

CAP88 WEB TRAINING

USEPA

What is CAP88 ?

- Clean Air Act Assessment Package - 1988.
- A set of computer programs, datasets and associated utility programs for estimation of dose and risk from radionuclide air emissions.
- Uses AIRDOS, a Gaussian Plume dispersion model which predicts air concentrations, deposition rates, concentrations in food, and intake rates for people.

What is CAP88? (continued)

- Estimates Dose (EDE) & risk to individuals, populations.
- Dose and risk is calculated for ingestion, inhalation, ground level air immersion and ground surface irradiation exposure pathways.
- Dose and risk factors were generated from the computer program RADRISK.

Regulatory Requirement

- Subpart H: 61.93 (a) states:
 - Radionuclide emissions shall be determined and effective dose equivalent values to members of the public calculated using EPA approved sampling procedures and models.
CAP-88 -- AIRDOS-PC
 - DOE facilities for which the maximally exposed individual lives within 3 kilometers of all sources of emissions in the facility, may use EPA's COMPLY model.
 - Alternate models can also be used.

Obtaining the Models

- EPA Web Site:
www.epa.gov/radiation/assessment/cap88
- DOE Web Site:
[www.sc.doe.gov/sc-80/sc-83/
cap88pc.shtml](http://www.sc.doe.gov/sc-80/sc-83/cap88pc.shtml)

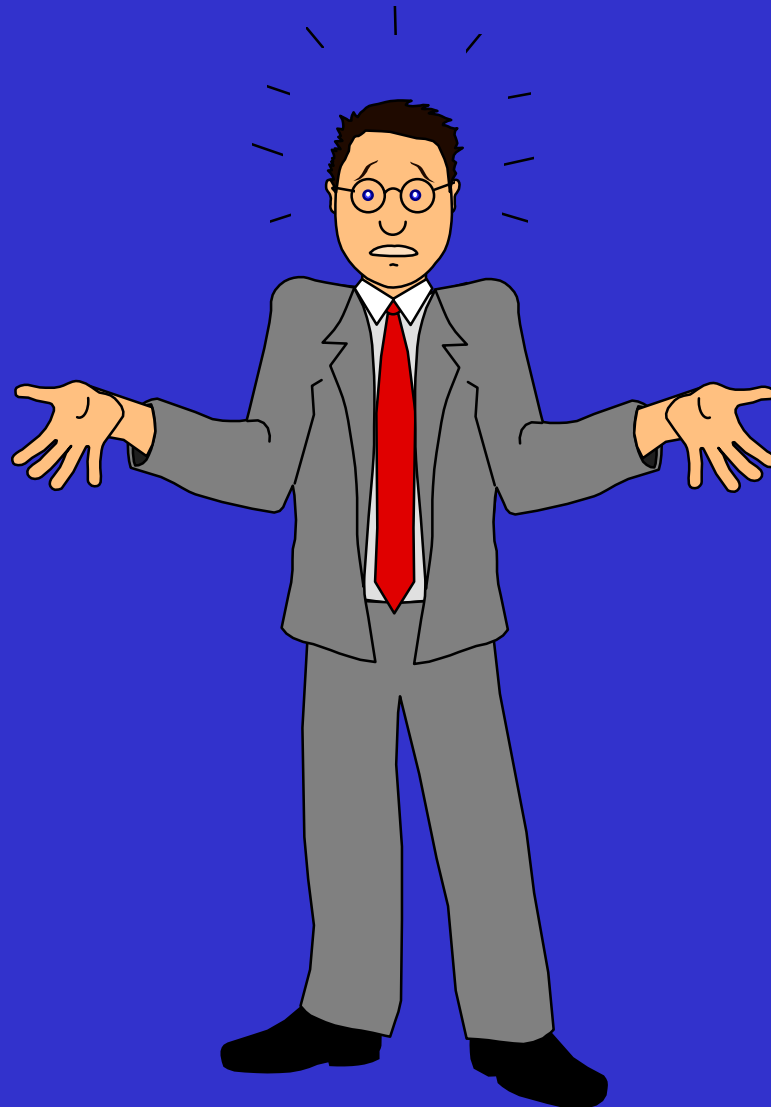
Characteristics

- Based on NCRP model and ICRP 26/30 methodology
- User-friendly Windows environment program
- 264 radionuclides are included in database
- Calculates dose and risk from multiple pathways
- Handles multiple stacks and area sources
- Uses site-specific meteorology
- Considers decay of parent/daughter build up
- Generates compliance report & other reports

Limitations

- No Resuspension
- Assumes flat terrain
- Assumes uniform Area Sources
- Only for low level chronic releases
- No building wake or tip down wash
- One plume rise mechanism assumed for all sources
- Multiple sources are assumed to be co-located.

How To Run An Assessment



Input Parameters Needed

- Facility information
- Population file or distance to receptors
- Meteorological data (STAR file, average rainfall, average temp., and lid height)
- Source data: stack height/diameter, plume rise
- Agricultural data
- Release data

Sample Assessment

- DOE facility
- Six stacks, stack heights and diameters are given
- The radionuclide release rates are known
- Wind file is given
- Population file is given
- Calculate the effective dose equivalent (EDE)

Facility Data

- Facility name
- Address
- City
- State (important)
- Emission year

Facility Data Screen

Facility name

Address

City

State (important)

Emission year

The screenshot shows the 'Facility Data' screen in the CAPBB PC Version 2.0 software. The window title is 'Dataset Name: Reactive Metals'. The form contains the following fields:

- Facility Name: Reactive Metals
- Address: (blank)
- City: Ashtabula
- State: Tennessee
- Emission Year: 1995
- Source Category: DOE Facilities
- Comments: Reactive Metals - Population Run

Source and Nuclide Data

- Up to 6 stacks or area source
 - Height
 - Diameter or area
 - Plume rise (momentum, buoyant, fixed or zero)
- Source term (radionuclides emissions)
 - Release rate (Ci/yr)
 - Particle size
 - Clearance class

Source Data Screen

- Height
- Diameter or area
- Plume rise
- (momentum,
- buoyant,
- fixed or zero)

Dataset Name: Reactive Metals

Facility Data | Run Options | Met Data | **Source Data** | Agri Data | Nucleide Data

Source Type: Area Stock

Number of Sources: 6

Enter dimensions of source

	1	2	3	4	5
Height (m)	15.24	15.24	15.24	15.24	7.62
Diameter (m)	0.41	0.46	0.50	0.36	0.25

Plume Rise: Buoyant Momentum Fixed Zero

Enter the exit velocity (meters/sec) for each source

	1	2	3	4	5	6
	13.5	9.25	19.54	3.79	7.94	15.04

Nuclide Data Screen

Source term
(radionuclides
emissions)

–Release rate
(Ci/yr)

–Particle size

–Clearance
class

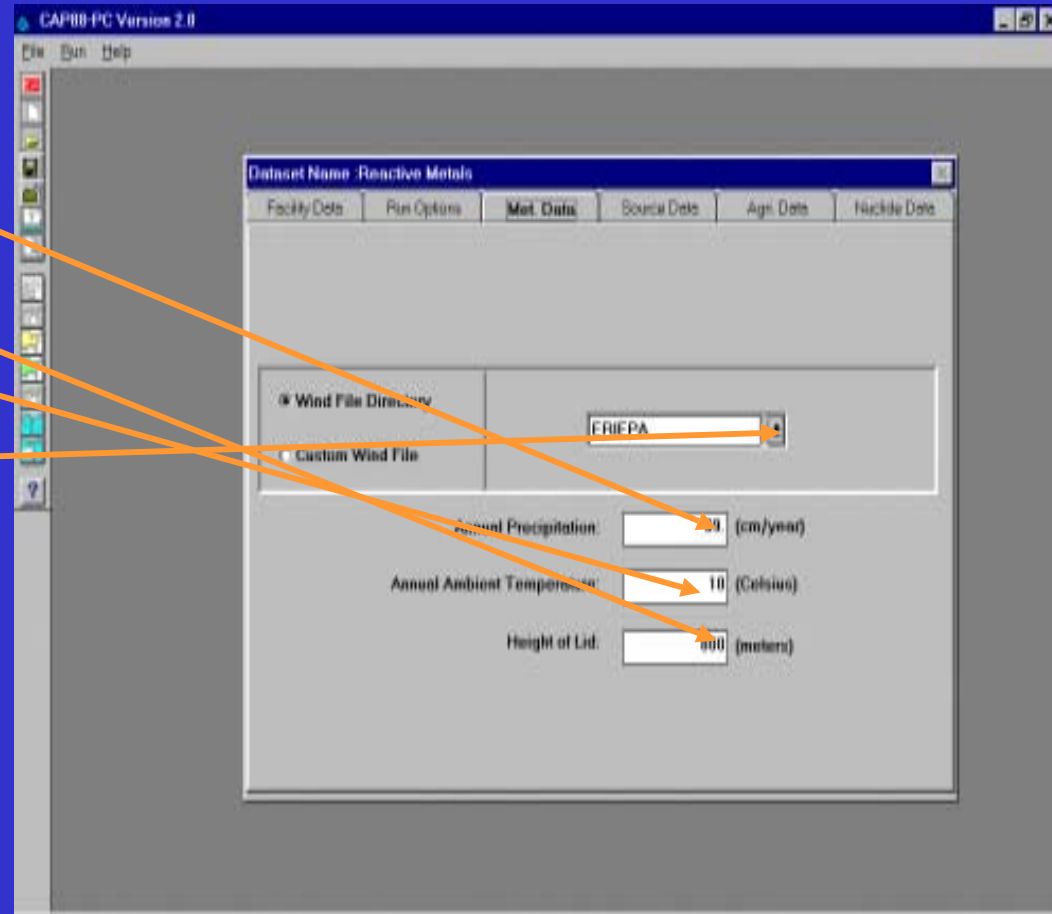
Nuclide	Release (Ci/yr)	Size (AMAD)	Class
U-234	6.5E-04	1.0	Y
U-235	1.73E-06	1.0	Y
U-236	0.E+00	1.0	Y
U-238	2.38E-04	1.0	Y

Meteorological Data

- STAR FORMAT - stability array
- Precipitation
- Lid height
- Temperature

Meteorological Data Screen

- Precipitation
- Lid height
- Temperature
- Wind File



Agricultural Data

- Ingestion pathway: milk, beef, crops
- Uses state-wide averages to construct distributions
- Assumes none within 500 meters of facility

Agricultural Data Screen

- Ingestion pathway:

- milk
- beef
- crops

- Uses state-wide averages to construct distributions

Dataset Name: Reactive Metals

Facility Data | Run Options | Mat. Data | Source Data | **Agri. Data** | Nuclide Data

EPA Food Source Scenarios (Choose one)

Urban Rural Local Regional Imported Entered

	Vegetable	Milk	Meat
Fraction home produced:	7	399	442
Fraction from assessment area:	3	601	550
Fraction imported:	0	0	0

Beef cattle density: (#/km2)

Milk cattle density: (#/km2)

Land fraction cultivated for vegetable crops:

Run Options

- Population or individual
- Output
 - Genetic effects
 - Dose and risk factors
 - Concentration tables
 - Chi/Q tables

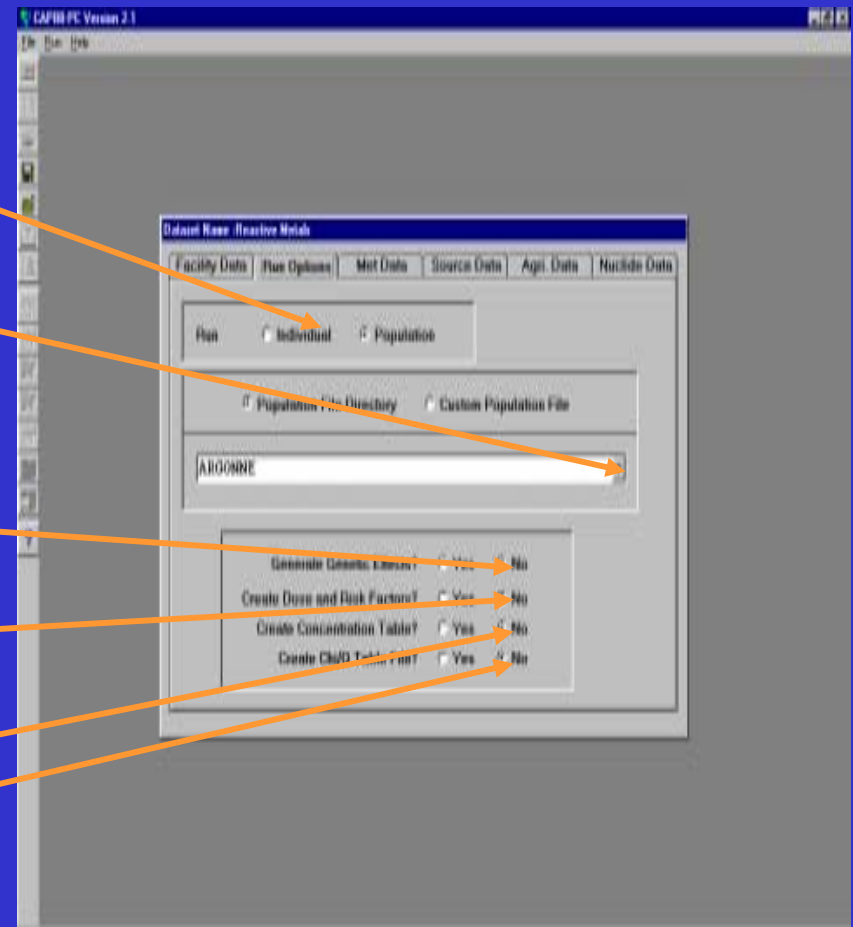
Run Options Screen

Population or individual

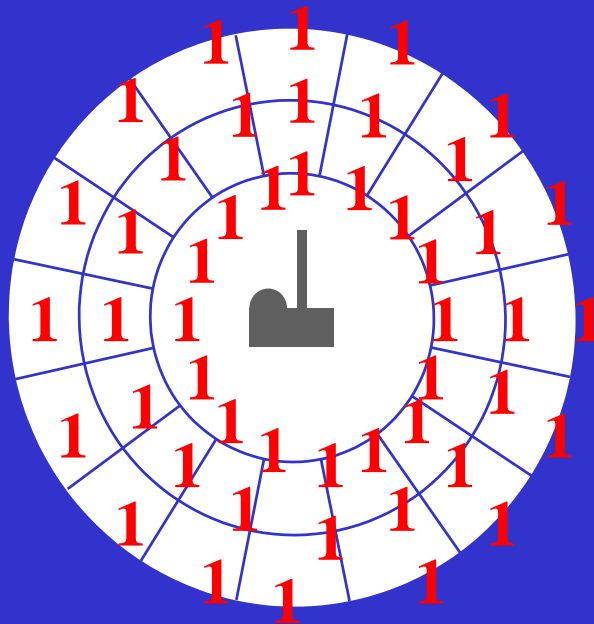
Population File

Output

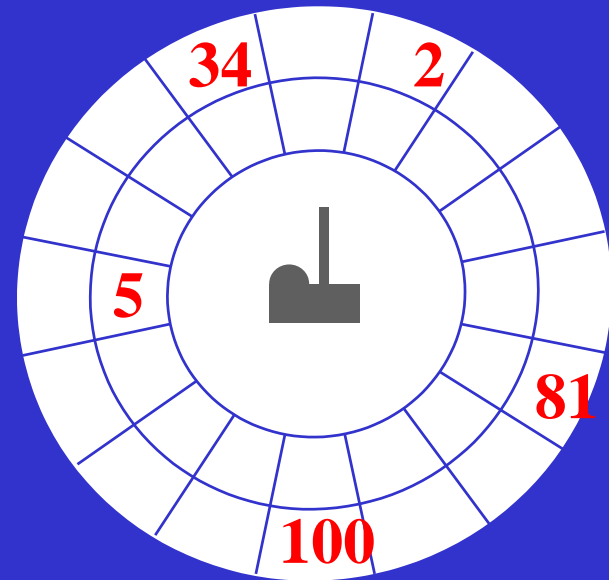
- Genetic effects
- Dose and risk factors
- Concentration tables
- Chi/Q tables



Type of Assessment



Individual Option
5.89E+1 mrem/yr, EDE,
310 meters North



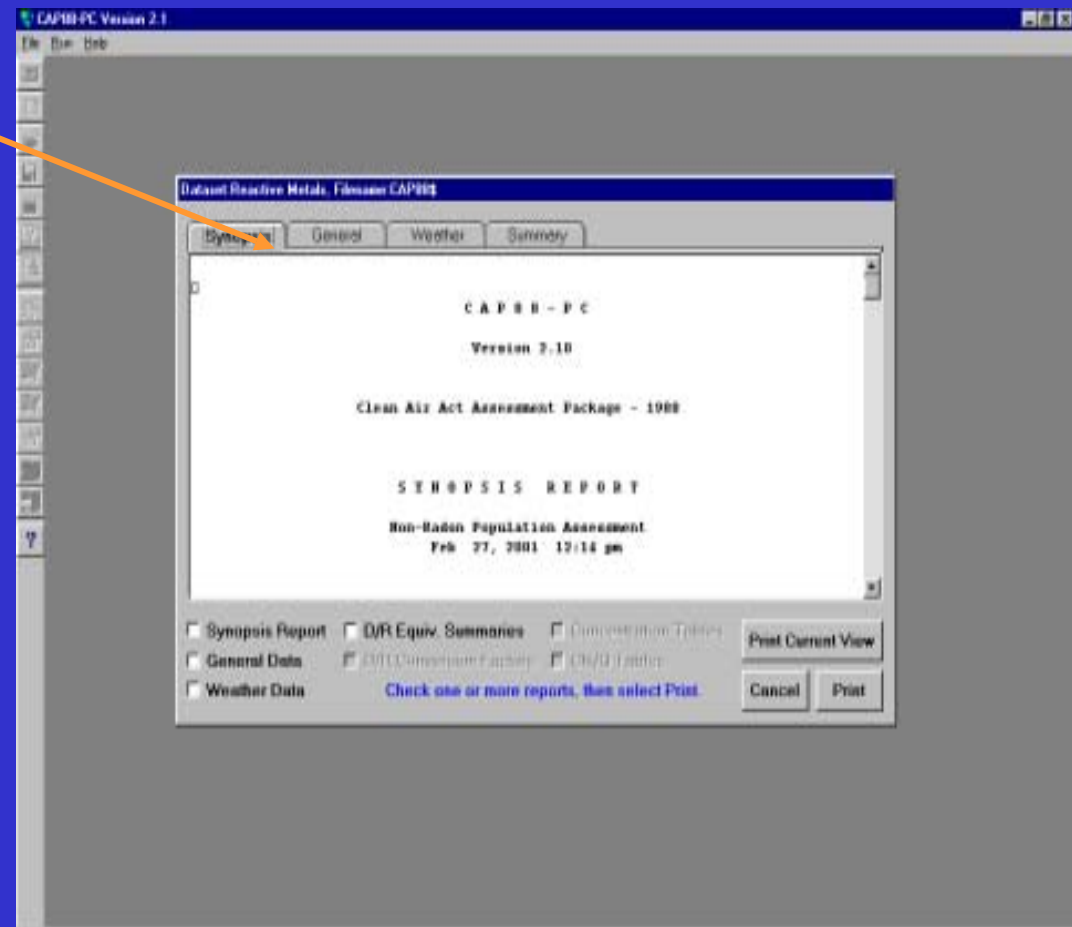
Population Assessment
1.67E+1 mrem/yr, EDE,
310 meters East Northeast

Print or View Reports

- Synopsis report
- General data
- Weather data
- Dose and risk equivalent summary
- Dose and risk conversion factors
- Concentration tables
- Chi/Q tables

Print Screen

- Synopsis report
- General data
- Weather data
- Dose and risk equivalent summary
- Dose and risk conversion factors
- Concentration tables
- Chi/Q tables



What is AIRDOS-PC?

- Computer Program for calculating Doses from radionuclide emissions to air.
- Replicates calculation in CAP88
- Menu driven for ease of data entry.

AIRDOS-PC: Characteristics

- User-friendly Menu Driven Program
- Based on Updated ICRP 26/30 Methodology
- Handles 41 Commonly Used radionuclides
- Calculates Dose from Multiple Pathways
- Handles Multiple Stacks and Area Sources
- Uses Site-Specific Meteorology
- Generates a Compliance Report

AIRDOS-PC: Limitations

- Source terms for annual averages only
- Ignores building wake factors
- Models only 18 radionuclides simultaneously
- Multiple sources are assumed to be co-located.
- Calculates only for circular grids
- Assumes 100% locally grown food source

What Is COMPLY?

- Calculates doses from airborne radionuclide emissions
- Various levels to reduce burden--greater input results in a more realistic dose.
- Used to demonstrate compliance with 40 CFR 61, Subparts I & H (mainly Subpart I).
- Based on NCRP Commentary No. 3

COMPLY: Components

- Table of Annual Possession - Level 1
- Table of Air Concentration - Level 1
- NCRP Screening Model - Level 2 & 3
- EPA's Compliance Model - Level 4

COMPLY: Characteristics

- Requires Minimum Effort to Demonstrate Compliance
- Based on NCRP Model and ICRP 26/30 Methodology
- Handles Over 450 Radionuclides and Multiple Stacks
- Considers Building Wake Factors
- Calculates Dose from Multiple Pathways
- Uses Site-Specific Meteorology
- Considers Decay of Parent and Daughter Build-up
- Generates a Compliance Report

COMPLY: Limitations

- A screening model
- Compliance can be demonstrated at any level
- Only for point sources
- Assumes flat terrain
- Needs minimum input
- Handles only low level chronic releases

Alternative Models

- Prior EPA Approval is needed
- What needs to be submitted?
 - Why alternative model is needed
 - Source Code
 - Documentation on the model formulation
 - Input Parameters
 - Time Frame needed for approval
- Example of EPA Prior Approval
 - Los Alamos
 - Additional Radionuclide