for each source

	1	2	3	4
cal/sec	100.00	50.00	90.00	40.00

ERRORS

CHANGES



# AGRICULTURAL TAB

- The user selects the food source from a drop-down menu (Urban, Rural, Local, Regional, Imported, and Entered)
  - For Urban, Rural, Local, Regional, and Imported, CAP88 will assign the fraction of vegetables, milk, and meat, that are home produced, produced in the assessment area, and imported.
  - For Entered, the user can assign the fraction of vegetables, milk, and meat, that are home produced, produced in the assessment area, and imported.
- The user can enter agricultural state from a drop-down menu. (CAP88 will assign beef and milk cattle density, and land fraction cultivated based on the state selected.)



# AGRICULTURAL TAB EXAMPLE

CAP88-PC - [Dataset Edit - PEP\_Example.dat]

File Tools Window Help

Dataset Facility Population Meteorological Sources **Agricultural** Nuclides Reports

Food Source

	Vegetable	Milk	Meat
Fraction home produced	<input type="text" value="0.08"/>	<input type="text" value="0.0"/>	<input type="text" value="0.01"/>
Fraction from assessment area	<input type="text" value="0.92"/>	<input type="text" value="1.0"/>	<input type="text" value="0.99"/>
Fraction imported	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>

Agriculture State

Beef cattle density	<input type="text" value="4.560e-02"/>	#/ha2
Milk cattle density	<input type="text" value="4.530e-03"/>	#/ha2
Land fraction cultivated for vegetables	<input type="text" value="1.590e-02"/>	

ERRORS

CHANGES



# NUCLIDES TAB

The user selects the nuclides to be modeled from the drop-down list, using the “Add” button. For each radionuclide selected:

- The user selects the chemical form from a drop-down menu.
- For particulate, the user selects the type and size.
- The user enters the release rates for each source.
- The user can also change the decay chain length
- For Rn-222, the user can select a “Radon Only” run



# NUCLIDES TAB EXAMPLE

Chain Length: max  Radon Only Ac-223 Add

Released Nuclide Count 1 Total Nuclide Count 17 Delete rows w/all 0 RR Remove selected row Remove

Adjust nuclide parameters, and enter release rates (ci/year) for each source  
*Note: Nuclides with no chemical form have no internal dose coefficient.*

Chn	Nuclide	Chem Form	Type	Size	RR1	RR2	RR3	RR4
0	Pu-239	Particulate	M	1....	1.000e-01	3.000e-01	2.000e-01	5.000e-01

ERRORS

CHANGES



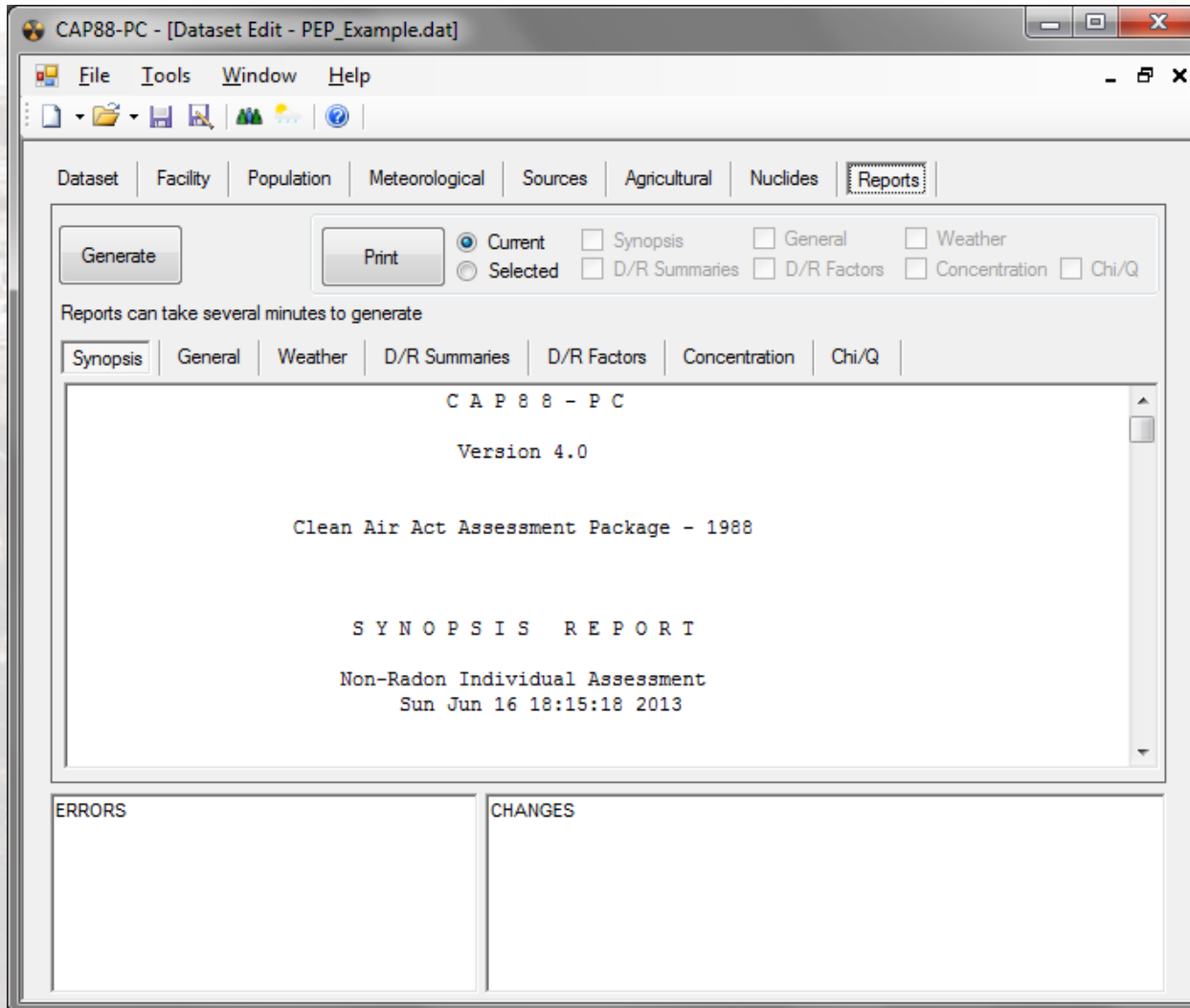


# REPORTS TAB

- The user can generate reports based on the most recently saved dataset by selecting the “Generate” button.
- The user can print the current report, or selected reports, by selecting the “Print” button.



# REPORTS TAB EXAMPLE



# UNDERSTANDING THE OUTPUT REPORTS

- Synopsis Report
- General Data
- Weather Data
- Dose and Risk Summaries
- Dose and Risk Conversion Factors
- Concentration Tables
- Chi/Q Tables
- Reports



# SYNOPSIS REPORT

Includes summary of user inputs

- Facility Information
- Source Information
- Meteorological Information
- Agricultural Information
- Population Information

Includes location and dose/risk to the MEI



# GENERAL DATA

Includes Radionuclide-dependent Parameters For Released Isotopes

- Decay constants
- Milk/meat transfer coefficients
- Concentration uptake factors



# GENERAL DATA (CONTINUED)

Includes Values For Radionuclide-independent Parameters

- Human inhalation rates
- Soil parameters
- Buildup and delay times
- Weathering
- Crop exposure duration
- Agricultural productivity
- Fallout interception fractions
- Grazing parameters
- Animal feed consumption factors
- Dairy productivity
- Meat animal slaughter parameters
- Decontamination
- Fractions grown in garden of interest
- Ingestion ratios
- Minimum ingestion fractions from outside area
- Human food utilization factors
- Swimming parameters



# WEATHER DATA

## Includes

- Harmonic average wind speeds (wind towards) by direction and Pasquill stability class
- Arithmetic average wind speeds (wind towards) by direction and Pasquill stability class
- Frequencies of stability classes (wind towards) by direction and Pasquill stability class



# DOSE AND RISK SUMMARIES

## Includes

- Dose and Risk Totals to the MEI by
  - Organ
  - Pathway
  - Radionuclide
- Total Individual Dose at each Location
- Collective population dose for Population Type runs
- Total Collective Population Fatal Cancer Risk for Population Type runs





# DOSE AND RISK CONVERSION FACTORS

- Dose Conversion Factors for each radionuclide and chemical form by organ for the following pathways:
  - Ingestion(age-dependent)
  - Inhalation (age-dependent)
  - Air immersion
  - Ground surface
- Risk Conversion Factors for each radionuclide and chemical form by organ for the following pathways:
  - Ingestion(age-dependent)
  - Inhalation (age-dependent)
  - Air immersion
  - Ground surface



# CONCENTRATION TABLES

Includes for each location (direction and distance downwind) and radionuclide:

- Air concentration
- Dry deposition rate
- Wet deposition rate
- Total deposition rate



# CHI/Q TABLES

Includes for each location (direction and distance downwind) the value of  $\text{chi}/Q$

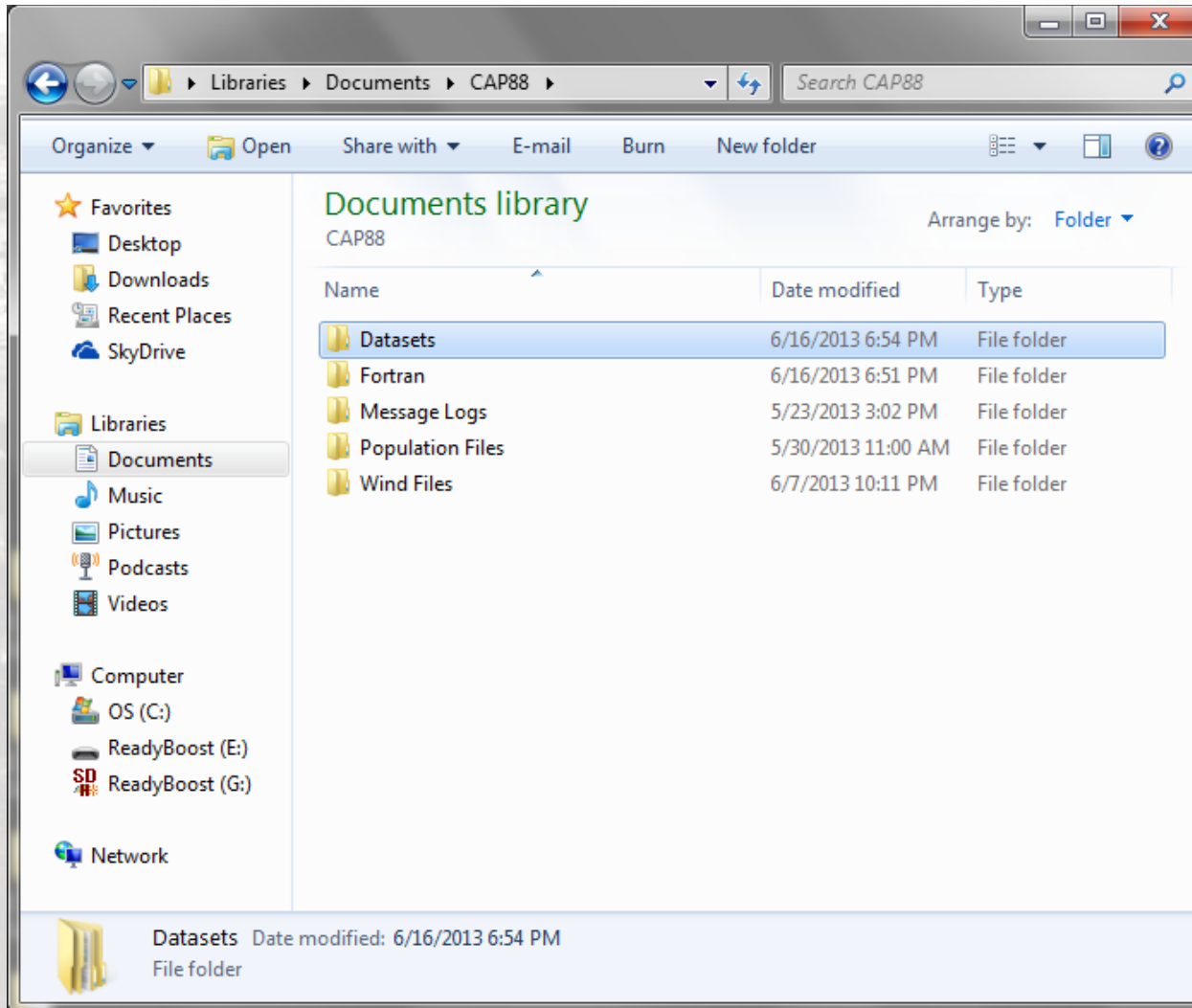


# CAP88 DATA FILE STRUCTURE

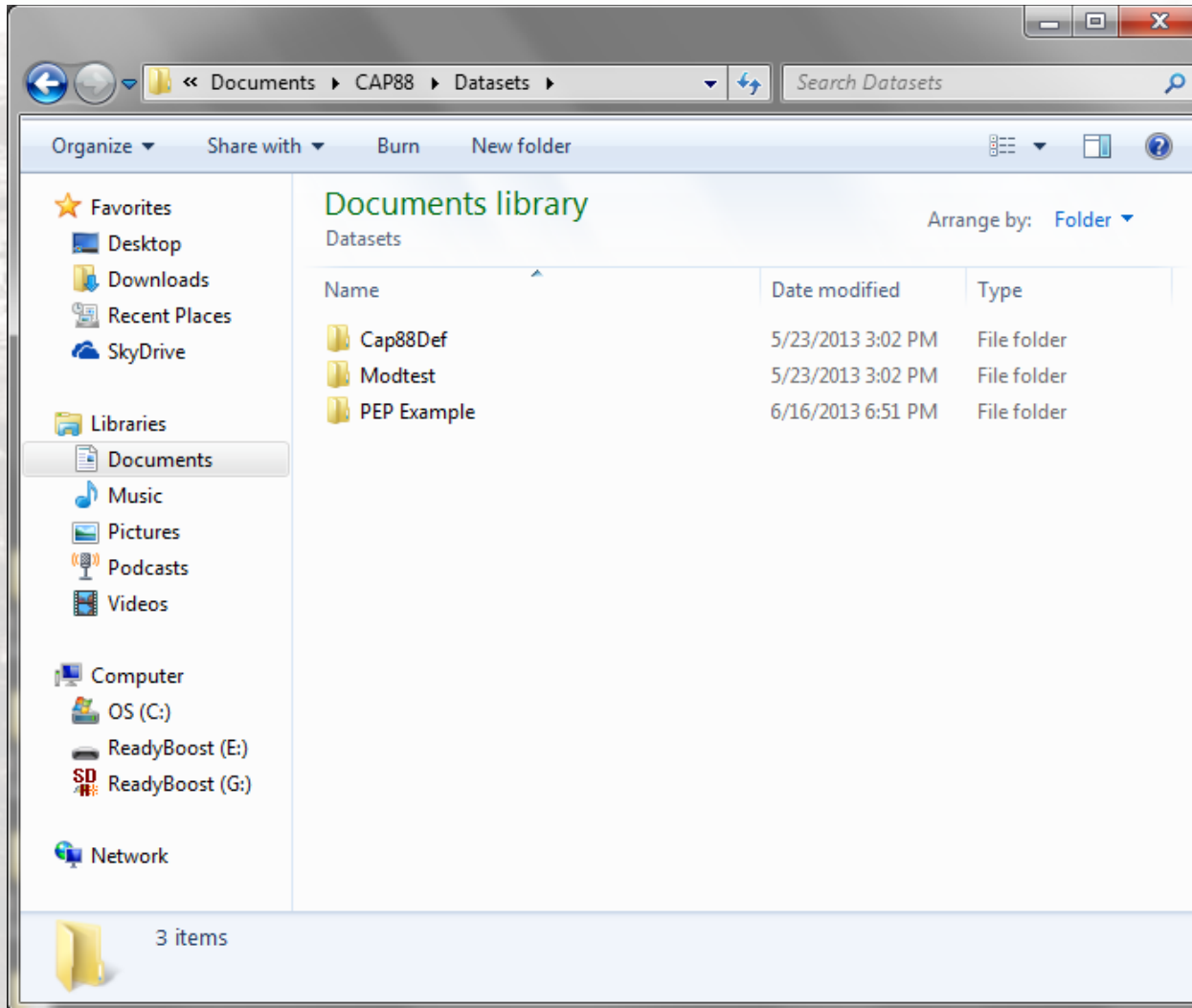
- User files, including wind and population files, are stored by default in a folder in the user's Documents Library/Folder
- The location where CAP88 stores files by default can be changed using the "Options" windows accessed through the "Tools" menu.
- Inputs are stored in a text file (with a .dat extension)
- Outputs are stored also stored in a text files (with .syn, .gen, .wea, .fac, .sum, .com, and .chi extensions)



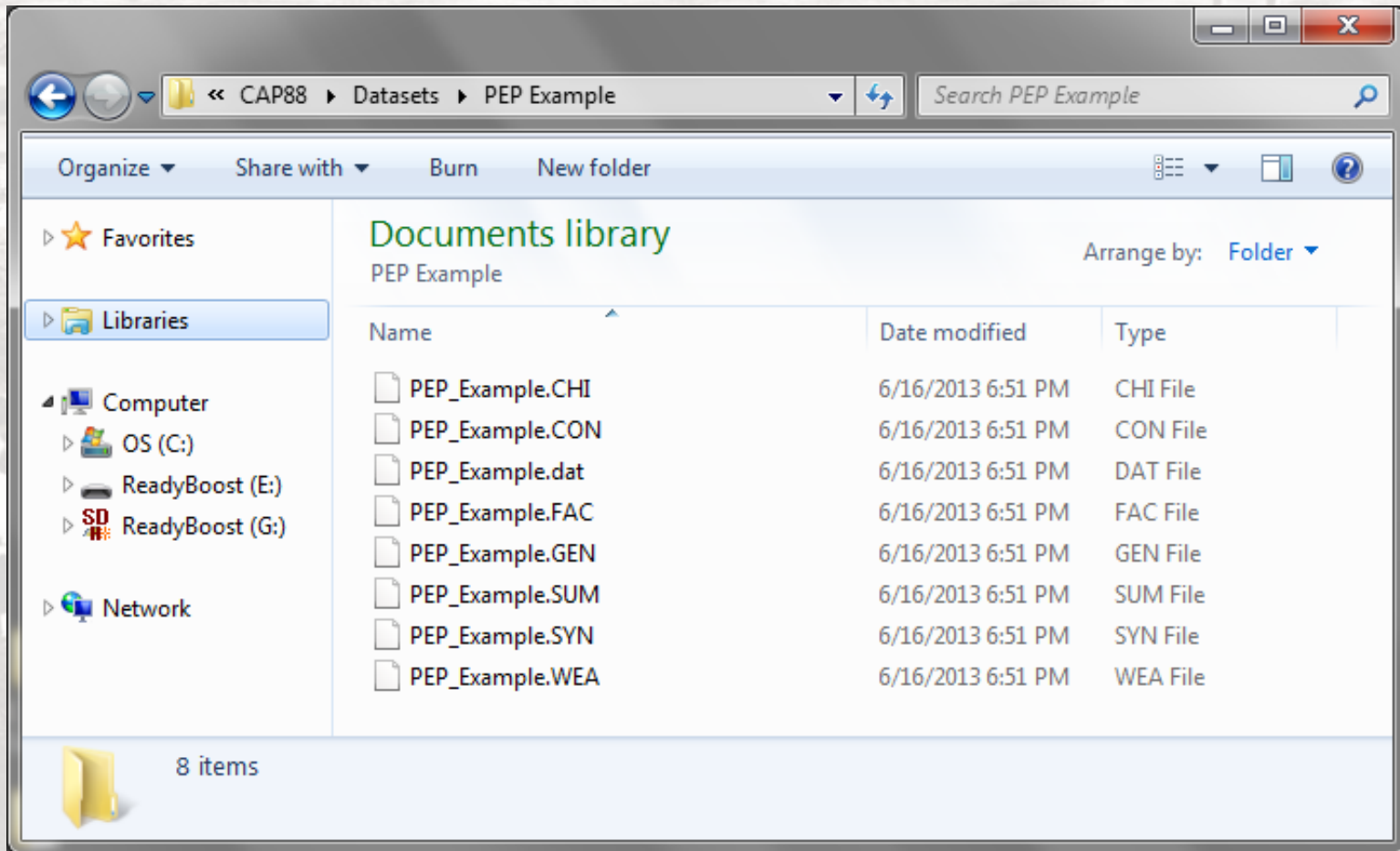
# CAP88 DOCUMENTS FOLDER



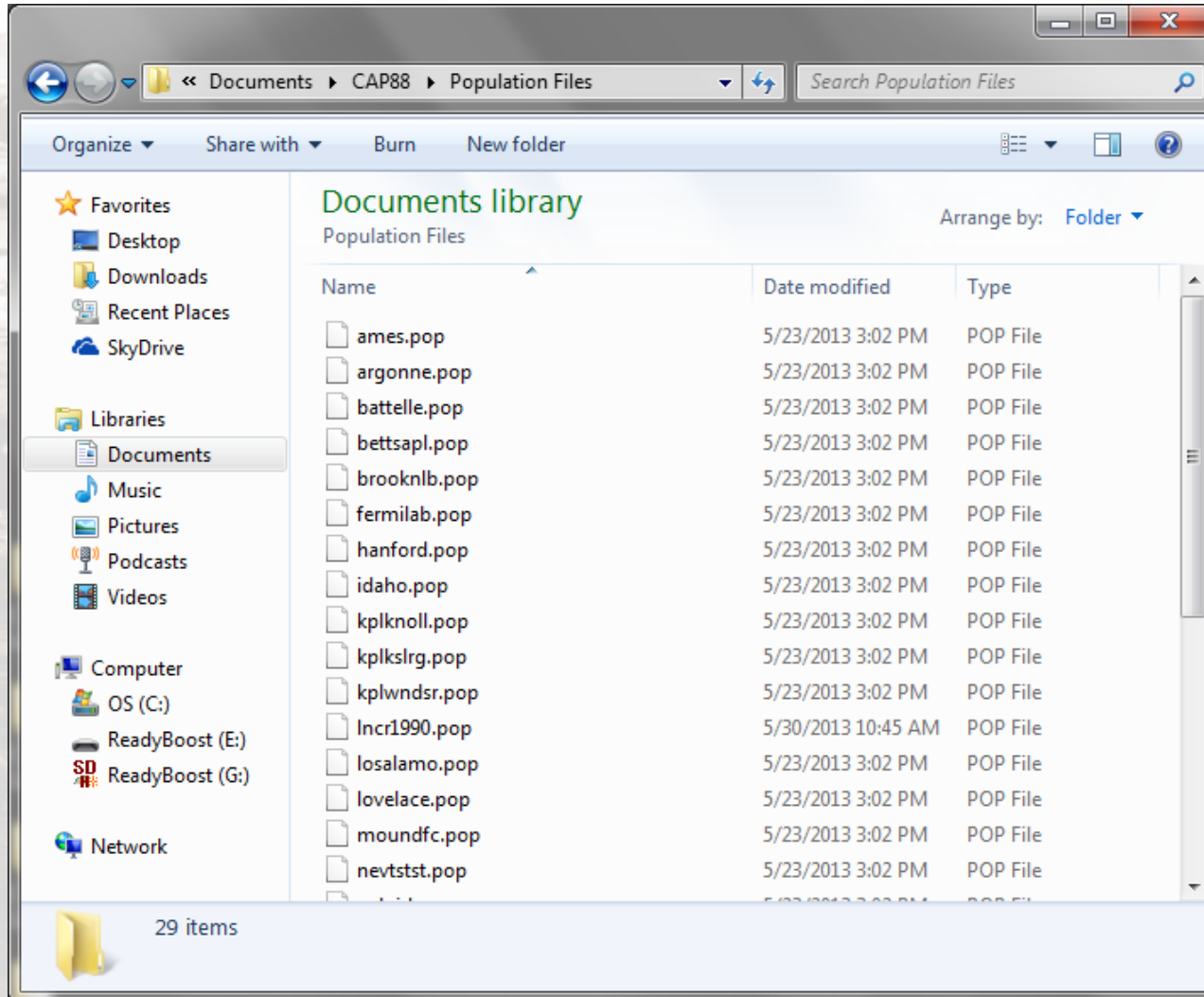
# CAP88 DATASETS FOLDER



# CAP88 DATASET FILE & OUTPUT REPORTS



# CAP88 POPULATION FILES FOLDER





# CAP88 WIND FILES FOLDER

