

CAP88-PC V4 TRAINING

Module 2.2

Models, Methods, File Structures



MAJOR CHANGES VISIBLE TO USER

Age Dependent Dose and Risk Factors from ORNL DCFPAK 2.2

Ingestion

Inhalation

Updated User Interface

File Management (Migration and Data Locations)

Report Generation

Look and Feel (Windows standard but retain earlier screen style)

Radionuclide Set

1252 Total Radionuclides (737 with internal DCFs)

Flags Radionuclides with External but not Internal DCF

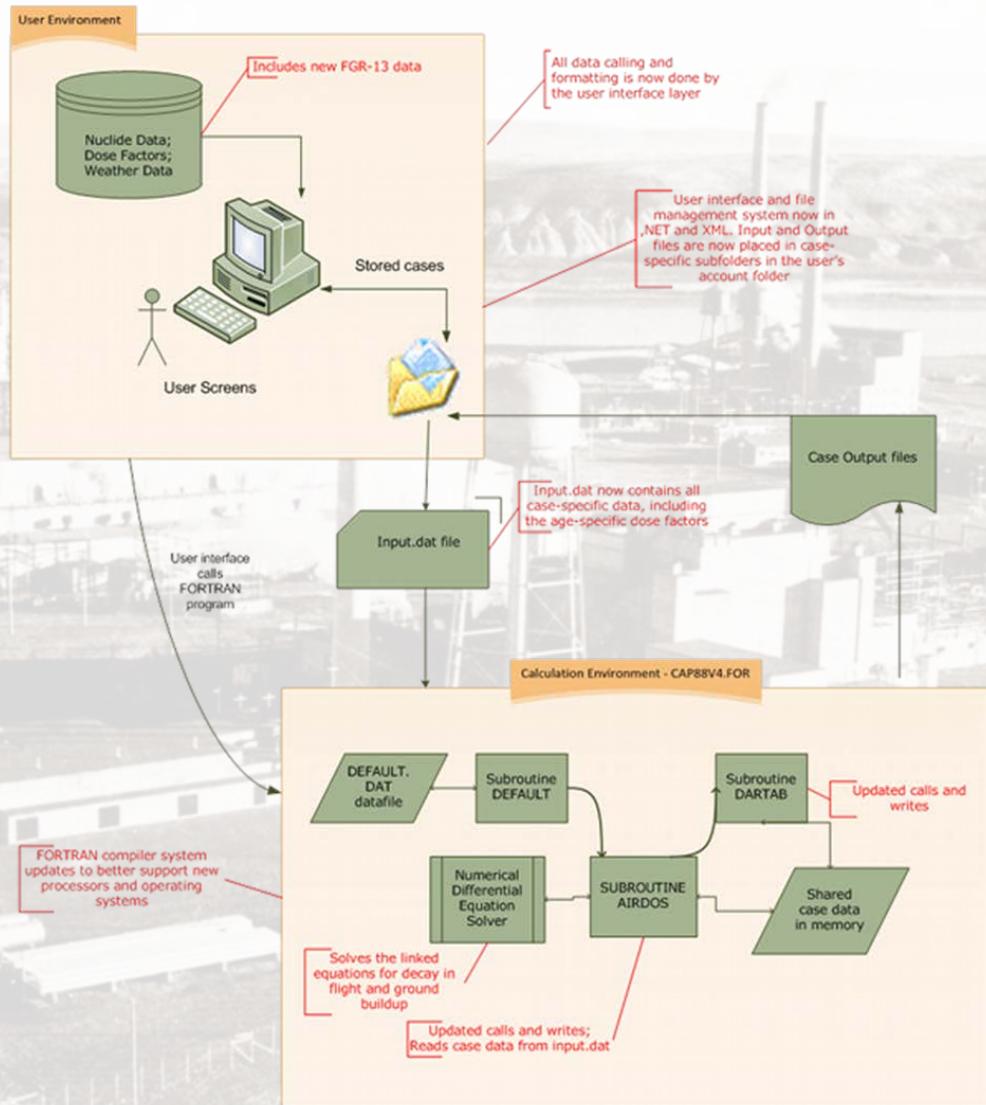
Up to 500 isotopes in a run



MAJOR ARCHITECTURE CHANGES

- Separation of data from calcs
- New data relationships
- Single FORTRAN code
- No temp files
- Standard variable naming
- Updated data and code standards

SPEED
MAINTAINABILITY



MODEL CHANGES

First: What Hasn't Changed?

Long-term Gaussian Plume Air Dispersion Model

Regulatory Guide 1.109 Food Chain Accumulation Model

Format for Wind and Population Files

- some minor changes

- general functionality unchanged

EPA Mandated Values for Certain Model Variables, e.g.

- deposition velocity

- scavenging coefficient

Radon-Only Case Model



MAJOR MODEL CHANGES

Age-Dependent DCFPAK 2.2 Values for Dose and Risk Factors

Build dose/risk factors in user interface code

26 dose organs incl. Whole Body (still 15 risk organs)

Age Dependent Inhalation and Ingestion Rates

Values compiled by EPA from 2009 Exposure Factors Handbook

Implementation of Numerical Solver for Chain Decay and Deposition

Handles chains up to 30 isotopes deep + branching

Chains defined in DCFPAK data, translated to XML

Implemented at each sector for air and ground surface

Replaces approximate methods used in V3

DLSODE solver package

New Compilers Allow Full Double Precision and Partial Vectorization

reducing run time and eliminating underflow crashes were priorities



SOME OTHER CHANGES

Enhanced Installation and Run Logging

All Case Information in One Location

Report Generation – Output Files Stored in Dataset Folder

Input Pop and Wnd Files in Dataset Folder

Greatly Increased Source Ranges ($1E-25$ to $1E+28$ Ci/yr)

Increased Input Validation, Viewable in Errors Window

Edits Displayed in Real Time in the Changes Window

Elimination of Supporting MS Access Databases

Expanded On-Line Help System

Digital Code Signature to Support Code Security Requirements



AGE DEPENDENT DATA

Six age groups: 100 day old, 1 year old, 5 year old, 10 year old, 15 year old, Adult

Run Type: Population Population Age: Adult Build up time: 100 years

Files with * are in the same folder as the dataset
Files with ! are in a non-default folder
C:\Users\vwood\Documents\CAP88\Population Files\ports.pop

File: ports Portsmouth

Midpoints: 10

1 - 5	800.00	2400.00	4000.00	5600.00	7250.00
6-10	12100.00	24150.00	40250.00	56350.00	72200.00
11-15	0.00	0.00	0.00	0.00	0.00
16-20	0.00	0.00	0.00	0.00	0.00

Maximum Exposed Individual
Direction: auto Midpoint index: 0 Auto-determine

ERRORS CHANGES

Age Selection



AGE DATA REPORTING

```
Modtest.SYN - Notepad
File Edit Format View Help
CAP88 - PC
Version 4.0
Clean Air Act Assessment Package - 1988
SYNOPSIS REPORT
Non-Radon Population Assessment
Thu Jun 13 13:14:43 2013
Facility: CAP88-PC Version 3
Address: 1111 Simulation Dr
City: Portsmouth
State: OH Zip: 45111
Source Category: Single Stack
Source Type: Stack
Emission Year: 2012
DOSE Age Group: Adult
Comments: Modtest problem
for Version 4 User Manual
Committed Effective Dose Equivalent
(mrem)
3.59E+02
At This Location: 800 Meters East Northeast
Dataset Name: Modtest.
```

Printed In Synopsis,
Summary, and
Factors files.
(.syn, .sum, .fac)



AGE DATA IMPLEMENTATION

All dose calculations for that dataset use the age-selected factors

- Max individual dose is for that age
- Population is assumed to all be at that age

Ingestion and Inhalation data are for the selected age group

- Individual intake rates
- All population intake rates

Why this approach:

- Programming implementation
- Uncertainty in direction of regulation (written with adult factors in mind)
- Other approaches for population would have imposed major compliance burden
 - New population data with age dependency

Future possible approaches:

- Loop all age groups and select highest dose result
- Require age-dependent receptor data
- Make assumptions on age distributions within the receptor population

This first use is only a step, full implementation will require policy changes



NEW GROUND SURFACE BUILDUP MODEL

Need to calculate ground surface activity for all isotopes at a given time

- Additive terms are deposition and radioactive ingrowth

- removal terms are leaching and radioactive decay

$$\frac{dn_1}{dt} = R_1 - \lambda_1^e n_1(t), \text{ where } \lambda_1^e \equiv \lambda_1 + \lambda_{l,1} \text{ for first member of chain}$$

R term is production term, includes sum of all decay chain contributors for progeny

Version 2 used pre-defined factors for a limited number of chains

Version 3 used approximate method performed in Visual Basic front end

Both methods had weaknesses



GROUND SURFACE MATRIX REPRESENTATION

$$\begin{bmatrix} dn_1/dt \\ dn_2/dt \\ dn_3/dt \\ \vdots \\ dn_i/dt \\ \vdots \\ dn_{N-1}/dt \\ dn_N/dt \end{bmatrix} = \begin{bmatrix} R_1 \\ R_2 \\ R_3 \\ \vdots \\ R_i \\ \vdots \\ R_{N-1} \\ R_N \end{bmatrix} + \begin{bmatrix} -\lambda_1^e & 0 & 0 & \cdots & 0 & \cdots & 0 & 0 \\ \lambda_{12} & -\lambda_2^e & 0 & \cdots & 0 & \cdots & 0 & 0 \\ \lambda_{13} & \lambda_{23} & -\lambda_3^e & \cdots & 0 & \cdots & 0 & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots & \vdots & \vdots & \vdots \\ \lambda_{1i} & \lambda_{2i} & \lambda_{3i} & \cdots & -\lambda_i^e & 0 & 0 & 0 \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ \lambda_{1,N-1} & \lambda_{2,N-1} & \lambda_{3,N-1} & \cdots & \lambda_{N-1,j} & \cdots & -\lambda_{N-1}^e & 0 \\ \lambda_{1,N} & \lambda_{2,N} & \lambda_{3,N} & \cdots & \lambda_{N,j} & \cdots & \lambda_{N,N-1} & -\lambda_N^e \end{bmatrix} \begin{bmatrix} n_1(t) \\ n_2(t) \\ n_3(t) \\ \vdots \\ n_i(t) \\ \vdots \\ n_{N-1}(t) \\ n_N(t) \end{bmatrix}$$

Note that lambda values must include branching fractions



GROUND CONCENTRATION FORMULATION IN FORTRAN

```
SUBROUTINE f_gc(n,t,yg,ydotg)

IMPLICIT NONE

<<<<<<< .mine
  INTEGER n, i
  DOUBLE PRECISION t_end,y(30)   Max of 30 members in chain
=====
  INTEGER n, i, j
  DOUBLE PRECISION t,yg(*),lame(30),blam(30,30),deptot(30)
  Double Precision first(30), ydotg(*), lam(30), atchi(30)
  Common /gcfuncdat/ lame,blam,deptot
>>>>>> .r203

      Do 5 i=1,30
        first(i)=0.d0
      5 Continue

!
! Decay differential equations with early branching terms set to zero
! because we know we never skip more than 4 isotopes in a branch.
! In short, (blam i,j)=0 if i-j>5, so leave out those terms
!

      Do 20 i=1,n
        Do 10 j=1,i
          first(i)=first(i)+(blam(i,j)*yg(j))   Sum of chain ingrowth terms
        10 Continue
        ydotg(i)=first(i)-(lame(i)*yg(i))+deptot(i) (Chain ingrowth) – removal + deposition
      20 Continue
! print*,"In f_gc, t is: ",t, "y1= ",y(1)

RETURN
END
```



NUMERICAL METHODS TESTING RESULTS

Part of Alpha Phase testing:

Ground Concentration

- Solved the equations analytically for up to 6 members
- Programmed solution into Excel
- Tested against 5 member Sr-81 chain analytical with good agreement

Air Concentration

- Bateman equations with branching (no deposition or leaching)
- Tested against web solvers and Excel versions of analytical solution
- All tests showed good agreement

Tested solver for resiliency against stiff problems with good results



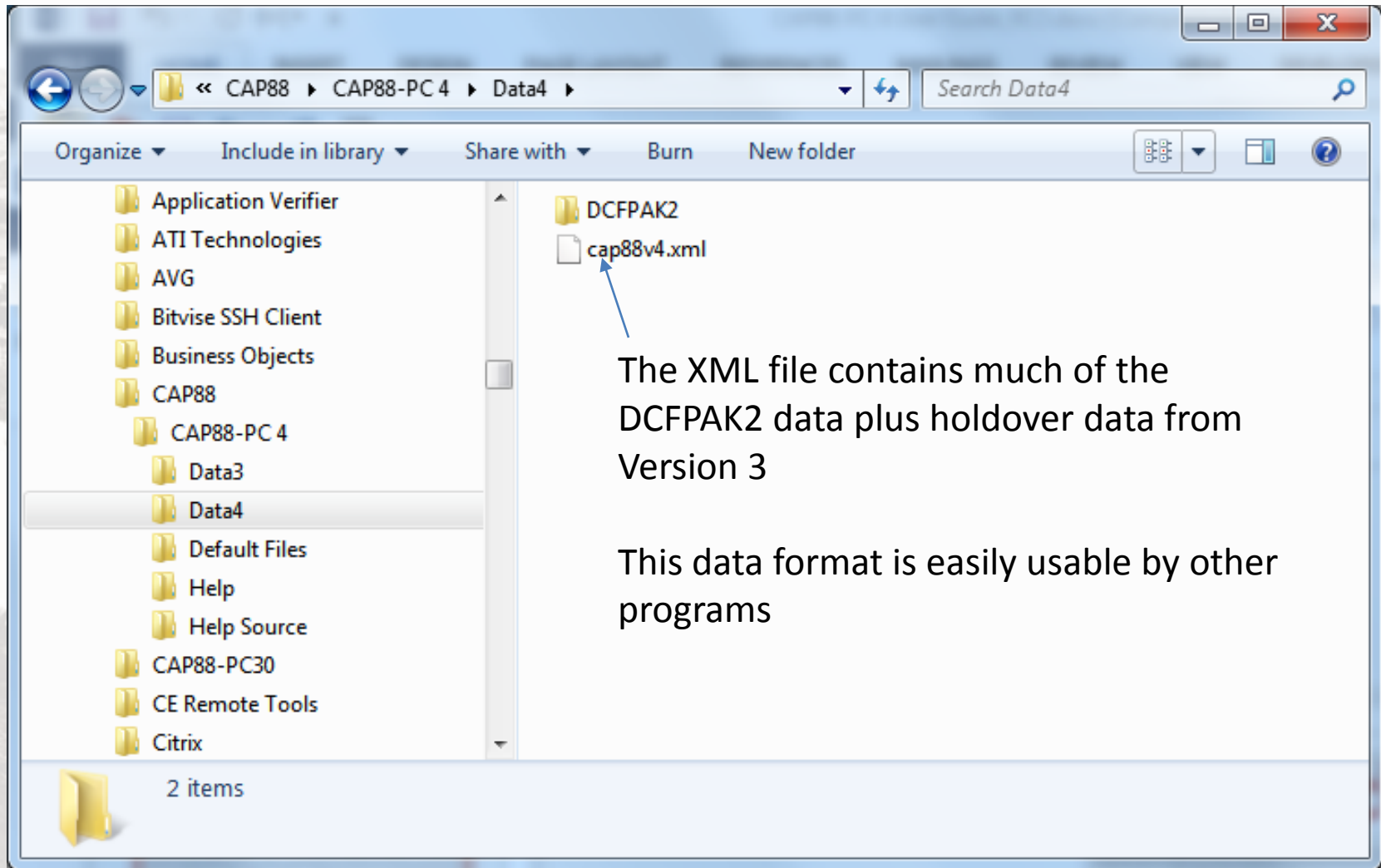
EXAMPLE ALPHA PHASE TEST RESULTS

U-235 Chain, CAP88 Solver vs. On-line Decay Solver at WISE Uranium Project

	Cap88	WISE
Case4: 10,000 units U235, no daughters at t=0, 1000 y		
U-235	1.00E+04	1.00E+04
Th-231	1.00E+04	1.00E+04
Pa-231	2.09E+02	2.09E+02
Ac-227	2.03E+02	2.03E+02
Th-227	2.00E+02	2.00E+02
Fr-223	2.80E+00	2.80E+00
Ra-223	2.03E+02	2.03E+02
Rn-219	2.03E+02	2.03E+02
At-219	1.68E-04	
Bi-215	1.63E-04	
Po-215	2.03E+02	2.03E+02
Pb-211	2.03E+02	2.03E+02
Bi-211	2.03E+02	2.03E+02
Tl-207	2.02E+02	2.02E+02
Po-211	5.60E-01	5.68E-01



NEW DATA LOCATIONS



The XML file contains much of the DCFPAK2 data plus holdover data from Version 3

This data format is easily usable by other programs



XML DATA FILE STATE AG DATA

```
<?xml version="1.0" encoding="utf-8" standalone="yes"?>
<Data>
  <AgriData Type="System.Collections.Generic.List`1[[Cap88Pc.Data3.AgriData,
Cap88Pc, Version=4.0.0.0, Culture=neutral, PublicKeyToken=null]]">
    <Record>
      <StateName Type="System.String">Alabama</StateName>
      <StateAbbr Type="System.String">AL</StateAbbr>
      <BeefDensity Type="System.Decimal">0.1520</BeefDensity>
      <MilkDensity Type="System.Decimal">0.007020</MilkDensity>
      <VegetationDensity Type="System.Decimal">0.004160</VegetationDensity>
    </Record>
```



XML DATA FILE ISOTOPE DATA

```
<NuclideIndex Type="System.Collections.Generic.List`1[[Cap88Pc.Data4.NuclideIndex, Cap88Pc,
Version=4.0.0.0, Culture=neutral, PublicKeyToken=null]]">
  <Record>
    <NuclideName Type="System.String">Ac-223</NuclideName>
    <HalfLife Type="System.Decimal">2.10</HalfLife>
    <HalfLifeUnit Type="System.String">m</HalfLifeUnit>
    <Fgr12iiiDat Type="System.Int32">1116</Fgr12iiiDat>
    <ExtRisksRbs Type="System.Int32">16684</ExtRisksRbs>
    <DcflngsDat Type="System.Int32">0</DcflngsDat>
    <DcflngsRbs Type="System.Int32">0</DcflngsRbs>
    <DcflngsD30 Type="System.Int32">0</DcflngsD30>
    <IngestionChemicalForms Type="System.Int32">0</IngestionChemicalForms>
    <Hdb Type="System.Int32">0</Hdb>
    <Rbs Type="System.Int32">0</Rbs>
    <D30 Type="System.Int32">0</D30>
    <InhalationChemicalForms Type="System.Int32">0</InhalationChemicalForms>
    <DcfVaporDat Type="System.Int32">0</DcfVaporDat>
    <DcfVaporRbs Type="System.Int32">0</DcfVaporRbs>
    <DcfVaporD30 Type="System.Int32">0</DcfVaporD30>
    <VaporGasChemicalForms Type="System.Int32">0</VaporGasChemicalForms>
  </Record>
```



XML DATA FILE CHAIN DATA

```
<DcfDecayParent Type="System.Collections.Generic.List`1[[Cap88Pc.Data4.DcfDecayParent, Cap88Pc, Version=4.0.0.0, Culture=neutral, PublicKeyToken=null]]">
  <Record>
    <NuclideName Type="System.String">Ne-24</NuclideName>
    <DecayItems Type="System.Collections.Generic.List`1[[Cap88Pc.Data4.DcfDecayItem, Cap88Pc, Version=4.0.0.0, Culture=neutral, PublicKeyToken=null]]">
      <Record>
        <NuclideName Type="System.String">Ne-24</NuclideName>
        <Daughters Type="System.Collections.Generic.List`1[[Cap88Pc.Data4.DcfDecayItemDaughter, Cap88Pc, Version=4.0.0.0, Culture=neutral, PublicKeyToken=null]]">
          <Record>
            <NuclideName Type="System.String">Na-24</NuclideName>
            <DecayPercent Type="System.Decimal">1.000</DecayPercent>
            <IsFinalItem Type="System.Boolean">>false</IsFinalItem>
          </Record>
        </Daughters>
      </Record>
      <Record>
        <NuclideName Type="System.String">Na-24</NuclideName>
        <Daughters Type="System.Collections.Generic.List`1[[Cap88Pc.Data4.DcfDecayItemDaughter, Cap88Pc, Version=4.0.0.0, Culture=neutral, PublicKeyToken=null]]">
          <Record>
            <NuclideName Type="System.String">Mg-24</NuclideName>
            <DecayPercent Type="System.Decimal">1.000</DecayPercent>
            <IsFinalItem Type="System.Boolean">>true</IsFinalItem>
          </Record>
        </Daughters>
      </Record>
    </DecayItems>
  </Record>
```



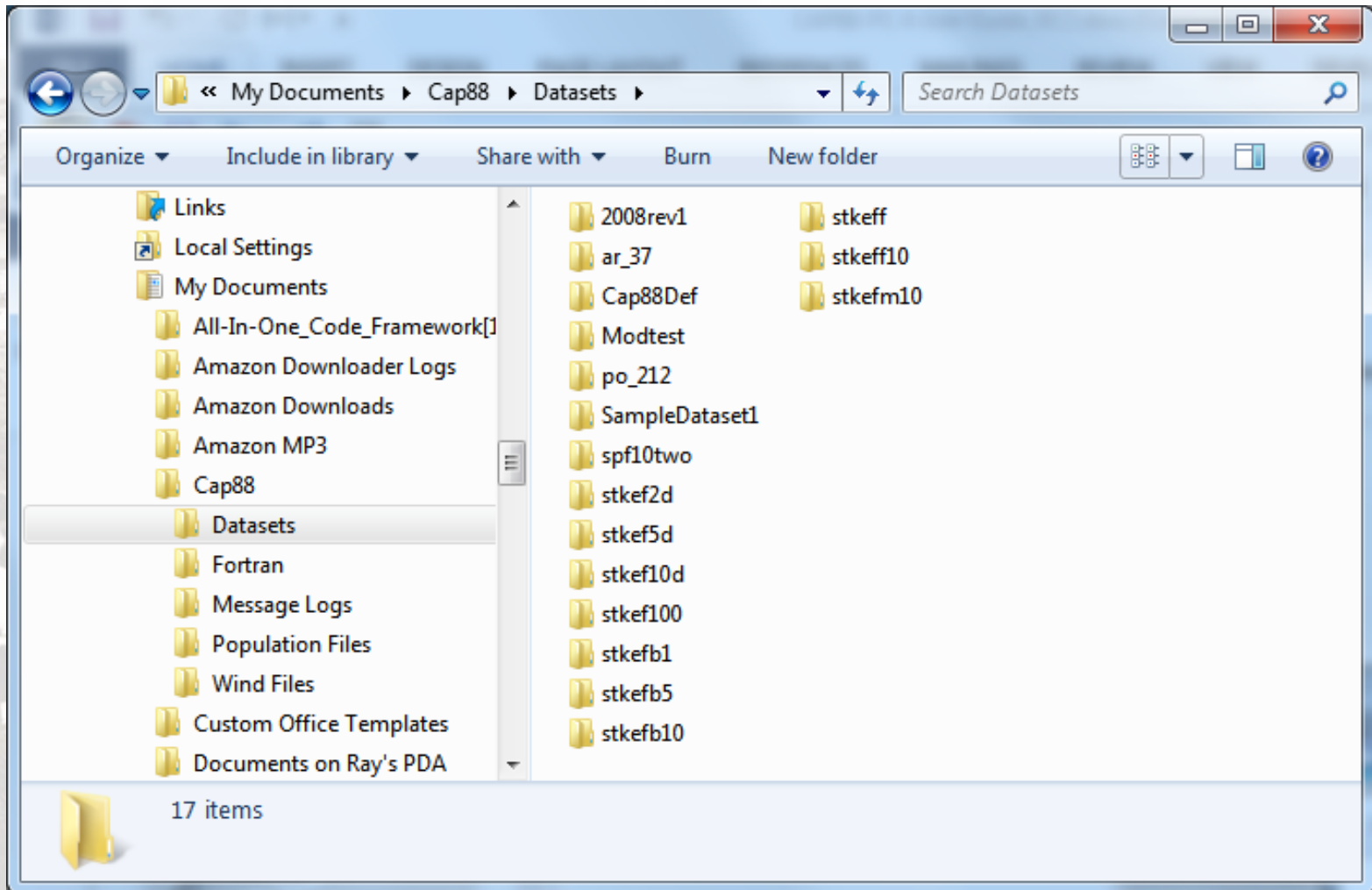
DCFPAK V2.2 DATA SOURCE

Included with installation package under installed program folder

AI.HDB	AI.INT	AI.RBS
BBE-GEL.HDB	BBE-GEL.INT	BBE-GEL.RBS
BBE-SEQ.HDB	BBE-SEQ.INT	BBE-SEQ.RBS
BBE-SOL.HDB	BBE-SOL.INT	BBE-SOL.RBS
BBI-GEL.HDB	BBI-GEL.INT	BBI-GEL.RBS
BBI-SEQ.HDB	BBI-SEQ.INT	BBI-SEQ.RBS
BBI-SOL.HDB	BBI-SOL.INT	BBI-SOL.RBS
DCF_INGS.D30	DCF_INGS.DAT	DCF_INGS.RBS
DCFPAK_UserGuide.pdf	DCFPAK2.DEP	DCFPAK2.NDX
DCFVAPOR.D30	DCFVAPOR.DAT	DCFVAPOR.RBS
ET1.HDB	ET1.INT	ET1.RBS
ET2.HDB	ET2.INT	ET2.RBS
EXTRISKS.RBS	FGR12III_1.DAT	FGR12III_2.DAT
FGR12III_3.DAT	FGR12III_4.DAT	FGR12III_5.DAT
FGR12III_6.DAT	FGR12III_7.DAT	INGEST.TXT
INHALE.TXT	NucList-1.TXT	NucList-14.TXT
NucList-15.TXT	PCHART.EMF	RISKCOEF.DEP
Vapors.TXT		



NEW DATASET LOCATION



V4 DATASET FILE STRUCTURE

Editable Text Format, but Direct Editing NOT Advised

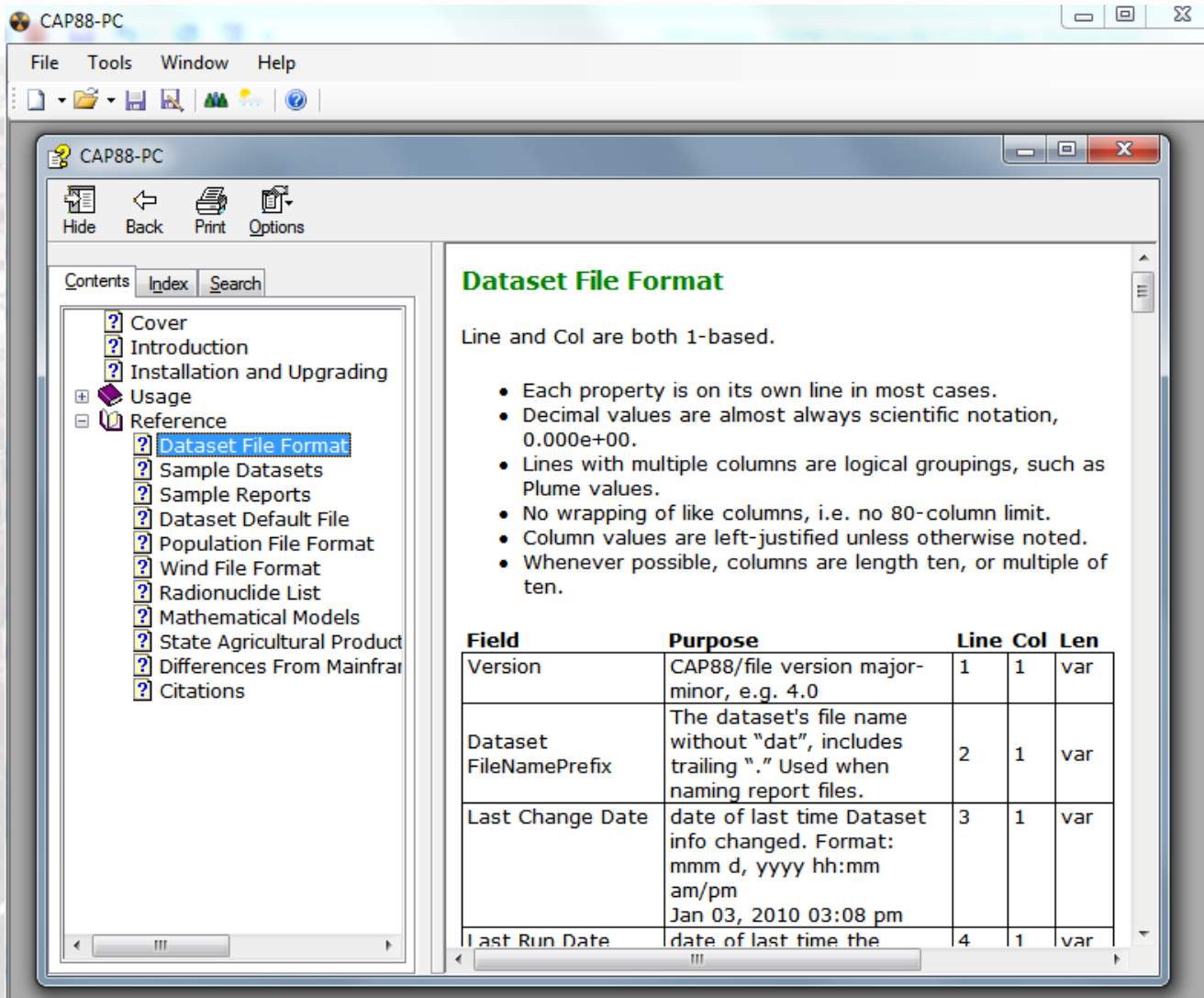
```
po_212.dat - Notepad
File Edit Format View Help
H.0
Po_212.
Jan 25, 2013 08:36 PM
Jan 25, 2013 08:36 PM
Der Test Haus
8832 Falmouth Dr

Cincinnati
45231
old 3 stack
2010
1, 2, 3, Ci K-40
Avg Met
1
C:\Program Files (x86)\CAP88-PC30\PopFiles\FERMILAB.POP
Adult
100
13
0
0
250      750      1500      2500      3500      4500      7500      15000      25000      35000      45000      55000      70000      0      0      0      0      0
T      T      T      T
C:\Program Files (x86)\CAP88-PC30\wndFiles\03816.WND
40.00
6.01
800.00
8.00
0
3
1.000e+00 1.000e+00 1.000e+00
1.000e+00 1.000e+00 1.000e+00
0
1.500e+00 1.500e+00 1.500e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
1
0.70      0.30      0.00
0.40      0.60      0.00
0.44      0.56      0.00
OH
2.030e-01
4.560e-02
1.700e-02
86400
5
F
1
0
84      K-40      Particulate      M      1.0000      1.000e+00      2.000e+00      3.000e+00
93      53      84
Adrenal UB_wall Bone_Sur Brain 493 5263 M ULI_wall LLI_wall Kidneys Liver Muscle Ovaries Pancreas R_Marrow Skin Spleen Testes
esophagus stomach colon liver lung bone skin breast ovary bladder kidney thyroid leukemia residual Total
1
K-40      Particulate      M      1.0000      3.948e+16      1.800e-03      1.000e-07      5.480e-05      1.000e+00      1.000e+00      2.000e-02      7.000e-03      3.000e-01      3.000e+00
0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
5.040e-09 6.270e-09 5.000e-09 4.860e-09 4.830e-09 5.590e-09 5.100e-09 9.700e-09 1.880e-08 5.000e-09 5.000e-09 4.940e-09 5.110e-09 5.060e-09 4.960e-09 4.800e-09 5.000e-09 4.940e
1.731e-09 1.829e-09 1.565e-09 1.438e-09 1.706e-09 1.715e-09 1.511e-09 2.845e-09 5.434e-09 1.555e-09 1.690e-09 1.553e-09 1.501e-09 1.664e-09 1.588e-09 1.461e-09 1.655e-09 1.437e
6.650e-15 6.760e-15 1.120e-14 8.520e-15 8.860e-15 7.160e-15 6.620e-15 6.780e-15 6.700e-15 7.180e-15 7.260e-15 7.730e-15 6.810e-15 6.550e-15 7.870e-15 4.190e-14 7.270e-15 7.830e
1.260e-16 1.420e-16 1.940e-16 1.340e-16 1.450e-16 1.360e-16 1.360e-16 1.360e-16 1.400e-16 1.380e-16 1.370e-16 1.520e-16 1.280e-16 1.290e-16 1.460e-16 6.230e-15 1.360e-16 1.520e
2.480e-13 3.480e-12 5.430e-12 3.700e-13 2.370e-12 2.270e-14 1.940e-14 9.660e-13 3.350e-13 6.350e-13 1.280e-13 8.290e-14 1.300e-12 4.190e-12 1.960e-11
1.474e-12 2.534e-12 8.805e-12 1.906e-12 4.184e-10 1.063e-13 7.601e-14 2.783e-12 1.458e-12 3.422e-12 5.988e-13 1.851e-13 6.839e-12 8.935e-12 4.575e-10
7.900e-18 2.890e-17 6.960e-17 1.100e-17 7.750e-17 1.060e-18 4.180e-18 4.280e-17 9.690e-18 1.630e-17 3.740e-18 2.570e-18 4.420e-17 1.040e-16 4.230e-16
1.420e-19 5.490e-19 1.420e-18 2.080e-19 1.390e-18 1.840e-20 6.220e-19 7.010e-19 1.820e-19 3.430e-19 7.180e-20 4.360e-20 8.200e-19 2.020e-18 8.530e-18
```



DATASET FILE DESCRIPTION

Contained in User Manual Accessible Via Help Button



The screenshot shows the CAP88-PC software interface. The main window is titled 'CAP88-PC' and has a menu bar with 'File', 'Tools', 'Window', and 'Help'. Below the menu bar is a toolbar with icons for 'Hide', 'Back', 'Print', and 'Options'. The left pane shows a 'Contents' list with 'Dataset File Format' selected. The right pane displays the 'Dataset File Format' section, which includes a list of bullet points and a table with columns for 'Field', 'Purpose', 'Line', 'Col', and 'Len'.

Dataset File Format

Line and Col are both 1-based.

- Each property is on its own line in most cases.
- Decimal values are almost always scientific notation, 0.000e+00.
- Lines with multiple columns are logical groupings, such as Plume values.
- No wrapping of like columns, i.e. no 80-column limit.
- Column values are left-justified unless otherwise noted.
- Whenever possible, columns are length ten, or multiple of ten.

Field	Purpose	Line	Col	Len
Version	CAP88/file version major-minor, e.g. 4.0	1	1	var
Dataset FileNamePrefix	The dataset's file name without "dat", includes trailing "." Used when naming report files.	2	1	var
Last Change Date	date of last time Dataset info changed. Format: mmm d, yyyy hh:mm am/pm Jan 03, 2010 03:08 pm	3	1	var
Last Run Date	date of last time the	4	1	var



POPULATION FILE STRUCTURE

CAP88-PC

File Tools Window Help

CAP88-PC

Hide Back Print Options

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 - State Agricultural Produ
 - Differences From Mainfr
 - Citations

Sample Population File

The following is the population file AMES.POP used in the sample assessment.

```

$ AMES LAB, IOWA STATE U.  LAT= 42.0000 LON= 93.6000 NSEC=16 NRADS=13
0.5      1.0      2.0      3.0      4.0      5.0      10.0
30.0     40.0     50.0     60.0     80.0
0.        1.      1381.    1211.    0.        0.        0.
3274.    2291.    594.     1230.    2161.    0.        0.
0.        0.        0.        0.        0.        0.        0.
867.     3581.    6828.    1002.    0.        1095.    878.
8056.    0.        0.        0.        0.        0.        0.
0.        0.        0.        784.     2301.    7543.    3561.
1020.    352.     2467.    1741.    35233.   0.        0.
0.        0.        0.        0.        0.        0.        0.
450.     6060.    10153.   452.     13595.   1011.    543.
3671.    0.        0.        0.        0.        0.        0.
0.        0.        0.        0.        0.        0.        74.
431.     2712.    967.     1687.    7374.    0.        0.
0.        0.        0.        0.        0.        0.        0.
0.        416.     0.        341.     1283.    2131.    8035.
3949.    0.        0.        0.        0.        0.        0.
0.        0.        1415.    0.        0.        0.        551.
2801.    1815.    2273.    4285.    5813.    0.        0.
0.        0.        0.        0.        0.        0.        0.
0.        0.        1250.    1962.    1879.    5032.    51718.
3345.    0.        0.        0.        0.        0.        0.
0.        0.        0.        0.        0.        0.        375.
    
```



WIND FILE STRUCTURE

```
03160_WND_Documented.txt - Notepad
File Edit Format View Help
^L [Magic value]
4.27363 [Average wind Speed]
0.05900.01810.03940.07870.08100.06820.12380.09540.06090.02820.02530.02410.03750.06360.10320.0936 [wind direction Frequency; Sum to 1]
1.33 1.11 1.27 1.15 1.08 1.35 1.36 1.50 1.13 1.25 1.47 1.10 1.25 1.36 1.41 1.45 [Pasquill] A Reciprocal Average wind Speed Toward Direction N-NNE]
1.47 1.33 1.25 1.38 1.25 1.39 1.33 1.50 1.45 1.24 1.34 1.23 1.51 1.71 1.85 1.62
3.12 2.18 2.68 2.64 2.24 2.51 3.28 3.07 2.65 1.92 1.91 2.00 2.68 3.66 4.09 4.17
6.07 3.43 4.29 4.77 4.19 4.69 6.02 5.91 4.68 3.68 3.25 3.42 3.87 5.17 6.15 6.89
3.61 3.13 3.22 3.49 3.34 3.52 3.82 3.78 3.34 3.28 3.10 3.18 3.39 3.70 3.89 3.81
1.26 1.24 1.26 1.39 1.38 1.38 1.40 1.43 1.34 1.35 1.14 1.17 1.28 1.36 1.37 1.20
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 [Pasquill] G Reciprocal Average wind Speed Toward Direction N-NNE]
1.85 1.56 1.78 1.62 1.50 1.87 1.88 2.02 1.59 1.76 1.99 1.53 1.75 1.89 1.94 1.97 [Pasquill] A True Average wind Speed Toward Direction N-NNE]
2.32 2.16 2.04 2.30 2.00 2.22 2.05 2.47 2.27 1.97 2.08 1.91 2.33 2.67 2.80 2.59
4.92 3.23 3.66 3.84 3.39 3.44 4.17 4.12 3.67 2.88 2.78 2.84 3.58 4.66 5.45 5.69
7.10 4.59 5.22 5.56 5.30 5.76 6.61 6.68 6.01 5.20 4.81 4.64 5.00 5.99 6.97 7.68
3.83 3.35 3.45 3.72 3.57 3.75 4.00 3.97 3.58 3.52 3.32 3.41 3.63 3.91 4.05 4.00
1.77 1.74 1.76 1.91 1.90 1.90 1.93 1.96 1.87 1.87 1.60 1.65 1.79 1.88 1.89 1.68
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 [Pasquill] G True Average wind Speed Toward Direction N-NNE]
0.0147 0.0903 0.1610 0.4659 0.1289 0.1392 0.0000 [Fraction of Time in Pasquill Category A-G Direction N]
0.0177 0.1546 0.1866 0.2087 0.1160 0.3164 0.0000 [Fraction of Time in Pasquill Category A-G Direction NNW]
0.0041 0.0921 0.1707 0.3293 0.1347 0.2692 0.0000
0.0048 0.0441 0.0980 0.3522 0.1750 0.3258 0.0000
0.0064 0.0468 0.0757 0.2085 0.1890 0.4736 0.0000
0.0072 0.0419 0.0629 0.2029 0.2365 0.4486 0.0000
0.0021 0.0247 0.0604 0.4410 0.2253 0.2465 0.0000
0.0024 0.0343 0.0926 0.4362 0.1943 0.2402 0.0000
0.0076 0.0765 0.1248 0.2351 0.1912 0.3649 0.0000
0.0149 0.1377 0.1360 0.2001 0.1512 0.3601 0.0000
0.0269 0.1766 0.1797 0.1971 0.1342 0.2854 0.0000
0.0295 0.2431 0.2003 0.1816 0.1222 0.2232 0.0000
0.0181 0.2258 0.2490 0.2474 0.1017 0.1580 0.0000
0.0157 0.1323 0.2612 0.3845 0.1053 0.1009 0.0000
0.0069 0.0772 0.2351 0.5318 0.0916 0.0574 0.0000
0.0051 0.0742 0.1790 0.6065 0.0828 0.0525 0.0000 [Fraction of Time in Pasquill Category A-G Direction NNE]
extended data
StationName=DESERT ROCK
State=Nv
Latitude=36.617
Longitude=116.017
TimeZone=8
RecordPeriod=1988,1989,1990,1991,1992
AveragePeriodTemperature=17.64
Comments=
```

Wind file editor is still being developed

