OVERVIEW

SAND2013-4649C

RESRAD – Code for Estimating Cleanup

Hotspot – Health Physics code for the PC

CAP88 – Code for Compliance Screening of Air Emissions

(These slides were clipped from various Internet sites for discussion with Jordan Atomic Energy Commission (JAEC) colleagues. They are available for unlimited distribution.)

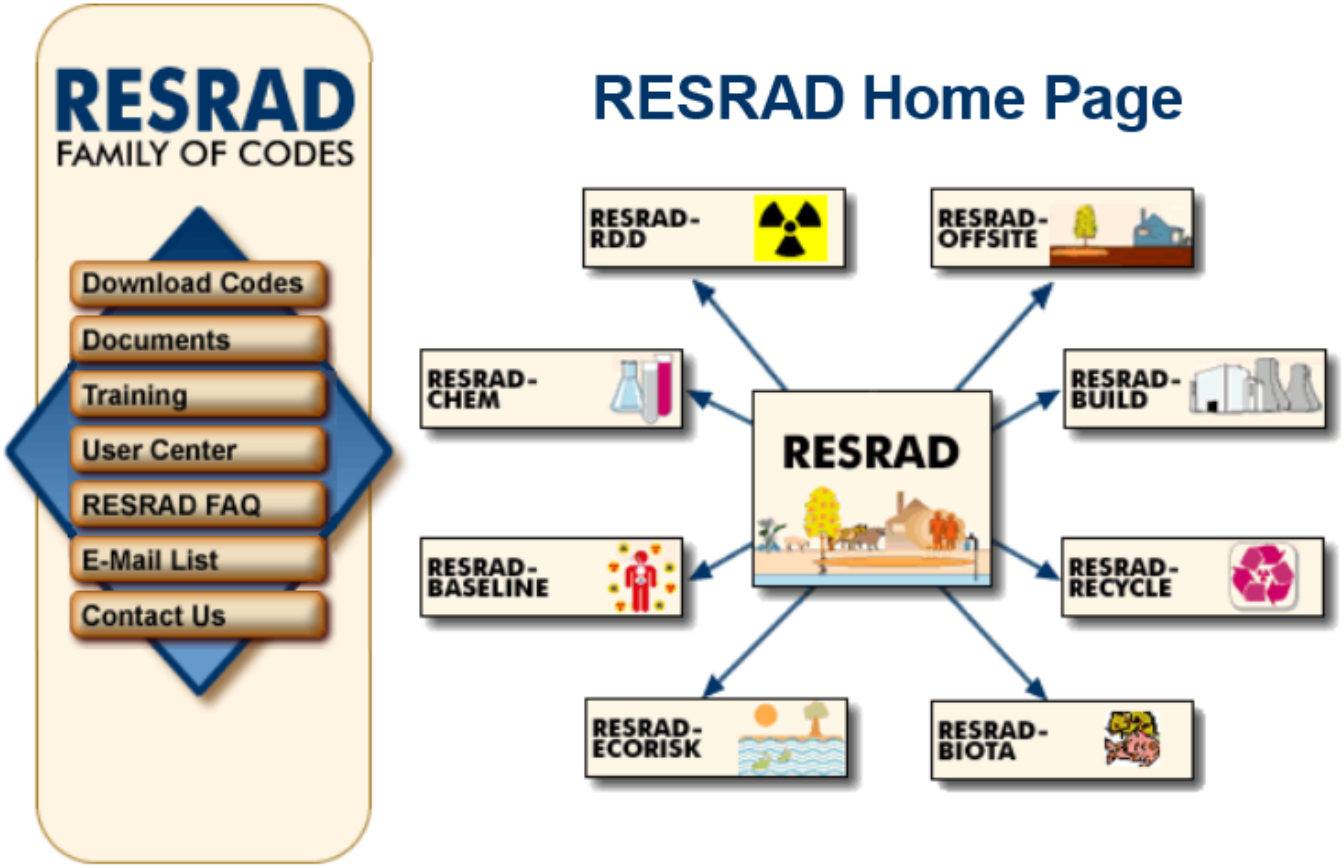
JAEC Radiation Protection Study Tour

Sandia National Laboratories
10 – 14 June 2013

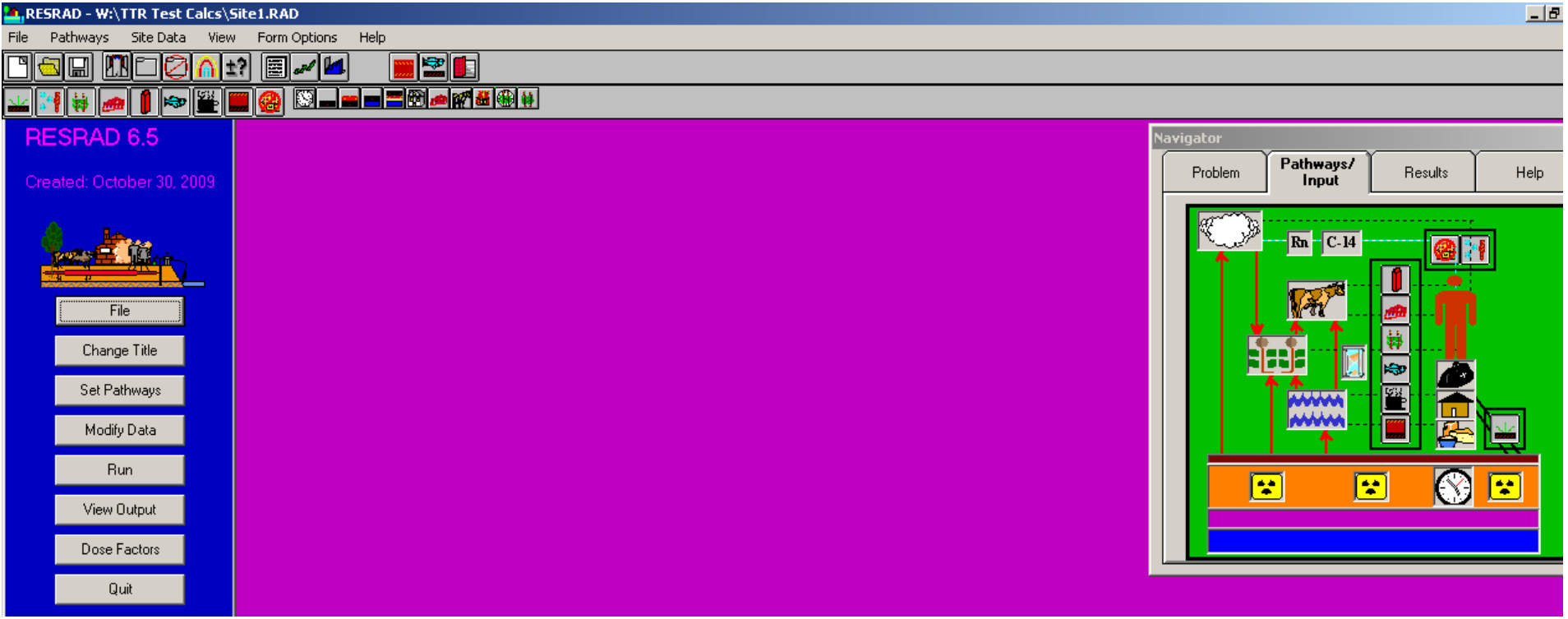
Sandia National Laboratories

RESRAD

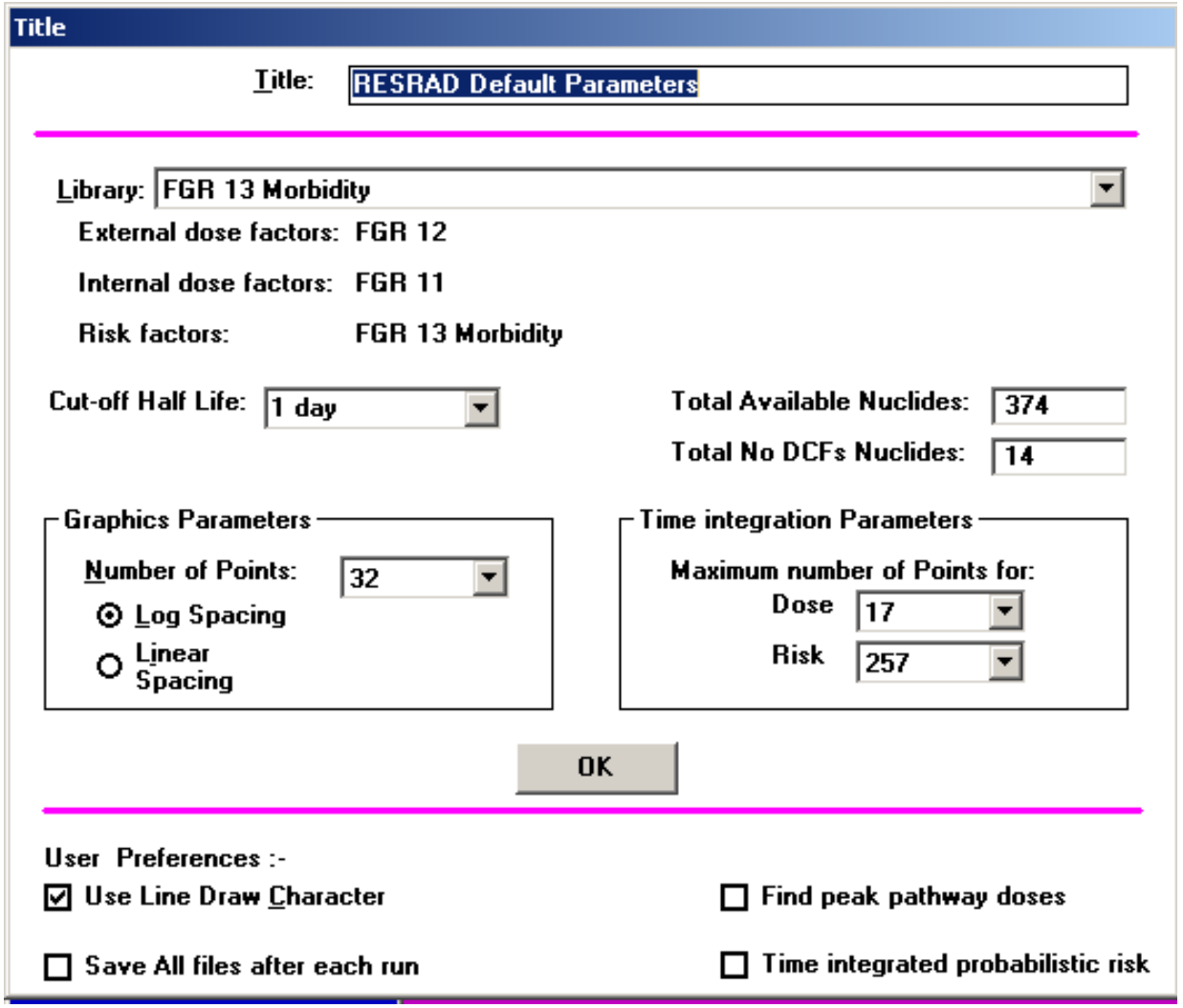
http://web.ead.anl.gov/resrad/home2/



RESRAD Input Screen

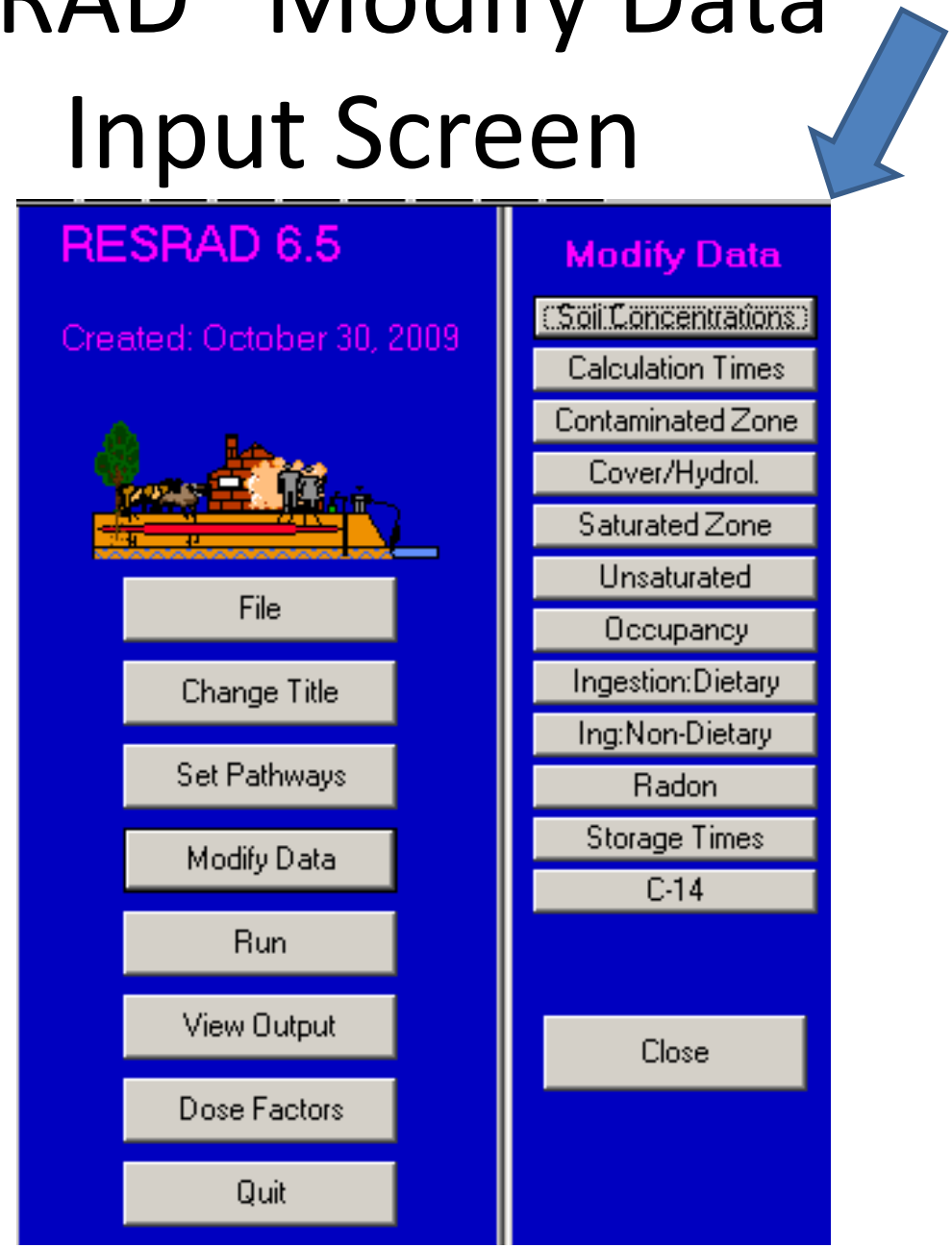


RESRAD "Change Title" Input Screen

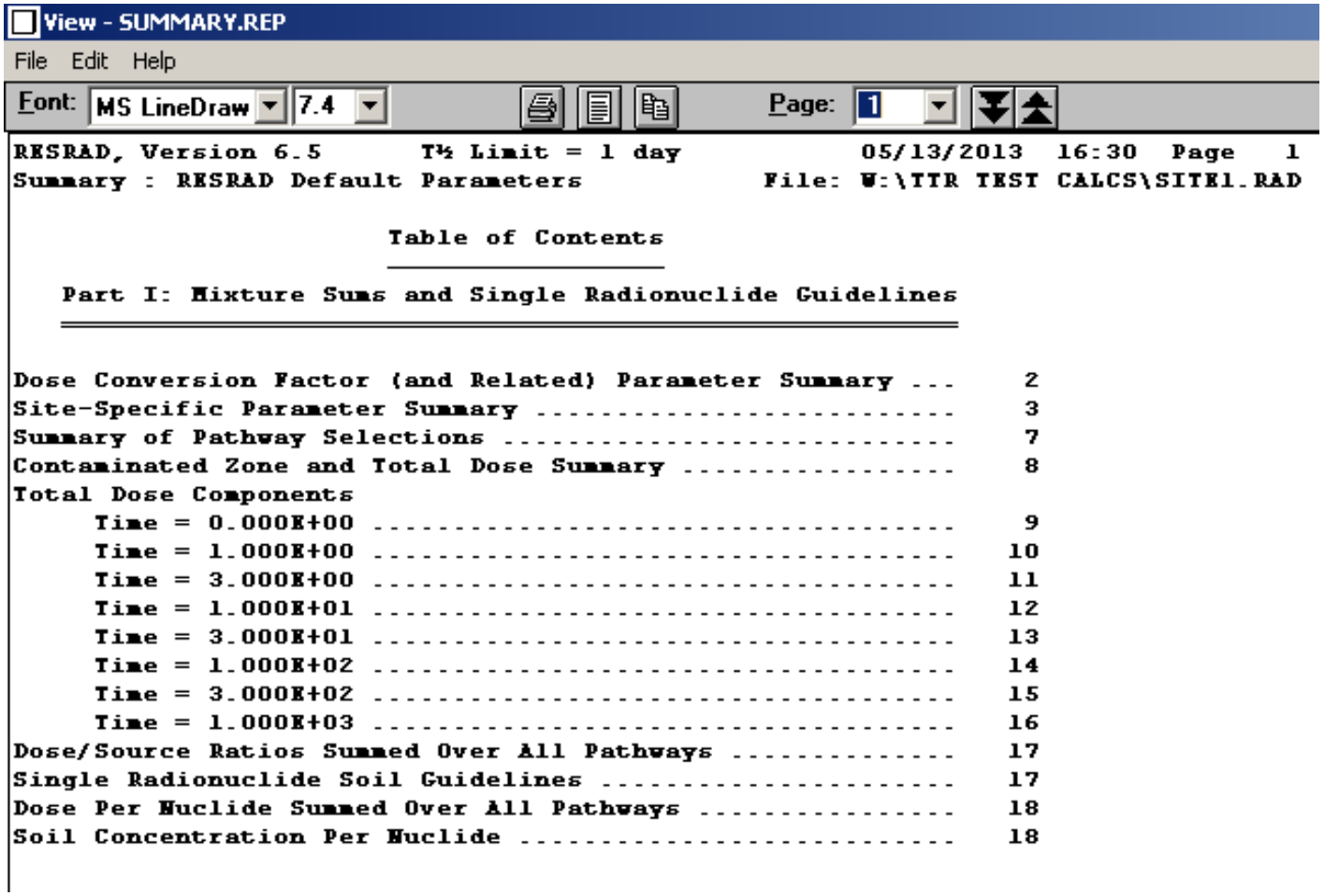


RESRAD "Set Pathways" Input Screen

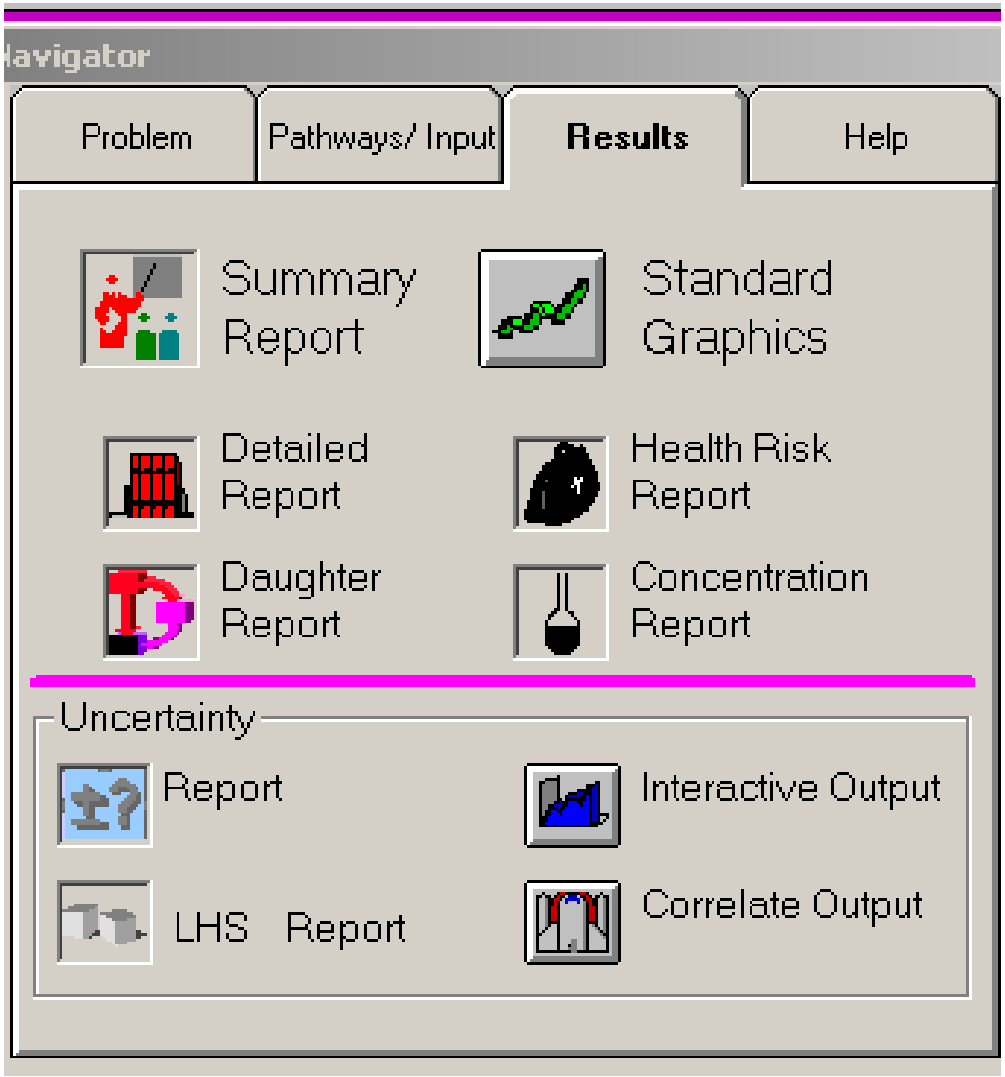
RESRAD “Modify Data” Input Screen



RESRAD "Run Data" Output Screen (1 of many)



RESRAD "View Output" Options Screen



HOTSPOT

Availability

- Free download from the web:

  https://narac.llnl.gov/HotSpot/HotSpot.html

- Or visit www.llnl.gov and search for ‘hotspot’
- Current version: **Version 2.07**
- Developed by Steve Homann of LLNL

Main Purpose

- The HotSpot Health Physics codes were created to provide emergency response personnel and emergency planners with a fast, field-portable set of software tools for evaluating incidents involving radioactive material.
- The software is also used for safety-analysis of facilities handling nuclear material.
- Can also be used for planning, training, and exercise.
- Results can be output to GoogleEarth (with practice)

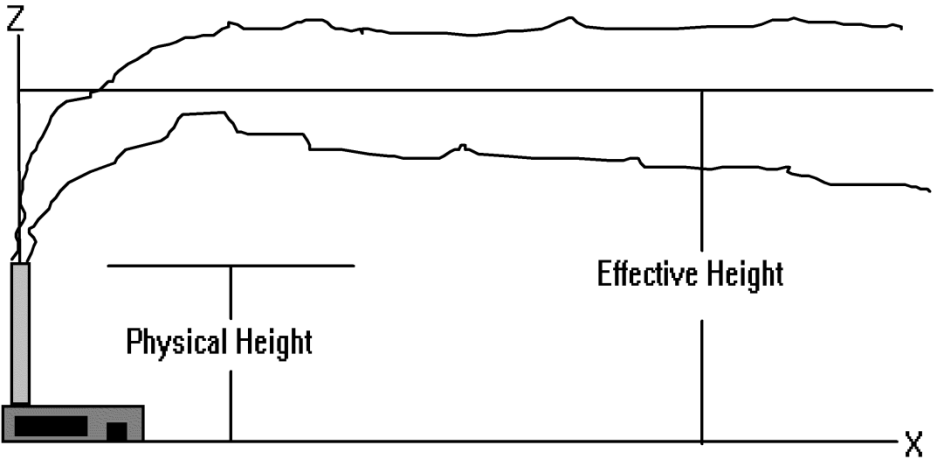
Overview

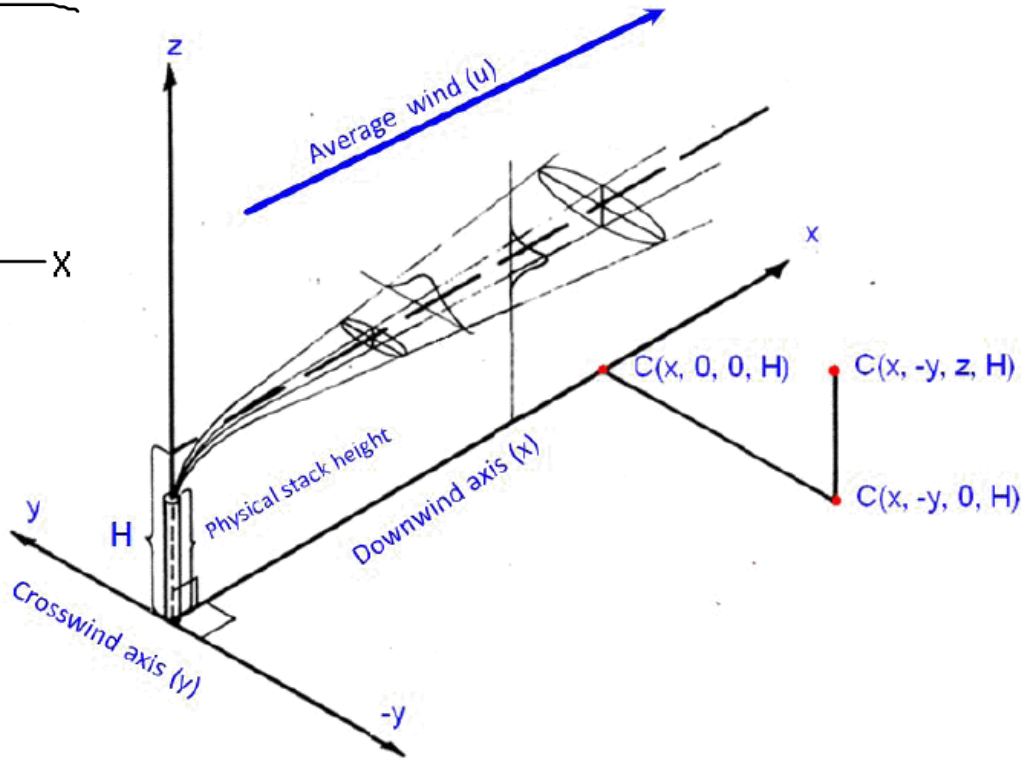
- Computer code to model radioactive material dispersion after a release, including:
  - Deposition levels
  - Exposure from cloud passage and ground contamination
  - Include inhaled dose
- To be used by health physics personnel to assist with:
  - Operational Planning
  - Monitoring locations
  - Consequence Management
  - Training
- Runs “stand alone” on PC computer.

Radioactive Material Transport

- User enters weather and source data (wind speed and direction, release height..)

- Hotspot does NOT:
  - Use complex wind assumptions
  - Calculate fate and transport of radioactive material in the environment (except for weathering and resuspension)



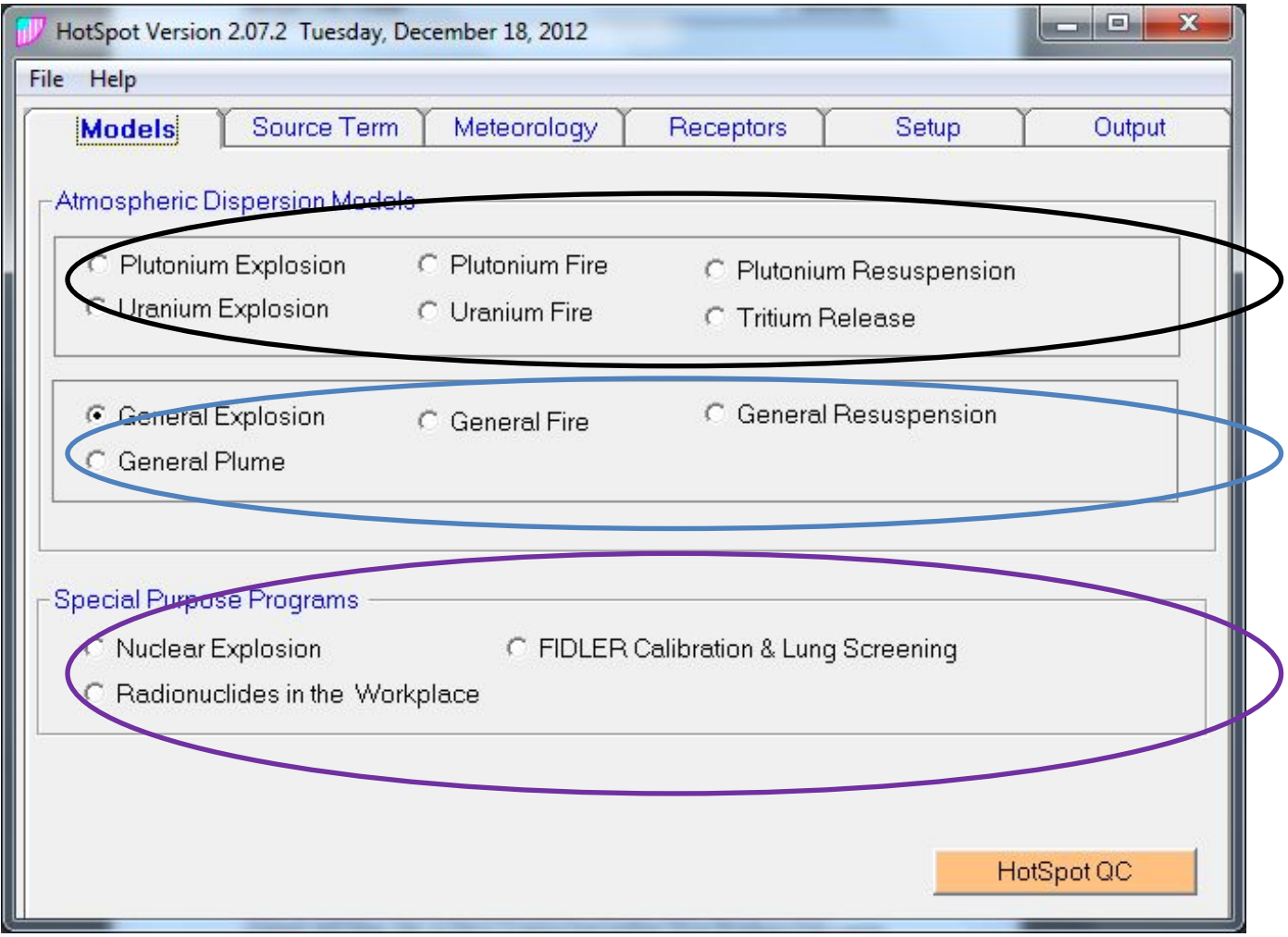


HotSpot Coordinate System

Applicability

- Optimize locations for sampling and monitoring
- Safety-analysis of facilities handling nuclear material
- Evaluate outcomes of accidents to assist with training and planning
- Calculate doses to surrounding locations from facility operations

Hotspot Main Screen



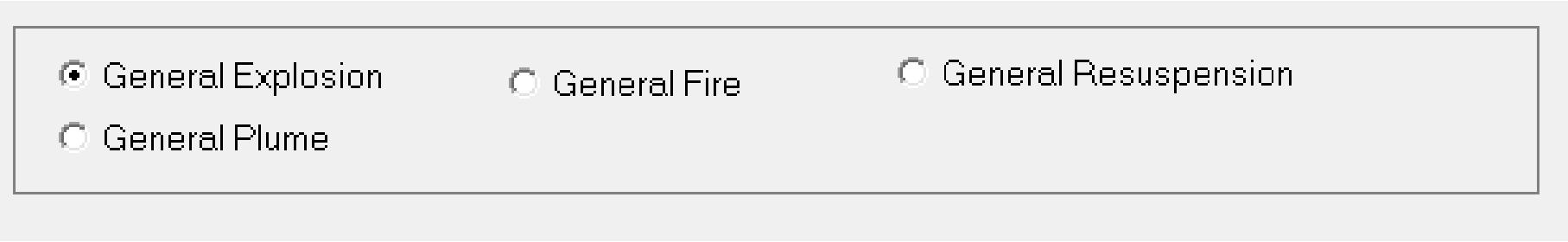
USDOE Emergency Response Dispersion Tools

General workplace and emergency response dispersion tools

Special purpose programs

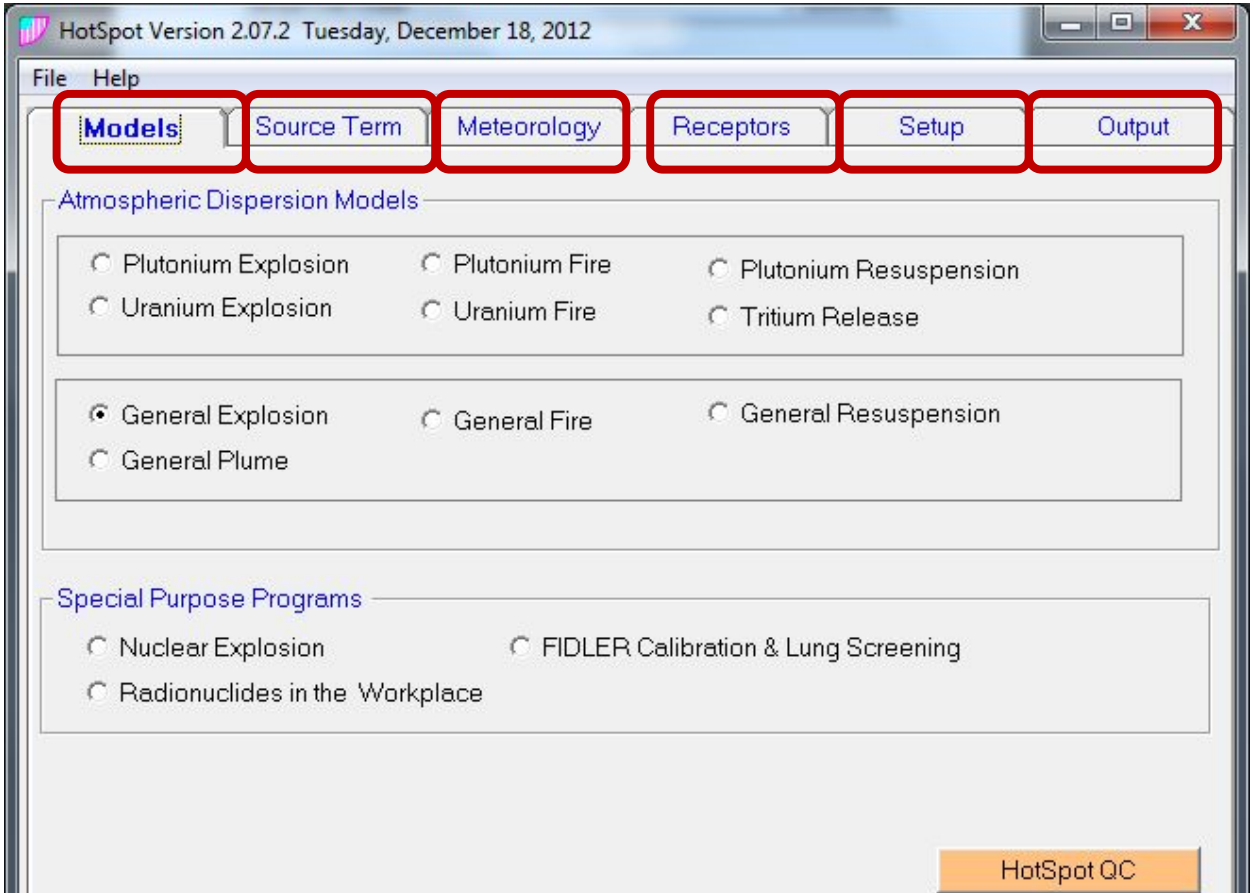
Four basic modes

- General Use
  - Plume
  - Explosion
  - Fire
  - Re-suspension



Program Each Tab in Sequence

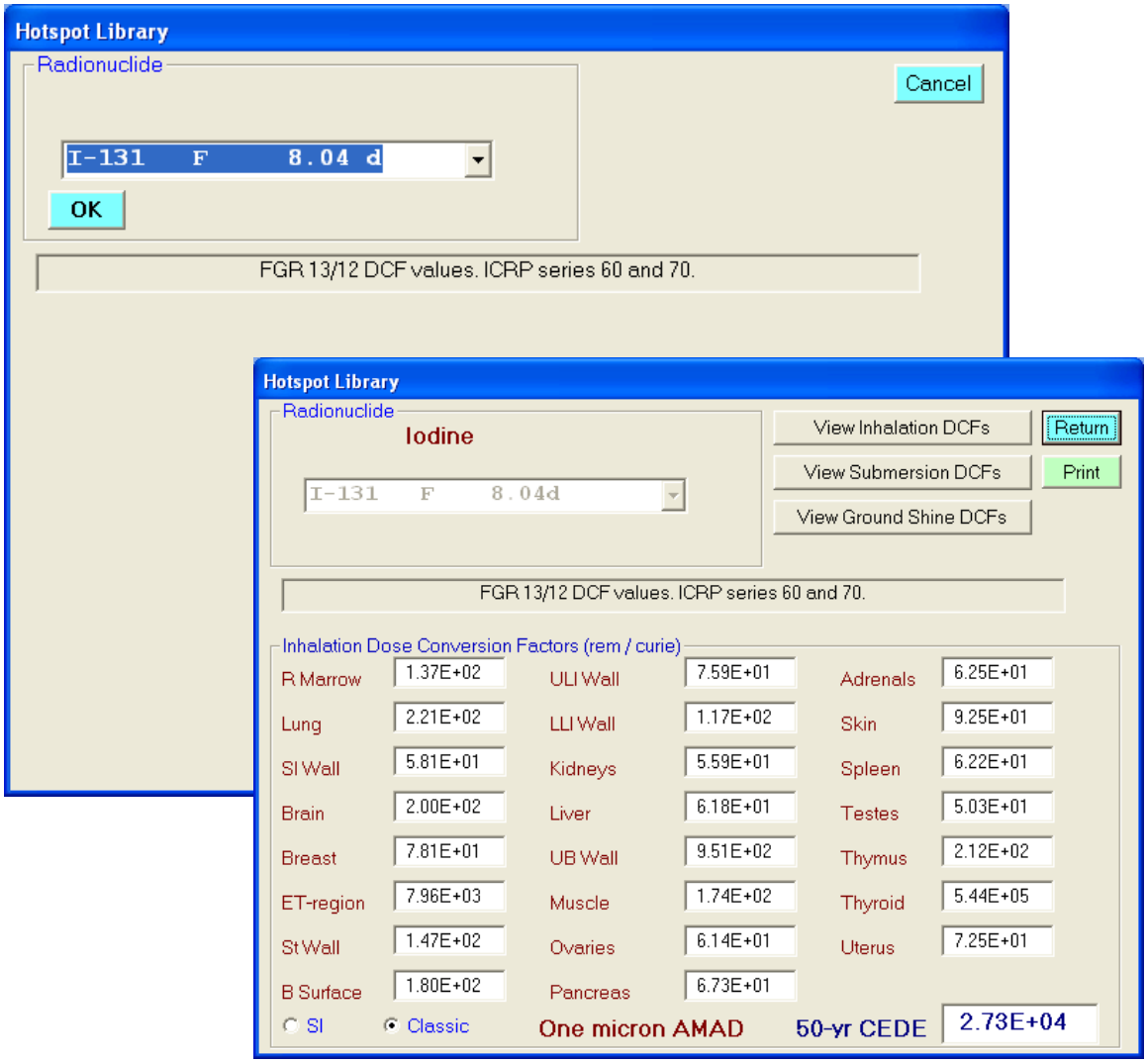
Follows natural progression of defining problem



Example #1

- Reactor Release:
  - Release of Iodine as a result of failed fuel
  - Use General Plume
  - Need to enter:
    - source term = I-131
    - Wind speed, direction, atmospheric stability
    - Stack height

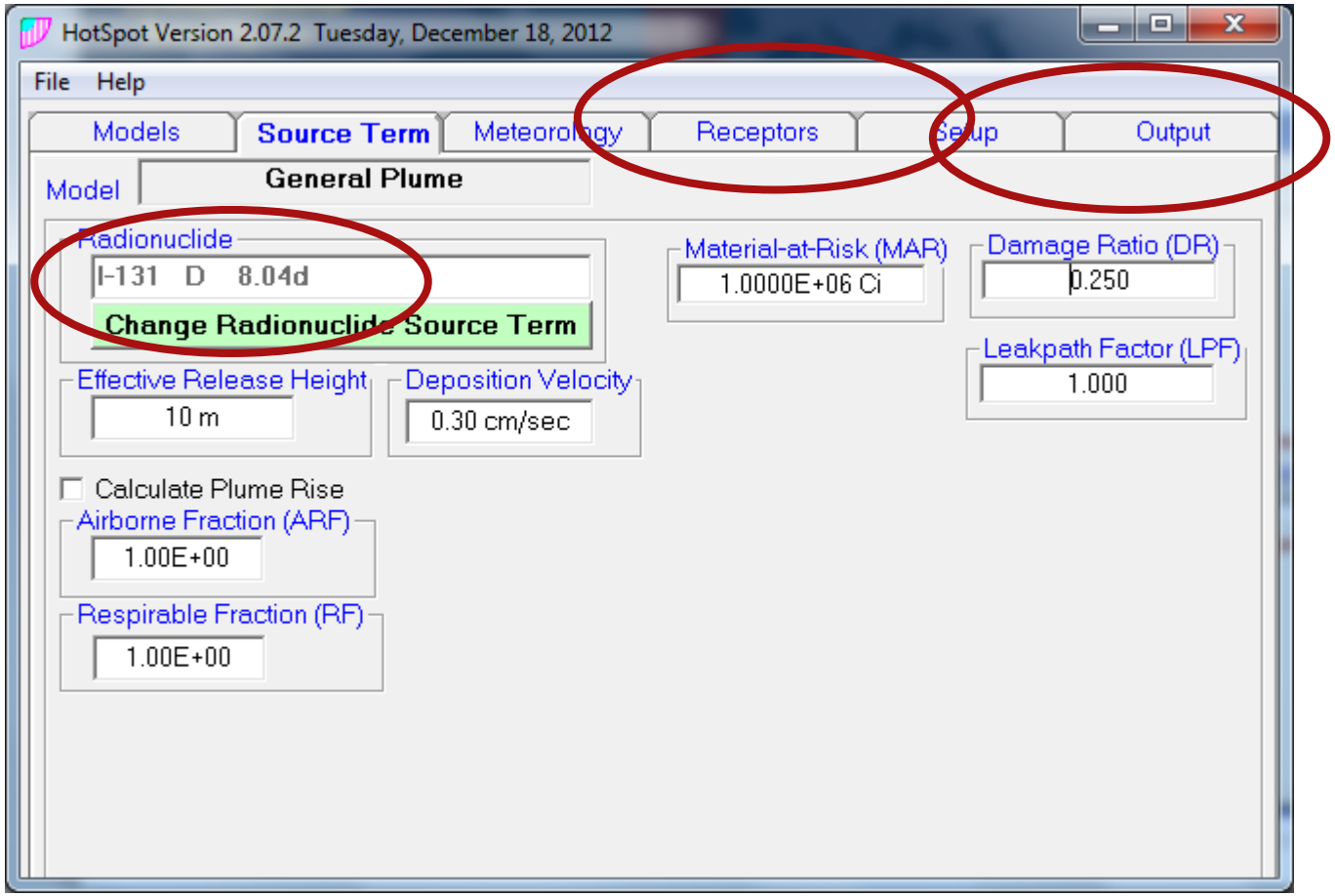
Selecting source term



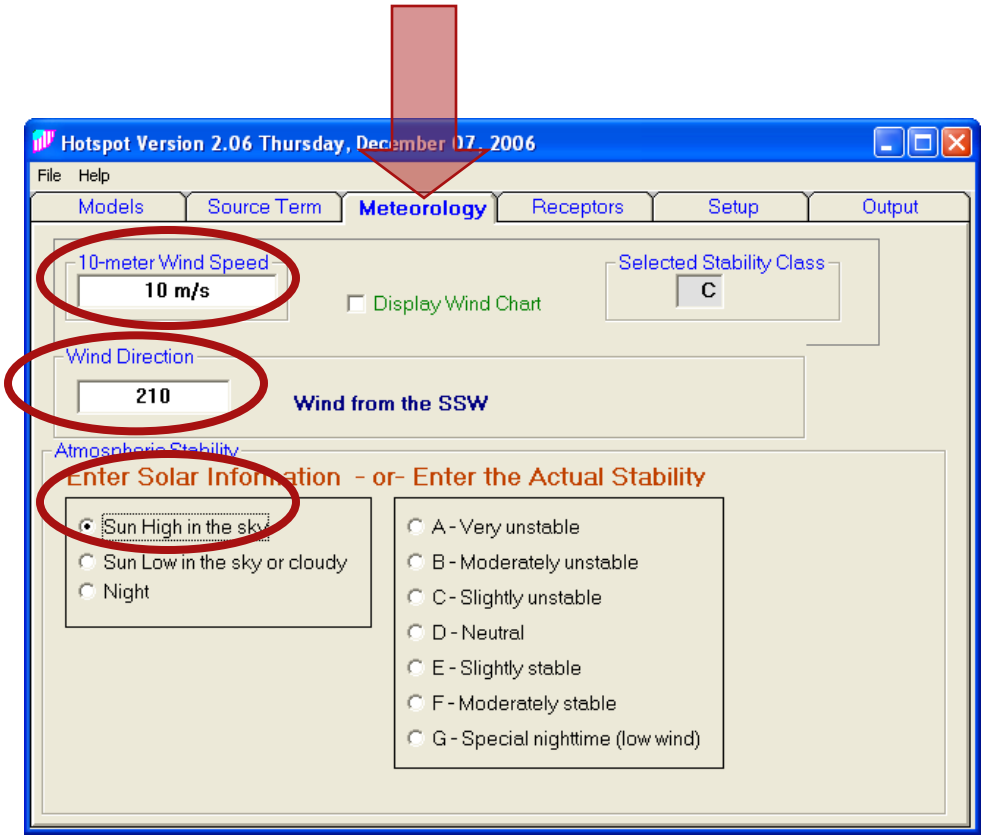
- First select Nuclide from a list (mixtures are possible)
- Dose conversion factors are displayed

Source inputs

- 1E6 Ci
- 10 meter stack height
- Damage Ratio 25%

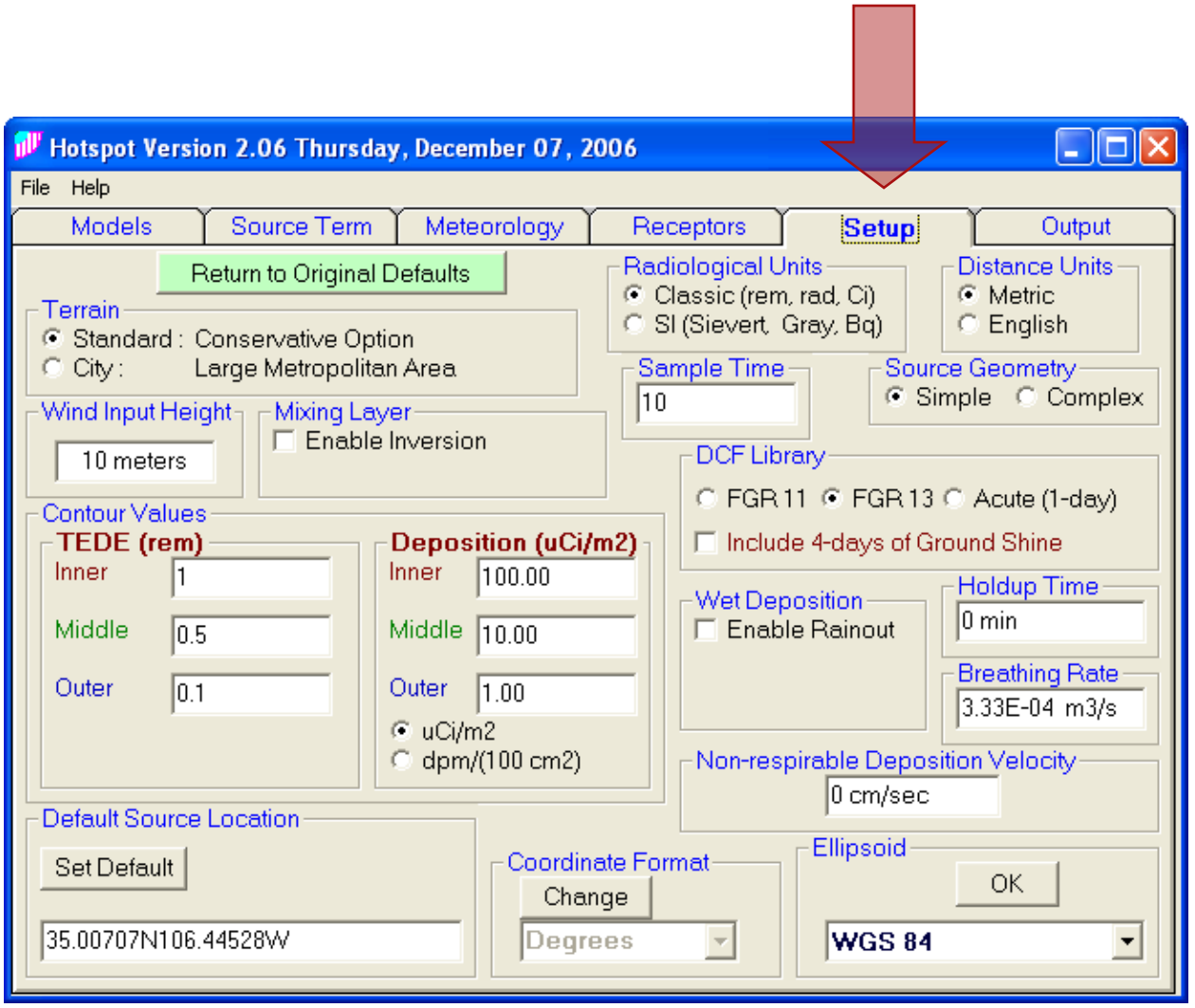


Meterology Inputs

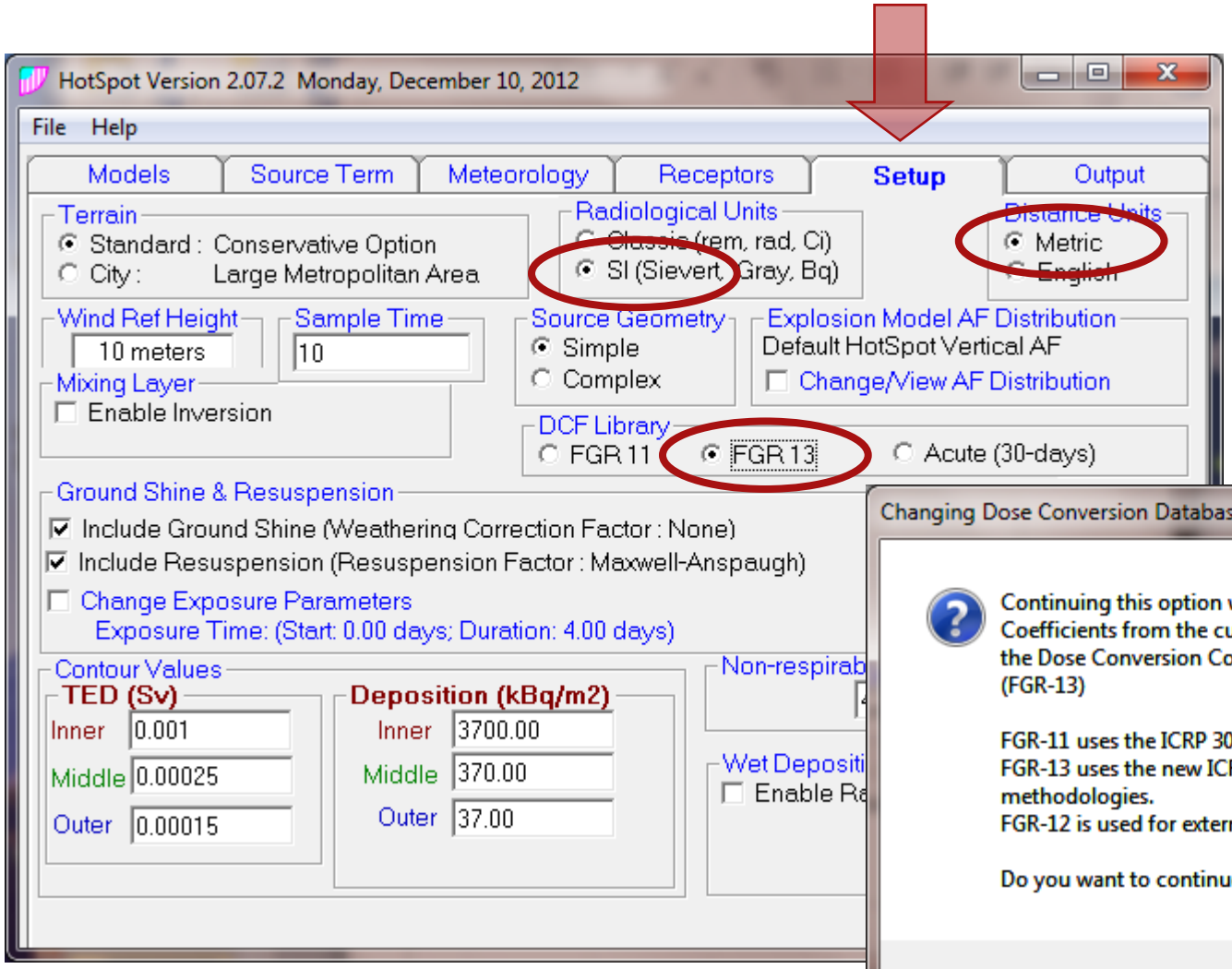


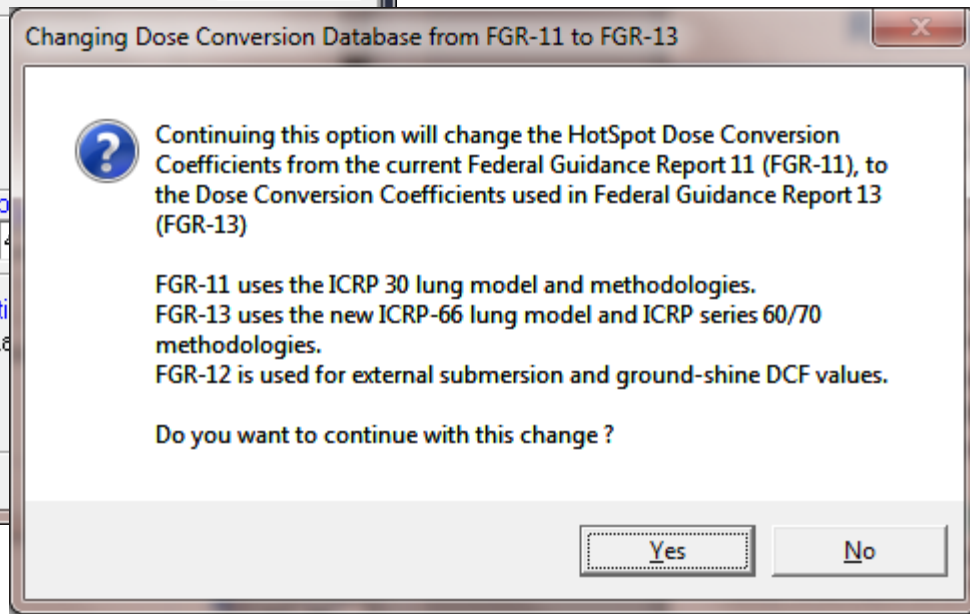
- Wind speed: 10 m/s
- Wind direction 210
- Sun High in the sky

Other setup parameters



Configuration for International Use





Metric

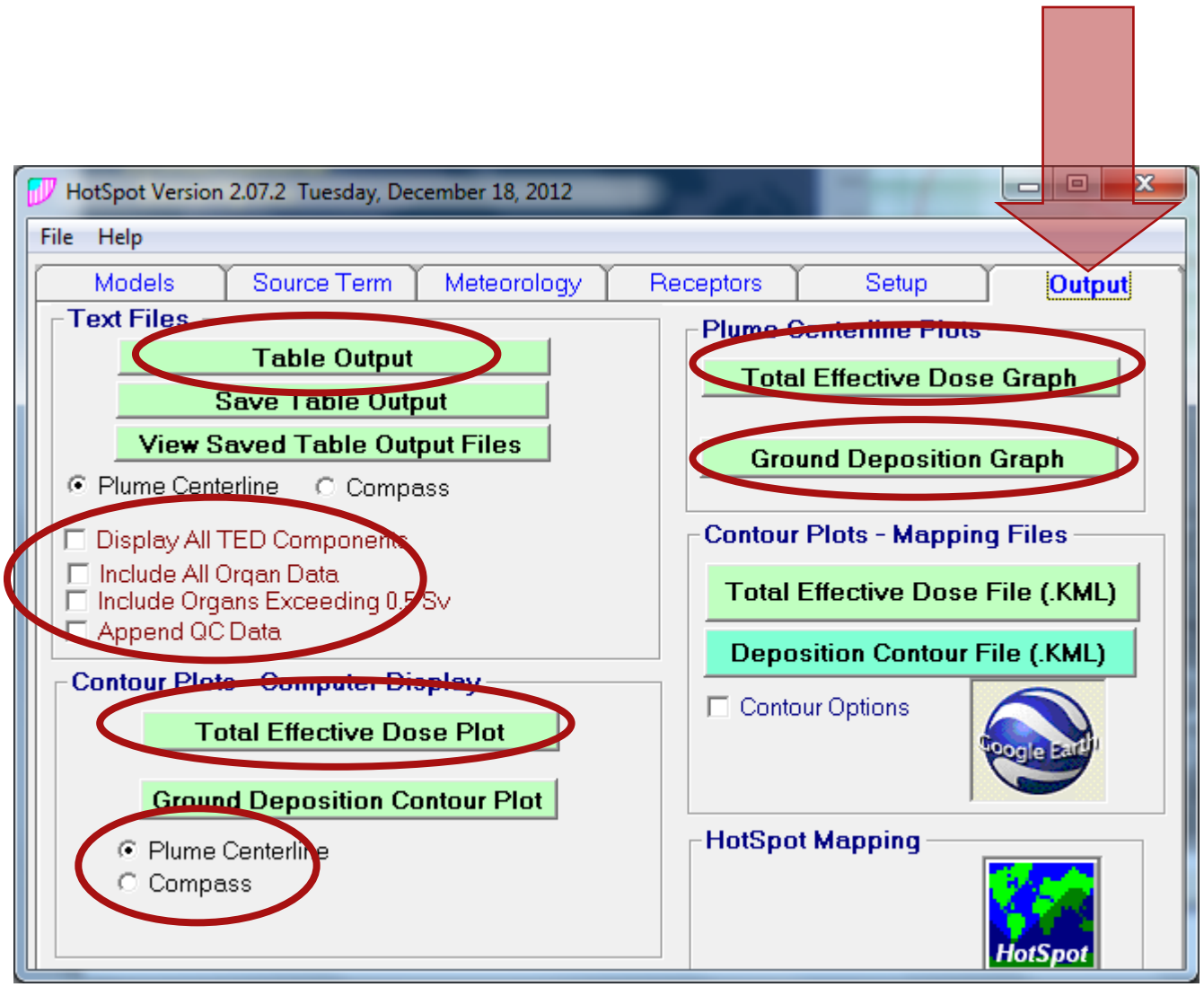
SI Units

FGR 13

Terminology

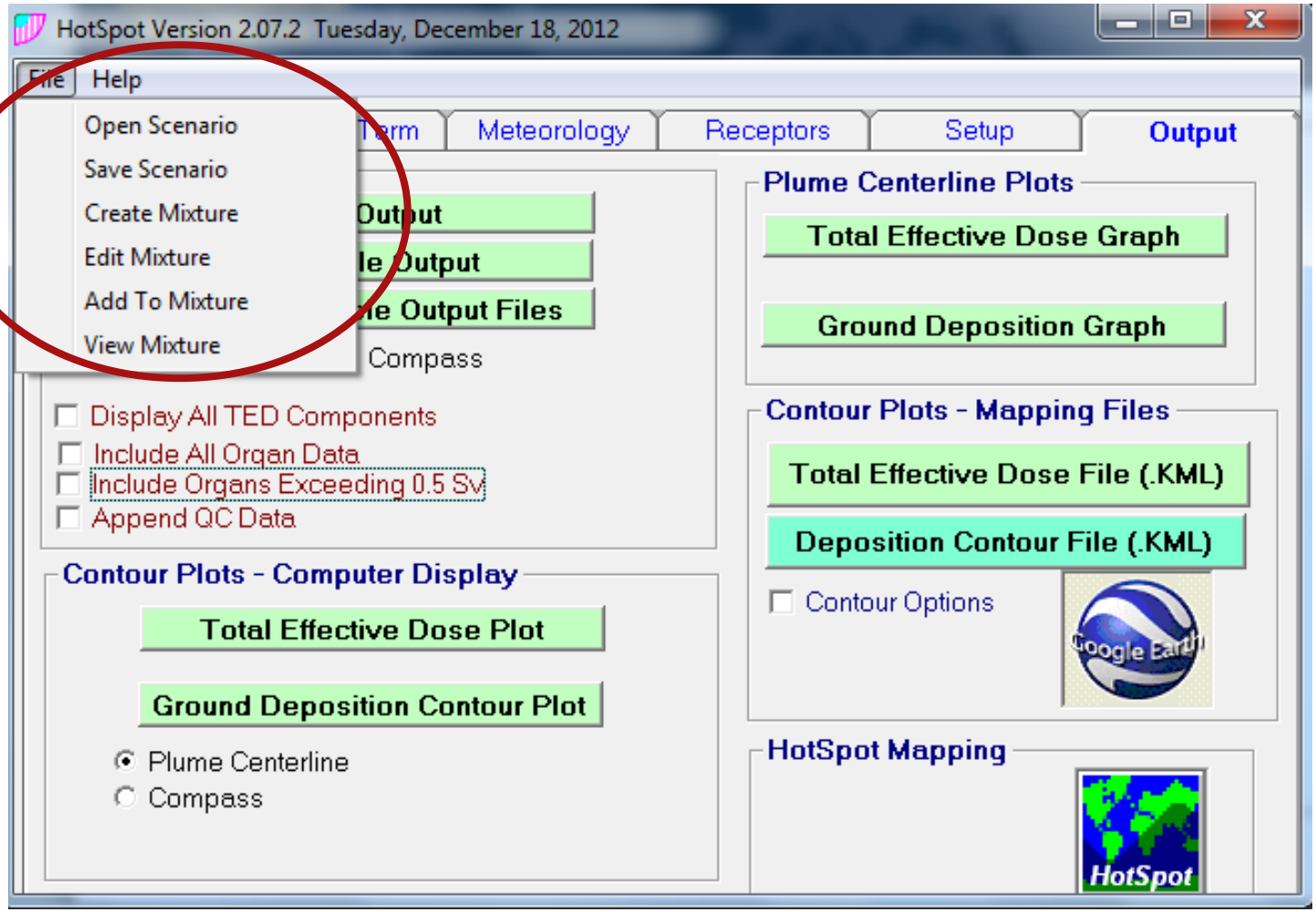
Old ICRP 26/30 (HotSpot FGR-11 Option)	New ICRP 60/66 (HotSpot FGR-13 Option)
Committed effective dose equivalent	Committed effective dose
Committed dose equivalent	Committed equivalent dose
Cumulative total effective dose equivalent	Cumulative total effective dose
Dose equivalent	Equivalent dose
Effective dose equivalent	Effective dose
Quality factor	Radiation weighting factor
Weighting factor	Tissue weighting factor
Total effective dose equivalent	Total effective dose

Output

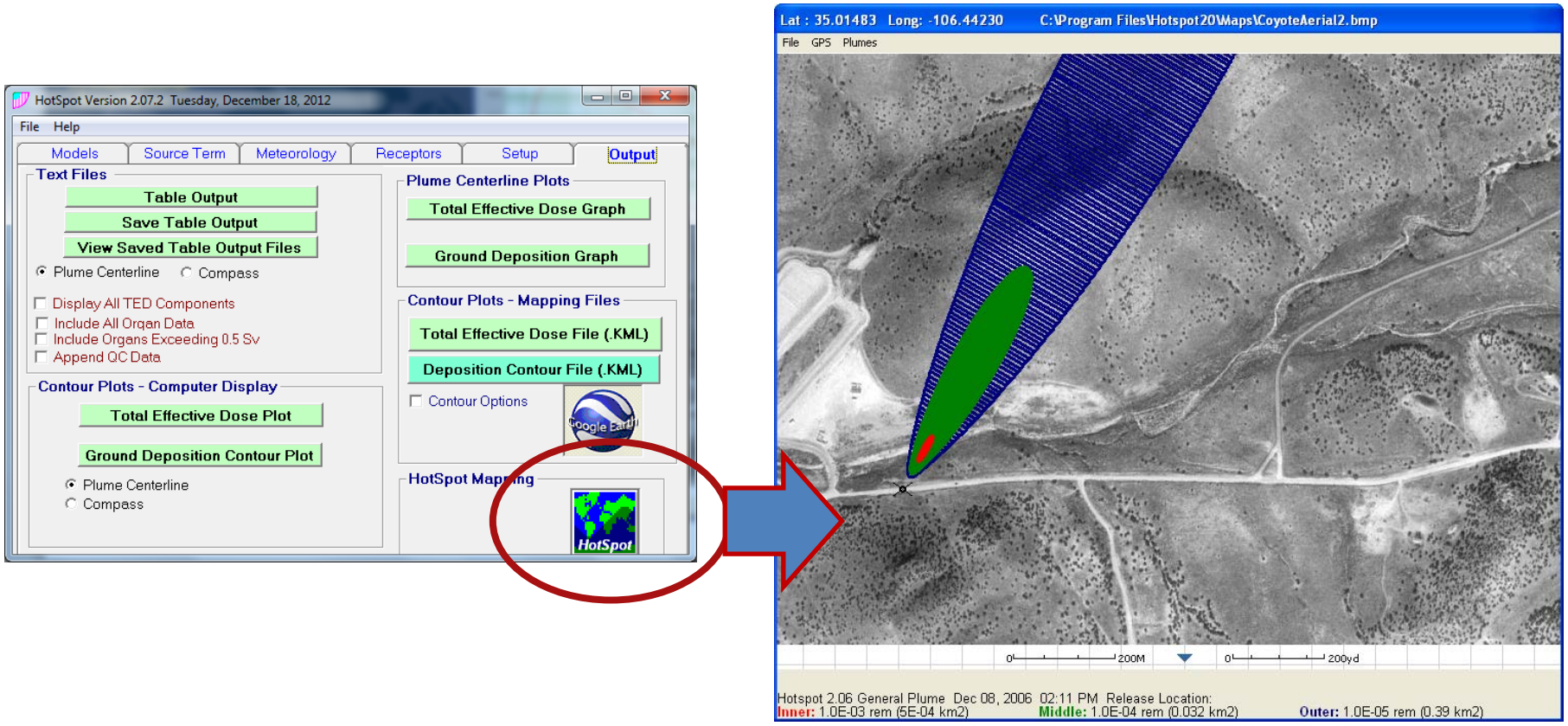


Many Options for Data Output

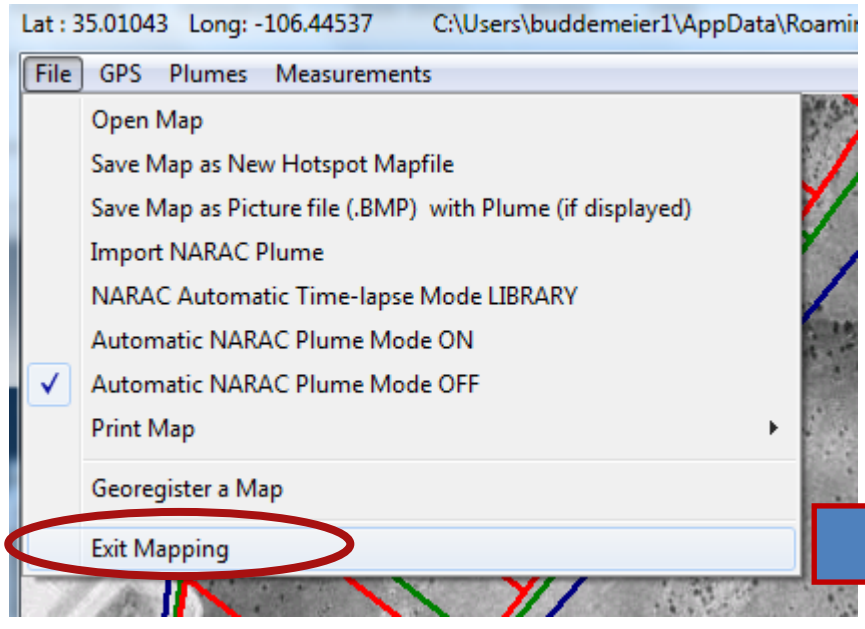
Save Scenarios for later reuse

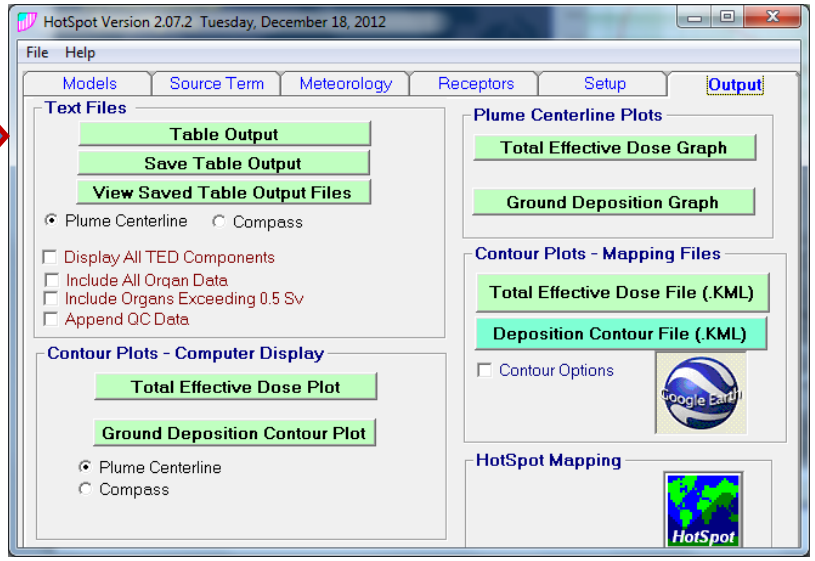


Output Modes

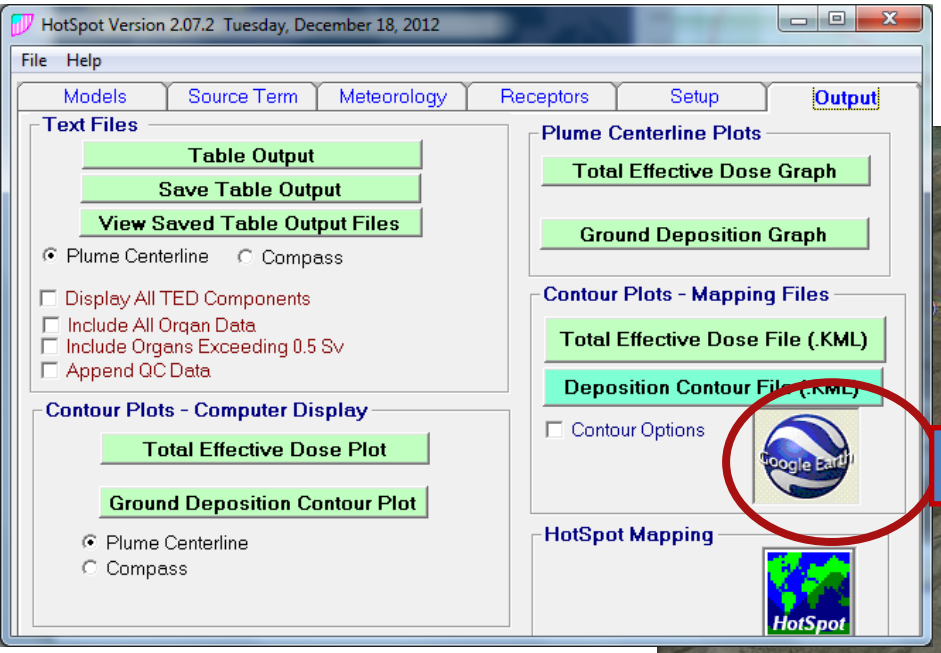


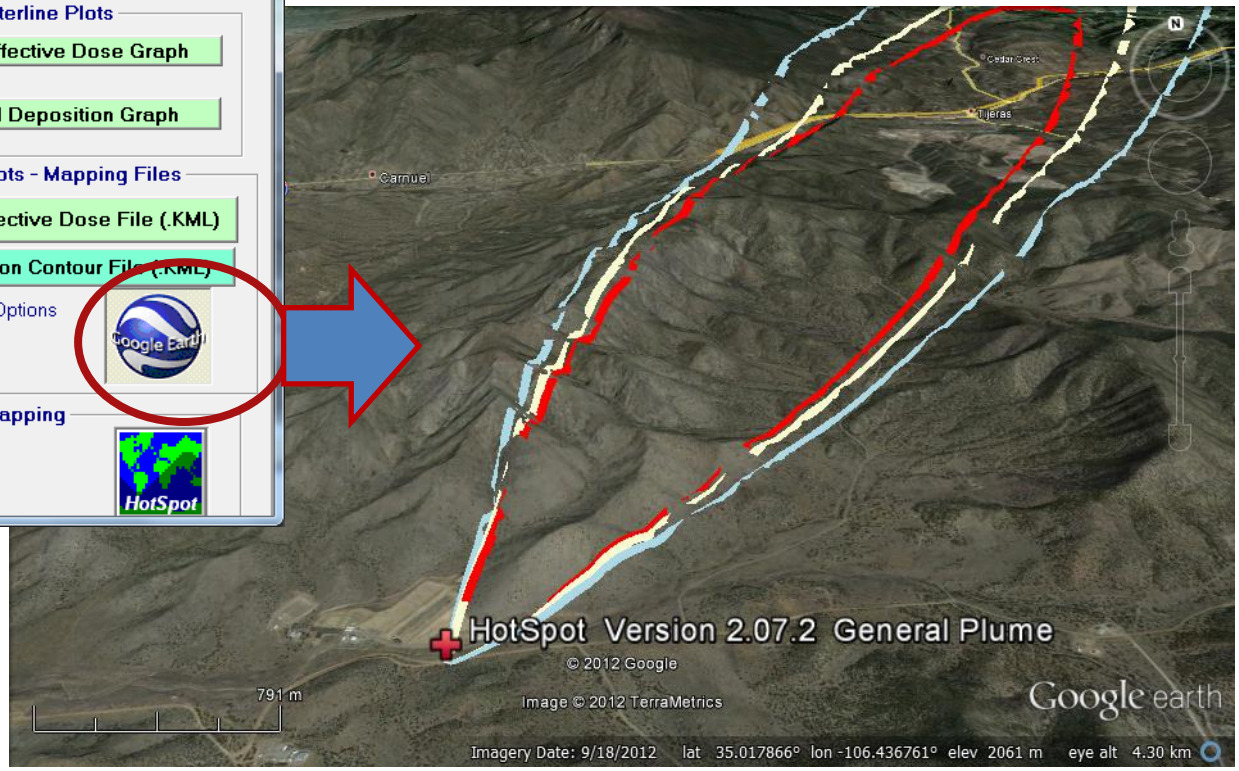
Going Back to Output Screen





Google Earth Export



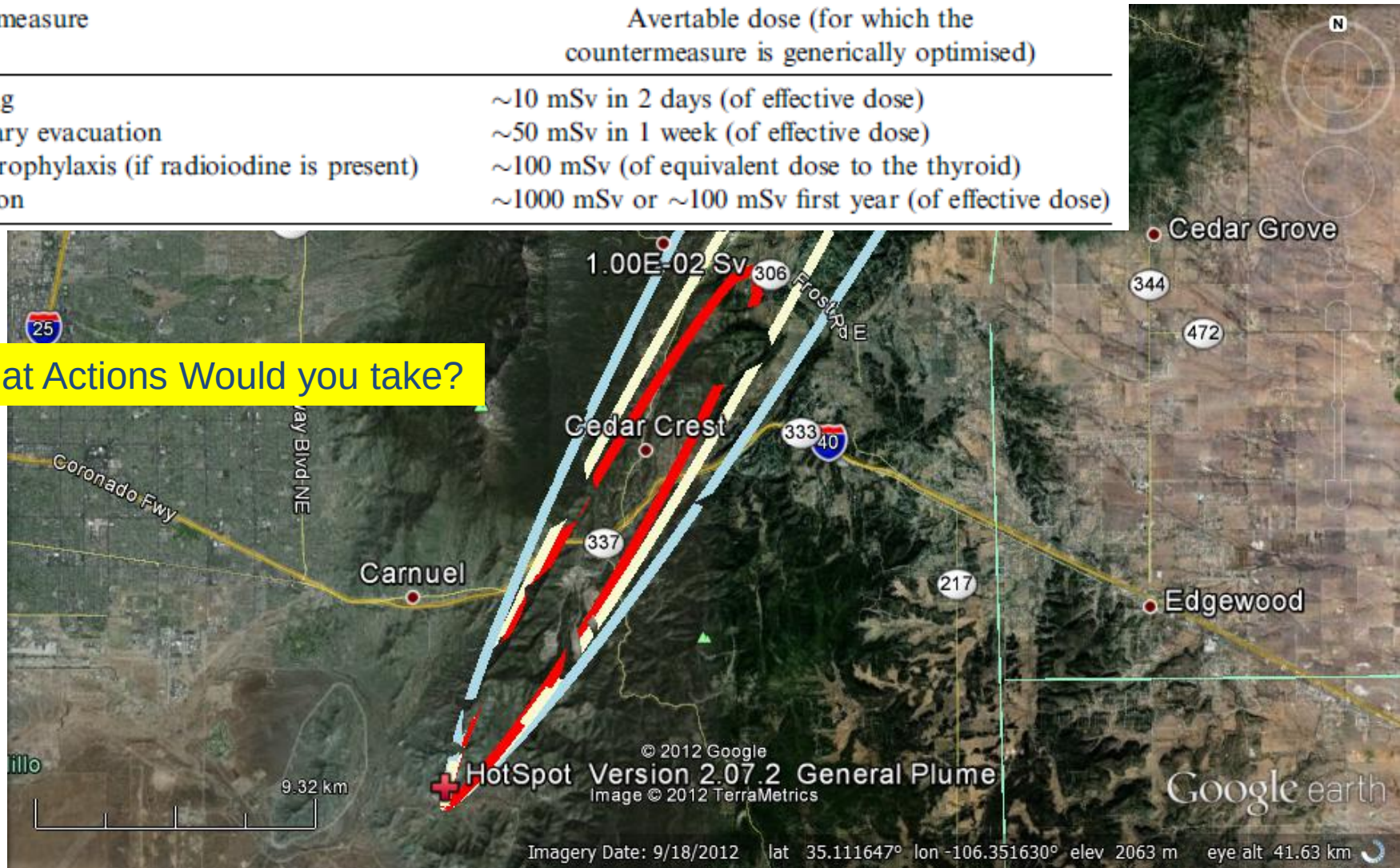


Great For Asking “What If”

Table 3. Recommended avertable doses for undertaking countermeasures

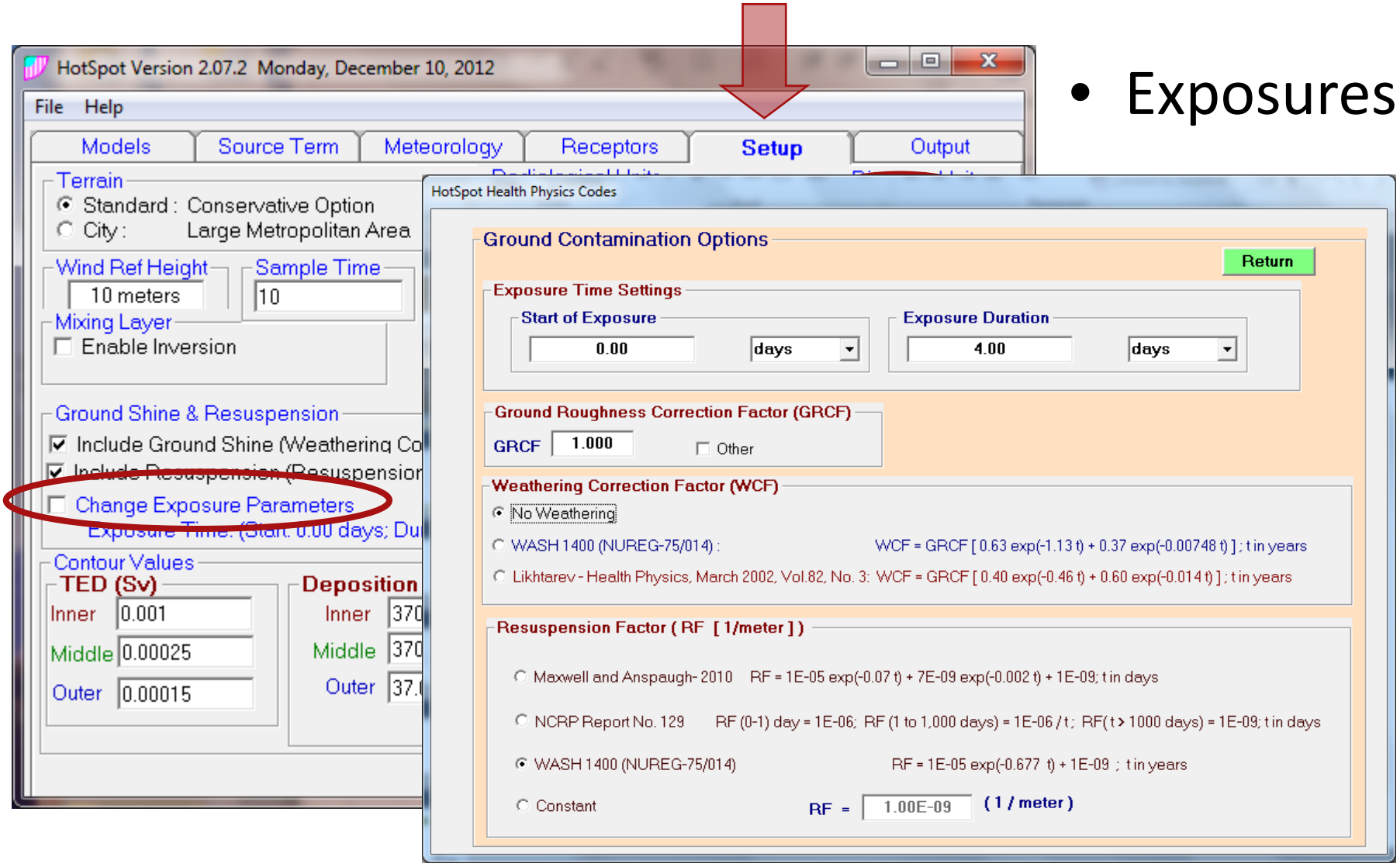
Countermeasure	Avertable dose (for which the countermeasure is generically optimised)
Sheltering	~10 mSv in 2 days (of effective dose)
Temporary evacuation	~50 mSv in 1 week (of effective dose)
Iodine prophylaxis (if radioiodine is present)	~100 mSv (of equivalent dose to the thyroid)
Relocation	~1000 mSv or ~100 mSv first year (of effective dose)

What Actions Would you take?

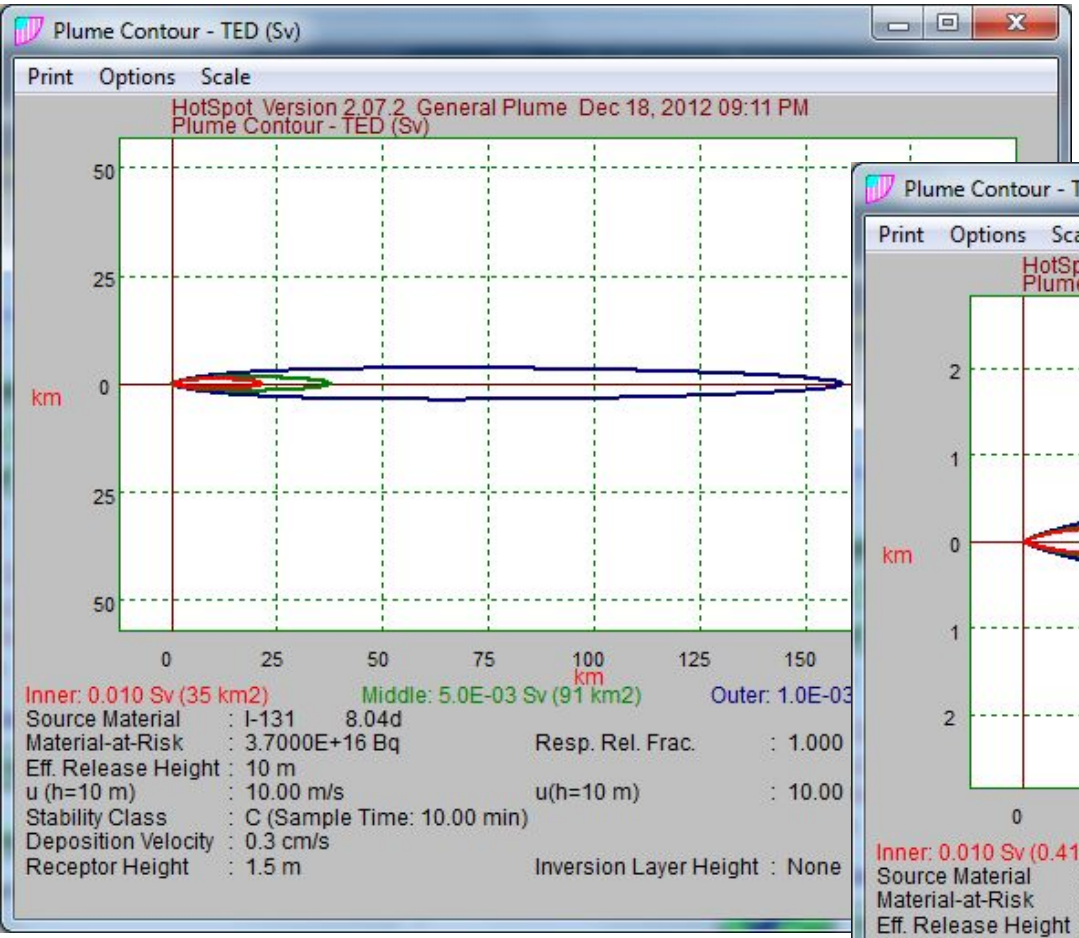


Play With Parameters and Assumptions

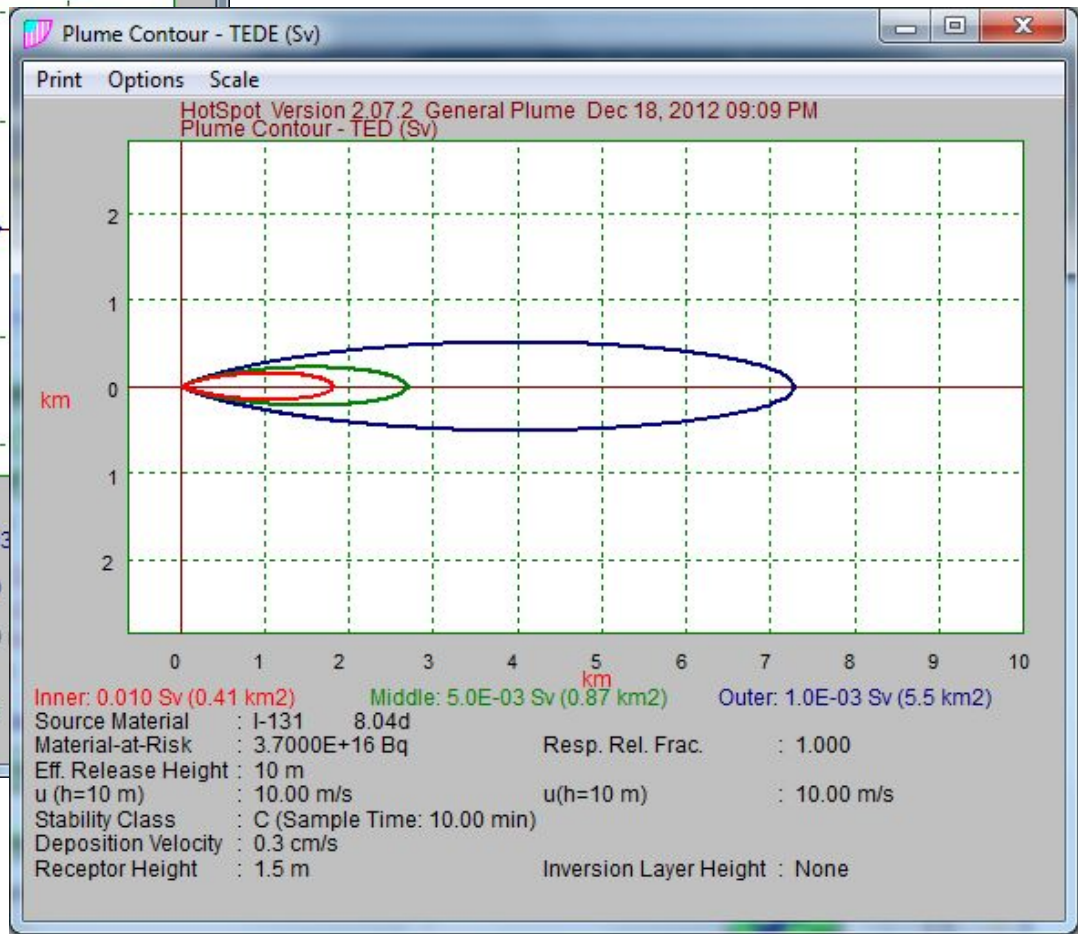
- Exposures



Play With Parameters and Assumptions



TED from Time =0.5 to 2 days



TED from Time =0 to 2 days

CAP88 – EPA's Air Emissions Compliance Screening Tool

Download code and user manuals

http://www.epa.gov/radiation/assessment/CAP88/index.html#version3

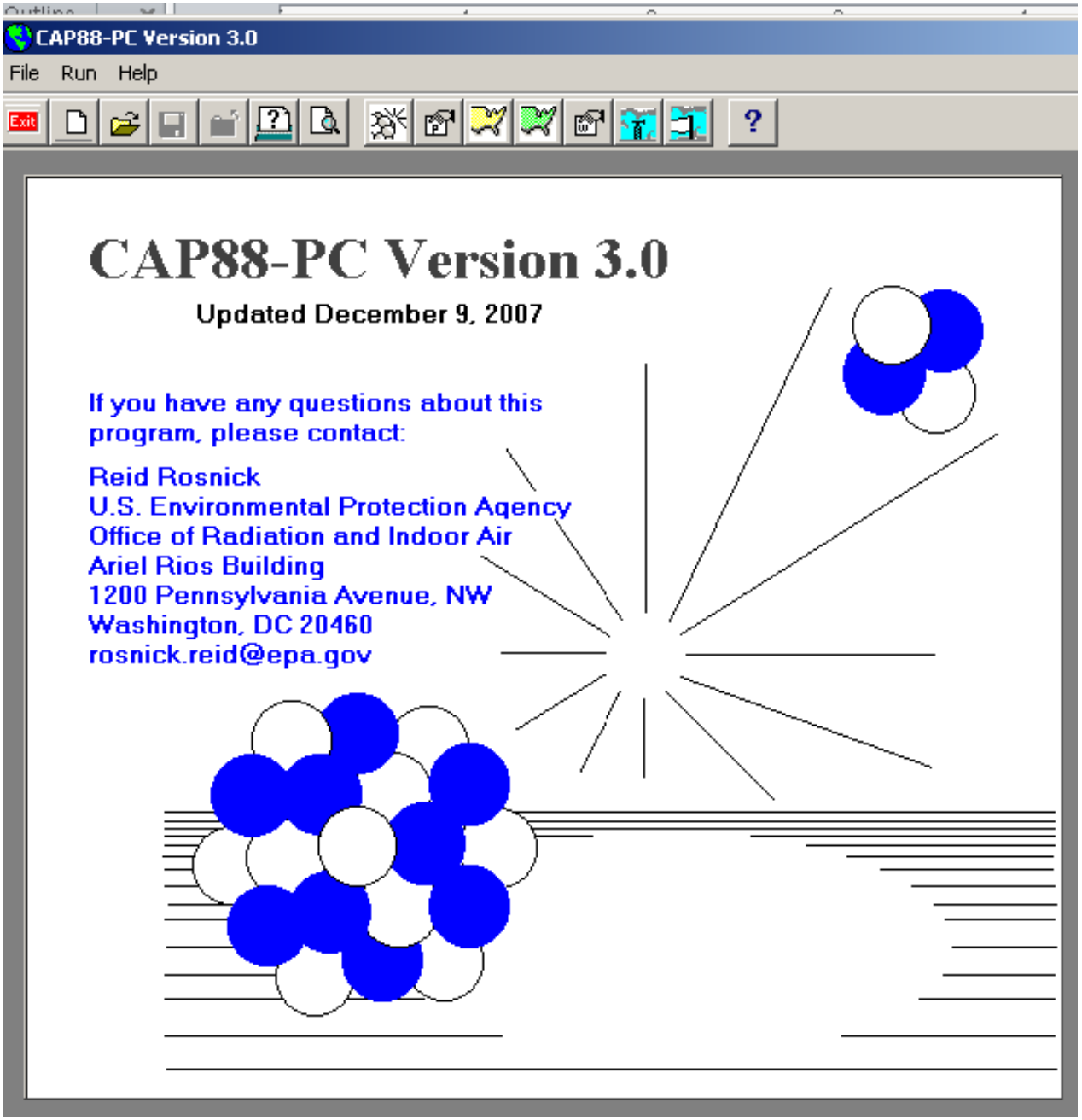
Caveats about CAP88

What CAP88 DOES do:

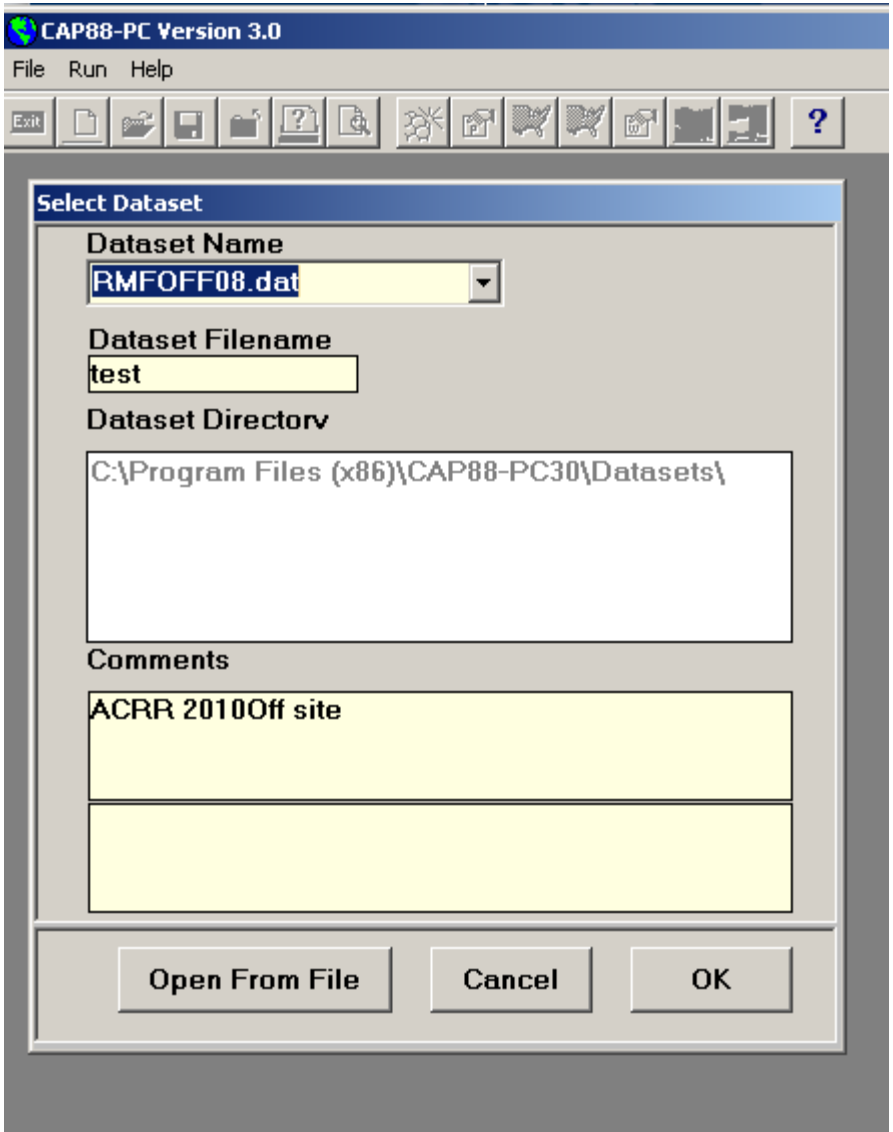
- **Annual SCREENING projections of dose from ANNUAL averages**
- **ROUTINE, not accident air emission pathway dose estimates**
- **AIRBORNE pathway ONLY**
- **Used for regulatory compliance demonstration**

What CAP88 DOESN'T do:

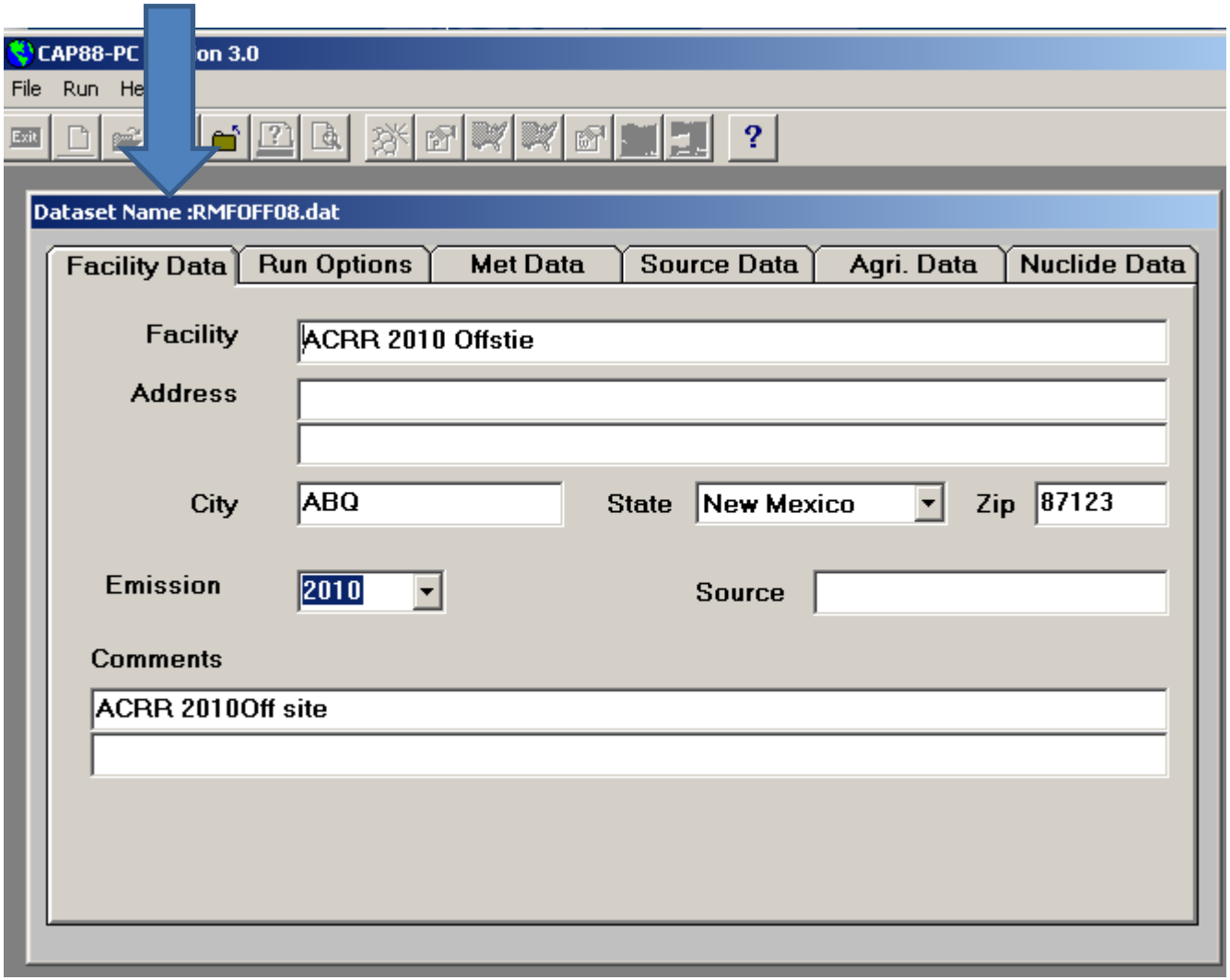
- **Emergency dose projections (use HOTSPOT for that)**


CAP88-PC Version 3.0
File Run Help
Exit
?
CAP88-PC Version 3.0
Updated December 9, 2007
If you have any questions about this program, please contact:
Reid Rosnick
U.S. Environmental Protection Agency
Office of Radiation and Indoor Air
Ariel Rios Building
1200 Pennsylvania Avenue, NW
Washington, DC 20460
rosnick.reid@epa.gov

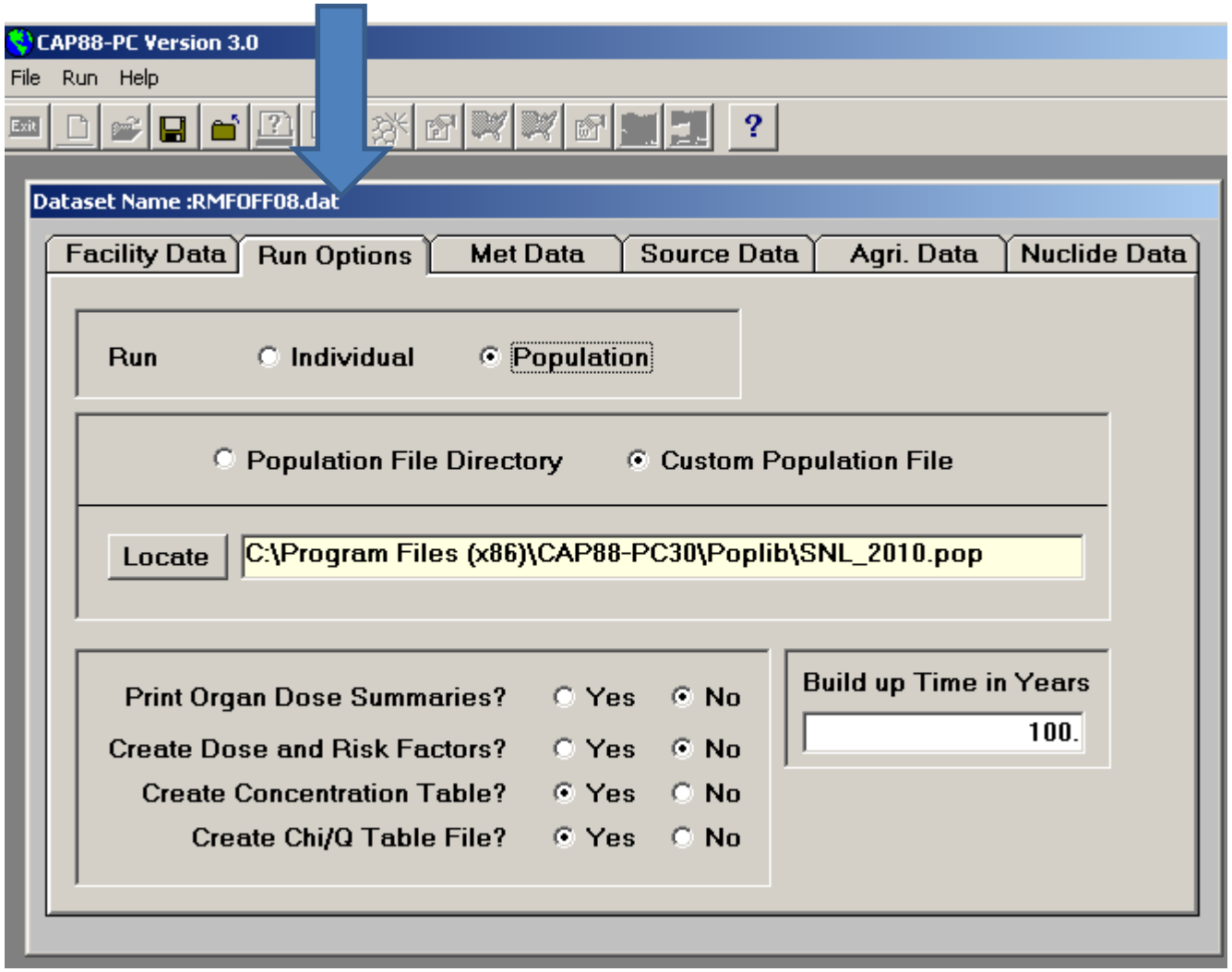
CAP88 Dataset Open Option



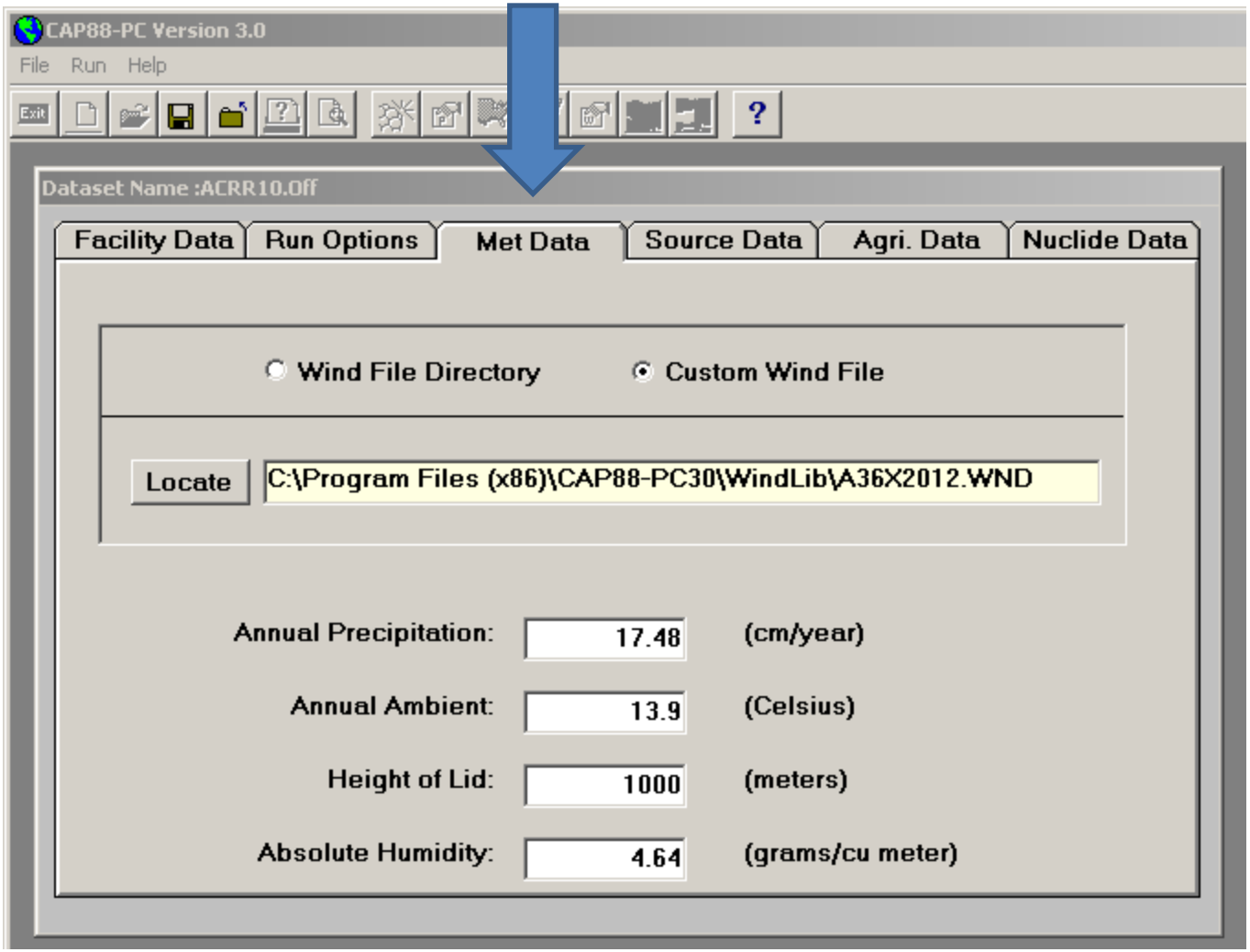
CAP88 Facility Data Tab



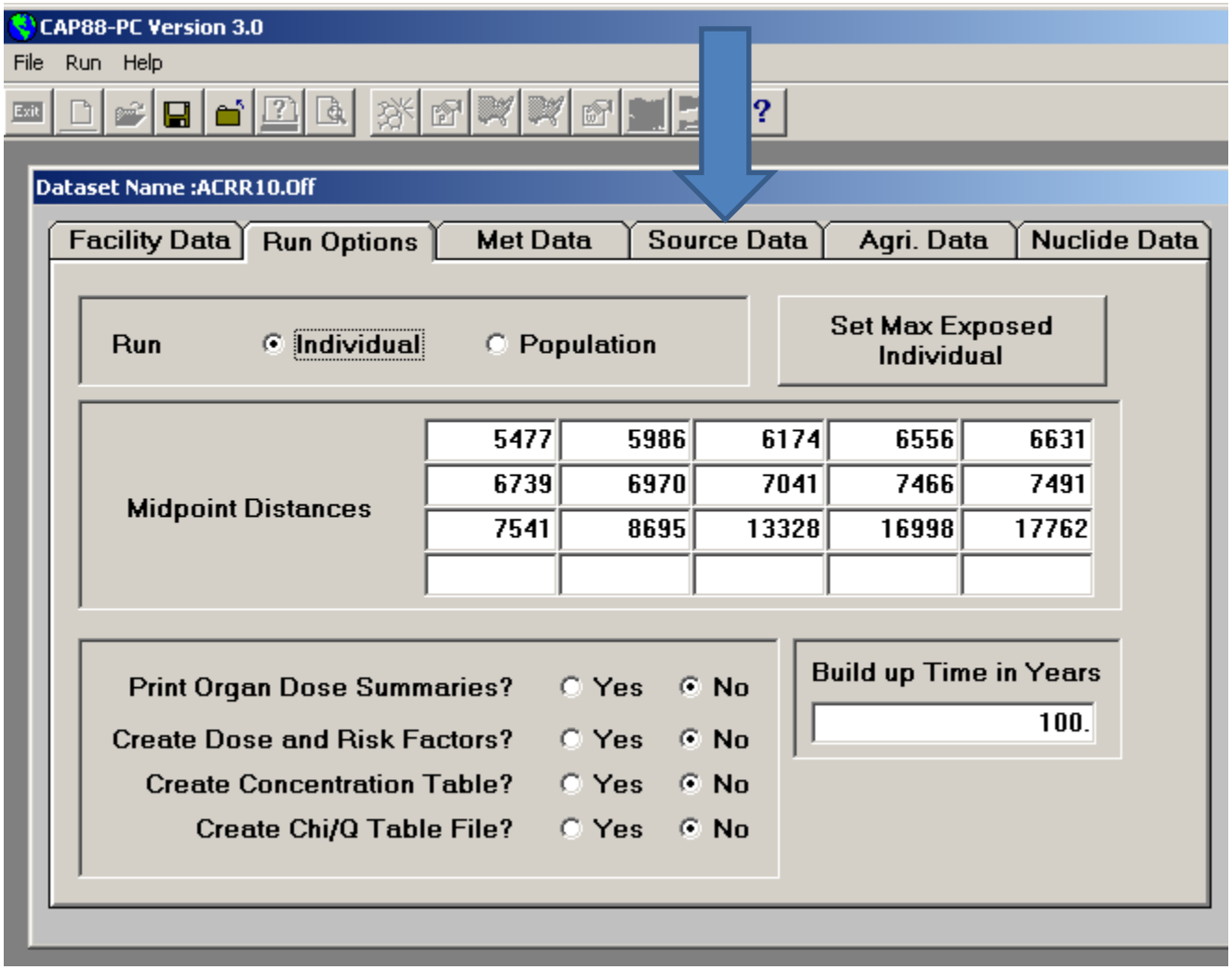
CAP88 Run Options Tab



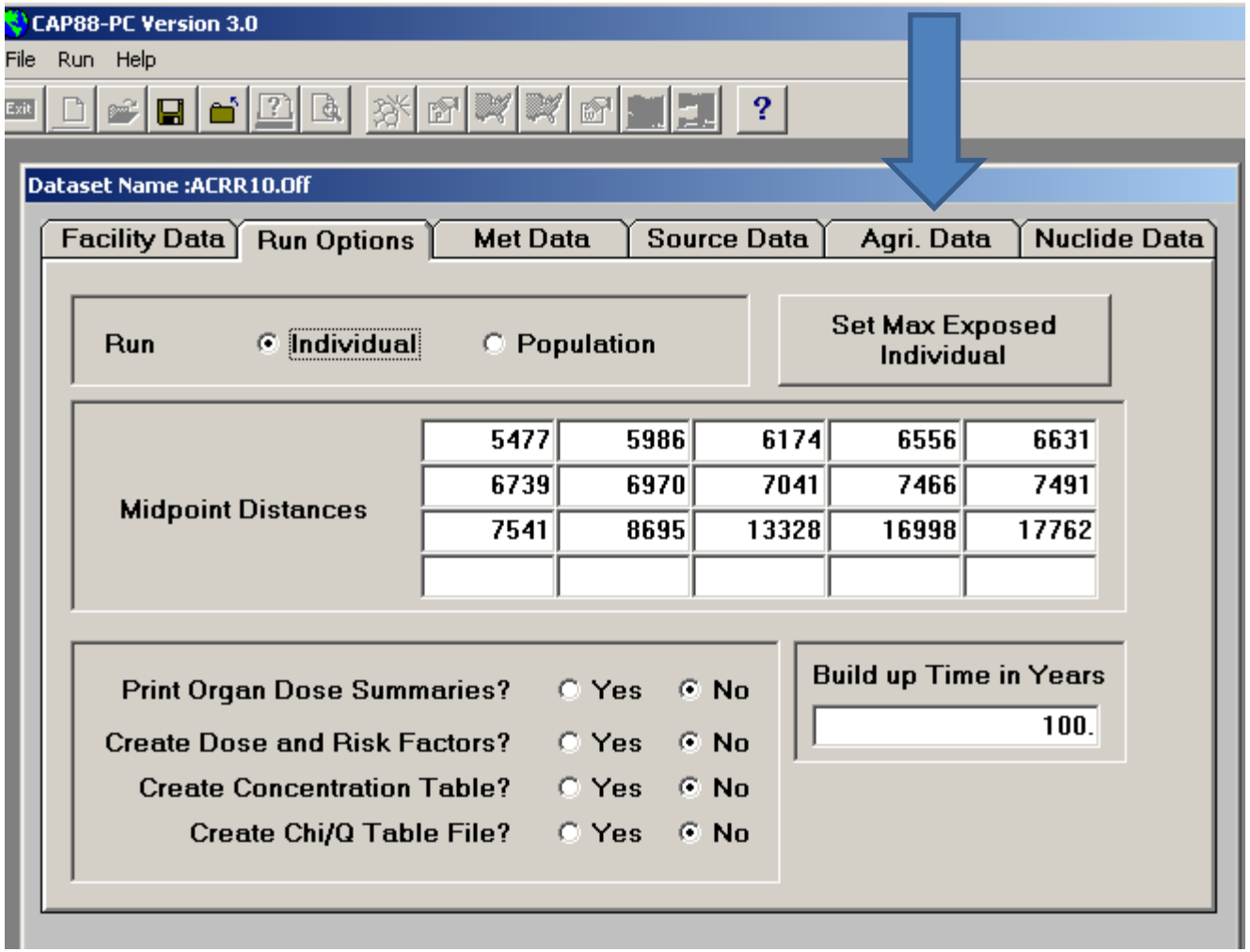
CAP88 Meteorological Data Tab



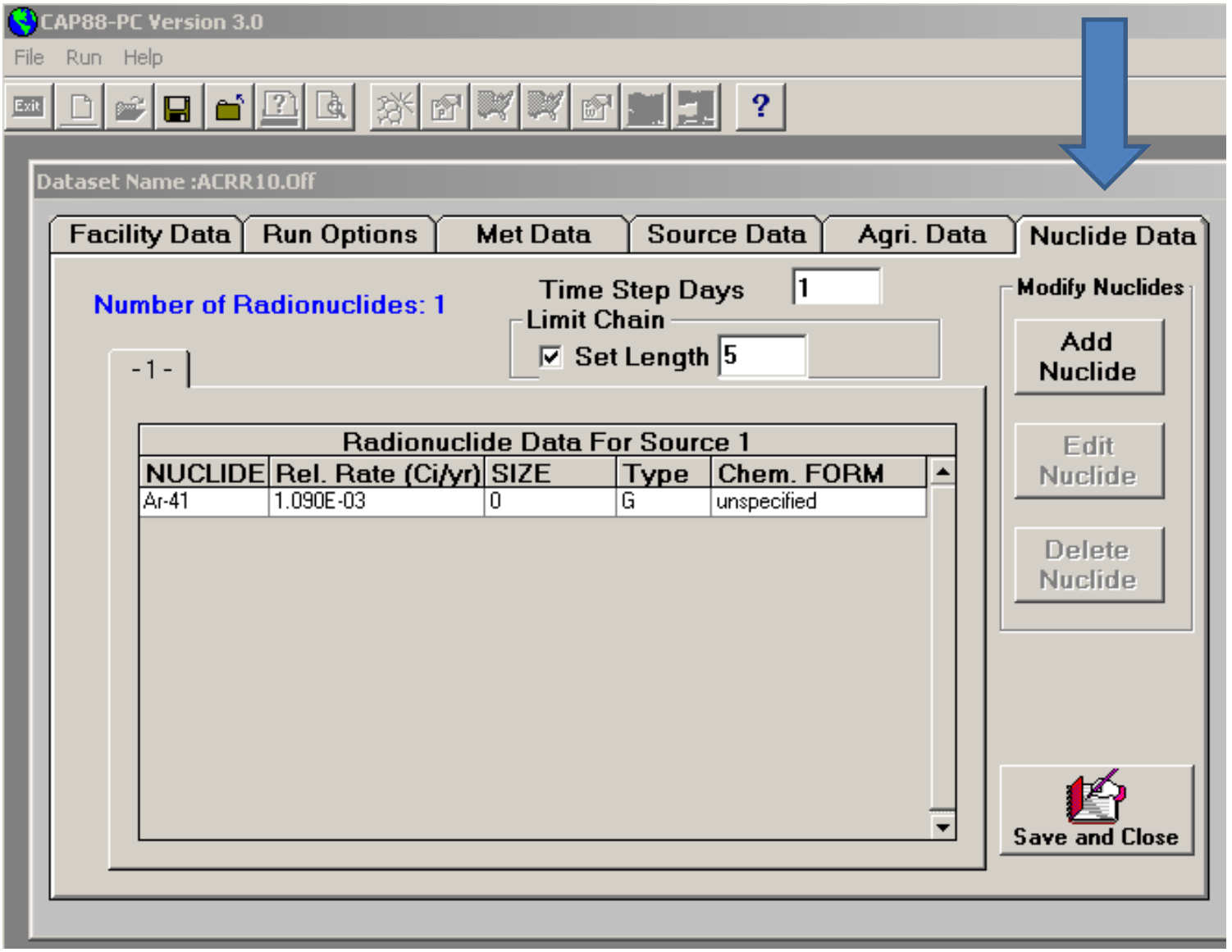
CAP88 Source Data Tab



CAP88 Agricultural Data Tab



CAP88 Nuclide Data Tab



CAP88 Output Example