3. QUICK REFERENCE FOR THE EXPERIENCED USER

3.1   FINDING YOUR WAY THROUGH THE MENUS

The Lead Model is a menu driven program. There is no need to remember special commands, just a cursory understanding of the menu structure. Often you can find what you want just by exploring the various menu options, and familiarity with the model is the best way to shorten this journey. For your reference, a complete menu tree is given in Figure 3-1. Use caution with unfamiliar menu options. Detailed explanations are given in Chapter 2, and more complete documentation may be found in Chapter 4 for most menu options. These should be reviewed before final decisions are made on critical model runs.

3.2   PARAMETER LIST WITH DEFAULT VALUES

The values in Table 3-1 have been assumed for the parameters of the model. These are our best estimates for urban residents with no unusual lead exposures. The estimated blood lead levels with the default parameters represent our best estimate of the blood lead "background" levels that cannot be avoided. The adjustable parameters are listed by screen in the order in which they appear in the model.

Default values are provided for the convenience of the user, but these values may not be appropriate for specific applications. The user has the ultimate responsibility for justification of values used in the applications of the model. We recommend that the user review each of the parameter values in Table 3-1. Most of the parameters will not need to be modified, but the user should be aware of them. Sensitivity analyses on parameters will be useful in documenting results. Many default parameters in the model have only a minor effect on the results (i.e., a 10% change in the air lead concentration parameter will change blood lead levels by less than 1%), but some parameters may be more influential.
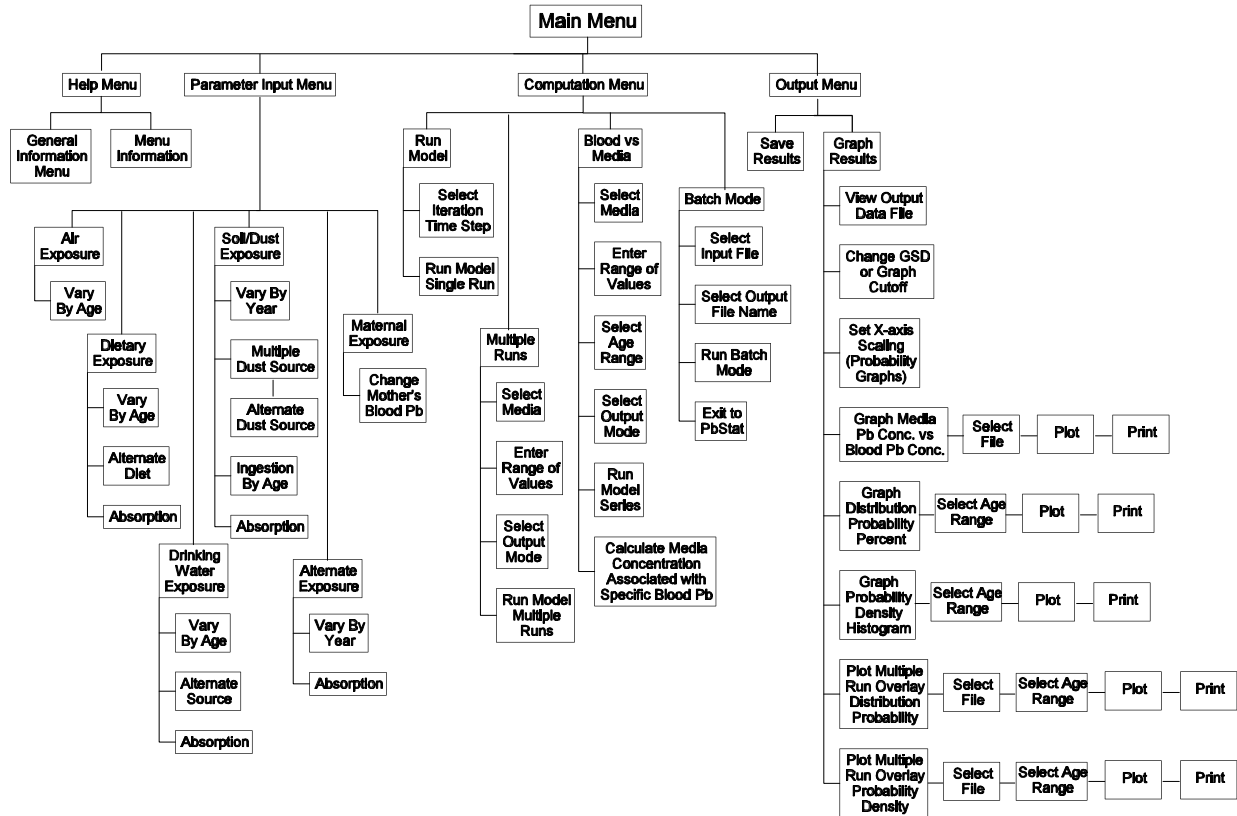
Figure 3-1.   Lead model menu tree.

3.3   BATCH MODE INPUT FORMAT

You may find a number of circumstances in which it is convenient to enter input data for many similar exposure scenarios in a single run of the model. Option 4 of the Computation Menu allows you to use a different age or a different value of the lead concentrations in soil, dust, water, air, and alternate lead intake sources for each exposure scenario. The media intake and absorption parameters are the same for every exposure scenario in the run and must be specified before using this option, unless default values are used. These situations may include, but are not limited to:

TABLE 3-1. DEFAULT VALUES FOR MODEL PARAMETERS

PARAMETER	DEFAULT VALUE	UNITS
AIR (constant)		
Outdoor air lead concentration	0.10	$\mu g/m^3$
Ratio of indoor to outdoor air lead concentration	30	%
AIR (by year)		
Air concentration		$\mu g/m^3$
Age = 0-1 year (0-11 mo),	.10	
1-2 years (12-23 mo)	.10	
2-3 years (24-35 mo)	.10	
3-4 years (36-47 mo)	.10	
4-5 years (48-59 mo)	.10	
5-6 years (60-71 mo)	.10	
6-7 years (72-84 mo)	.10	
Time outdoors		h/day
Age = 0-1 year (0-11 mo),	1	
1-2 years (12-23 mo)	2	
2-3 years (24-35 mo)	3	
3-7 years (36-83 mo)	4	
Ventilation rate		m^3/day
Age = 0-1 year (0-11 mo),	2	
1-2 years (12-23 mo)	3	
2-3 years (24-35 mo)	5	
3-4 years (36-47 mo)	5	
4-5 years (48-59 mo)	5	
5-6 years (60-71 mo)	7	
6-7 years (72-84 mo)	7	
Lung absorption	32	%
DATA ENTRY FOR DIET (by year)		
Dietary lead intake		μg Pb /day
Age = 0-1 year (0-11 mo),	5.53	
1-2 years (12-23 mo)	5.78	
2-3 years (24-35 mo)	6.49	
3-4 years (36-47 mo)	6.24	
5-6 years (48-59 mo)	6.01	
5-6 years (60-71 mo)	6.34	
6-7 years (72-84 mo)	7.00	
DATA ENTRY FOR ALTERNATE DIET SOURCES (by food class)		
Concentration:		μg Pb/g
home-grown fruits	0	
home-grown vegetables	0	
fish from fishing	0	
game animals from hunting	0	

TABLE 3-1 (cont'd). DEFAULT VALUES FOR MODEL PARAMETERS

PARAMETER	DEFAULT VALUE	UNITS
Percent of food class:		
home-grown fruits	0	%
home-grown vegetables	0	
fish from fishing	0	
game animals from hunting	0	
DATA ENTRY FOR DRINKING WATER		
Lead concentration in drinking water	4	μg/L
Ingestion rate		
Age = 0-1 year (0-11 mo),	0.20	liters/day
1-2 years (12-23 mo)	0.50	
2-3 years (24-35 mo)	0.52	
3-4 years (36-47 mo)	0.53	
4-5 years (48-59 mo)	0.55	
5-6 years (60-71 mo)	0.58	
6-7 years (72-84 mo)	0.59	
DATA ENTRY FOR ALTERNATE DRINKING WATER SOURCES		
Concentration		μg/L
first-draw water	4	
flushed water	1	
fountain water	10	
Percentage of total intake		
first-draw water	50	%
flushed water	100 minus first draw and fountain	
fountain water	15	
DATA ENTRY FOR SOIL/DUST (constant)		
Concentration		
soil	200	μg/g
dust	200	
Soil ingestion as percent of total soil and dust ingestion	45	%
DATA ENTRY FOR SOIL/DUST INGESTION (by year)		
Soil/dust ingestion		
Age = 0-1 year (0-11 mo),	0.085	g/day
1-2 years (12-23 mo)	0.135	
2-3 years (24-35 mo)	0.135	
3-4 years (36-47 mo)	0.135	
4-5 years (48-59 mo)	0.100	
5-6 years (60-71 mo)	0.090	
6-7 years (72-84 mo)	0.085	

TABLE 3-1 (cont'd). DEFAULT VALUES FOR MODEL PARAMETERS

PARAMETER	DEFAULT VALUE	UNITS
DATA ENTRY FOR DUST (by year)		
Dust lead concentration		
1-2 years (12-23 mo)	0	μg/g
2-3 years (24-35 mo)	0	
3-4 years (36-47 mo)	0	
4-5 years (48-59 mo)	0	
5-6 years (60-71 mo)	0	
6-7 years (72-84 mo)	0	
DATA ENTRY FOR SOIL/DUST MULTIPLE SOURCE ANALYSIS (constant)		
Ratio of dust lead concentration to soil lead concentration	0.70	unitless
Ratio of dust lead concentration to outdoor air lead concentration	100	μg Pb/g dust per μg Pb/m^3 air
DATA ENTRY FOR SOIL/DUST MULTIPLE SOURCE ANALYSIS WITH ALTERNATIVE HOUSEHOLD DUST LEAD SOURCES (constant)		
Concentration		
household dust	150	μg/g
secondary occupational dust	1,200	
school dust	200	
daycare center dust	200	
second home	200	
interior lead-based paint	1,200	
Percentage		
household dust	100 minus all other	%
secondary occupational dust	0	
school dust	0	
daycare center dust	0	
second home	0	
interior lead-based paint	0	
BIOAVAILABILITY DATA ENTRY FOR ALL GUT ABSORPTION PATHWAYS		
Total lead absorption (at low intake)		
diet	50	%
drinking water	50	
soil	30	
dust	30	
alternate source	0	
Fraction of lead absorbed passively at high intake		
diet	0.2	unitless
drinking Water	0.2	
soil	0.2	
dust	0.2	
alternate source	0.2	

TABLE 3-1 (cont'd). DEFAULT VALUES FOR MODEL PARAMETERS

PARAMETER	DEFAULT VALUE	UNITS
DATA ENTRY FOR ALTERNATE SOURCES (by year)		
Total lead intake		
Age = 0-1 year (0-11 mo),	0	μg/day
1-2 years (12-23 mo)	0	
2-3 years (24-35 mo)	0	
3-4 years (36-47 mo)	0	
4-5 years (48-59 mo)	0	
5-6 years (60-71 mo)	0	
6-7 years (72-84 mo)	0	
DATA ENTRY MENU FOR MATERNAL-TO-NEWBORN LEAD EXPOSURE		
Mother's blood lead level at time of birth	2.5	μg/dL
DATA ENTRY MENU FOR PLOTTING AND RISK ESTIMATION		
Geometric standard deviation for blood lead, GSD	1.6	unitless
Blood lead level of concern, or cutoff	10	μg/dL
COMPUTATION OPTIONS		
Iteration time step for numerical integration	4	h

(1)   comparison of predicted values from the Integrated Exposure/Uptake
Biokinetic (IEUBK) model with actual blood lead levels observed in a
blood lead and environmental lead field study such as illustrated in Table
3-2.;

(2)   risk estimation using predicted values from the IEUBK model with actual
environmental lead levels observed in an environmental lead field study;

(3)   estimation of the effect of variability in environmental lead levels on the
distribution of blood lead levels in the population;

(4)   sensitivity analyses on the impact of environmental lead exposure.

The input data file for a batch run must be created outside the IEUBK model using whatever
text editor the user prefers. The following conventions MUST be observed in creating the
batch file:

TABLE 3-2. FORMAT FOR BATCH MODE INPUT DATA FILE
(SIMULATED DATA)

Header line 1>   INPUT DATA FILE FOR A MONTE CARLO SIMULATION

Header line 2>   FIRST THREE COLUMNS RANDOM NOS. FOR SOIL, DUST, BLOOD

Header line 3>   ID FAM NBHD AGE PBS   PBD PBW PBA ALT PBB

				PBS	PBD	PBW	PBA	ALT	PBB
1	FP-1	PIONEER_HILL	18	510.0	457.8	4.0	0.1	0.0	2.6
2	FP-2	PIONEER_HILL	18	200.0	159.8	4.0	0.1	0.0	2.3
3	FP-3	PIONEER_HILL	18	373.1	475.3	4.0	0.1	0.0	3.4
4	FP-4	PIONEER_HILL	18	1042.5	1361.6	4.0	0.1	0.0	8.7
5	FP-5	PIONEER_HILL	18	519.2	332.7	4.0	0.1	0.0	2.9
6	FP-6	PIONEER_HILL	18	3123.6	1117.6	4.0	0.1	0.0	6.3
7	FP-7	PIONEER_HILL	18	1938.2	1295.8	4.0	0.1	0.0	4.9
8	FP-8	PIONEER_HILL	18	287.5	649.9	4.0	0.1	0.0	11.8
9	FP-9	PIONEER_HILL	18	1227.0	1997.5	4.0	0.1	0.0	23.3
10	FP-10	PIONEER_HILL	18	321.7	405.5	4.0	0.1	0.0	4.4
11	FR-1	RIVERSIDE	18	631.9	58.4	4.0	0.1	0.0	5.6
12	FR-2	RIVERSIDE	18	55.7	23.9	4.0	0.1	0.0	2.0
13	FR-3	RIVERSIDE	18	336.3	658.6	4.0	0.1	0.0	4.1
14	FR-4	RIVERSIDE	18	666.9	221.5	4.0	0.1	0.0	3.2
15	FR-5	RIVERSIDE	18	2005.6	1532.1	4.0	0.1	0.0	26.2
16	FR-6	RIVERSIDE	18	394.8	92.7	4.0	0.1	0.0	2.3
17	FR-7	RIVERSIDE	18	1183.3	692.8	4.0	0.1	0.0	2.7
18	FR-8	RIVERSIDE	18	450.8	83.6	4.0	0.1	0.0	2.4
19	FR-9	RIVERSIDE	18	210.2	94.7	4.0	0.1	0.0	1.5
20	FR-10	RIVERSIDE	18	650.6	682.0	4.0	0.1	0.0	4.5
21	FR-11	RIVERSIDE	18	238.4	314.2	4.0	0.1	0.0	2.0
22	FR-12	RIVERSIDE	18	256.6	48.0	4.0	0.1	0.0	2.0
23	FR-13	RIVERSIDE	18	636.2	219.6	4.0	0.1	0.0	4.4
24	FR-14	RIVERSIDE	18	100.3	31.5	4.0	0.1	0.0	3.2
25	FB-1	BRIDGE_ST	18	678.6	605.4	4.0	0.1	0.0	10.0
26	FB-2	BRIDGE_ST	18	249.5	136.3	4.0	0.1	0.0	2.0
27	FB-3	BRIDGE_ST	18	291.5	127.8	4.0	0.1	0.0	4.1
28	FB-4	BRIDGE_ST	18	750.9	2514.8	4.0	0.1	0.0	4.5
29	FB-5	BRIDGE_ST	18	89.3	135.4	4.0	0.1	0.0	3.3
30	FB-6	BRIDGE_ST	18	943.2	282.4	4.0	0.1	0.0	6.7
31	FB-7	BRIDGE_ST	18	1668.6	369.2	4.0	0.1	0.0	11.9
32	FB-8	BRIDGE_ST	18	1399.1	503.0	4.0	0.1	0.0	6.0
33	FB-9	BRIDGE_ST	18	1226.8	503.0	4.0	0.1	0.0	5.9
34	FB-10	BRIDGE_ST	18	1905.1	978.3	4.0	0.1	0.0	4.6
35	FB-11	BRIDGE_ST	18	366.3	2727.8	4.0	0.1	0.0	13.4
36	FB-12	BRIDGE_ST	18	62.5	464.7	4.0	0.1	0.0	3.9
37	FB-13	BRIDGE_ST	18	75.8	49.3	4.0	0.1	0.0	5.4
38	FB-14	BRIDGE_ST	18	393.5	88.6	4.0	0.1	0.0	1.2
39	FB-15	BRIDGE_ST	18	461.6	883.7	4.0	0.1	0.0	1.7
40	FB-15	BRIDGE_ST	18	461.6	883.7	4.0	0.1	0.0	1.9

- The input data file must be an ASCII file with no special characters.

- The data set must have a DAT extension (i.e., [name].DAT).

- The first three lines of the input data file can be any identifiers that the user requires; we usually use the first line for the run name, the second line for modelling options used in the run, and the third line as headers for variables in the data set;

- The data fields are entered format-free, although the use of regular spacings and alignment of decimal points are recommended to improve readability;

- Maximum width 80 columns;

- Variable values should be separated by spaces;

- Missing values must be shown by an isolated decimal point as in some examples in Chapter 5;

- Each line in the input data file must contain the following 10 variables:

    1. Child identifier or code
    2. Family or residence unit identifier or code
    3. Area or neighborhood identifier code
    4. Child's age in months
    5. Soil lead concentration in μg Pb/g
    6. Dust lead concentration in μg/g
    7. Drinking water lead concentration in μg/L
    8. Air lead concentration in μg/m^3
    9. Daily intake of lead from other sources, μg Pb/day
    10. Observed child blood lead level.

In Chapter 5 we will demonstrate an approach to using the IEUBK model in the batch mode option. Soil, dust, and blood lead "data" were simulated using realistic parameters for sites with active air lead point sources. The attached Table 3-2 shows a batch mode input data file for 40 children. All were assumed to be 18 months old and had default air, water, and alternate source lead values. The first three columns in Table 3-2 are the child identifier, the family identifier (note simulated twins as ID 39 and 40), and the "neighborhood". These fields could be any alpha-numeric identifiers defined by the user.

3.4 OUTPUTS FOR DOCUMENTATION, BRIEFING, AND PRESENTATION

3.4.1 Overview of Output Options

The IEUBK model includes some output options that facilitate presentation of the results and testing of the results for parameter sensitivity. These options may be a useful part of the documentation for decisions in which the IEUBK model plays a role. We will first describe the output options, and then show some of their applications. Some sensitivity analyses can be facilitated by the use of these options.

3.4.1.1 Plotting (Option 2)

Single-Plot Options (Selections 2 and 3)

Some plot options can be used with single runs of the IEUBK model, and others require multiple runs. Single-run options include:

- Plotting the log-normal probability density function of blood lead levels for a single exposure scenario predicting geometric mean blood lead (Selection 3);

- Plotting the cumulative probability distribution for exceeding any user specified blood lead level of concern for a single exposure scenario (Selection 2). This is sometimes called the exceedance probability distribution.

The probability density function gives most users a better idea of the spread of blood lead levels for children exposed to a single set of environmental lead concentrations. The exceedance probability distribution may be used to visually estimate the fraction of children above a blood lead level of concern for the single-exposure case (e.g., what fraction of children are above 10 μg/dL), or to visually estimate the blood lead level corresponding to a specified fraction of children (e.g., what blood lead concentration encompasses 95% of the children). The user may route the probability plots to a printer after viewing the display.

Multiple-Plot Options (Selections 1, 4, and 5)

There are additional features that allow the user to combine output from several runs onto single plots. These multiple-run options include:

- Overlaid plots of the log-normal probability density functions of blood lead levels for multiple exposure scenarios, where each run increases the lead concentration in a specified medium by a user-defined amount (Selection 5);

- Overlaid plots of the cumulative exceedance probability distributions of blood lead levels for multiple exposure scenarios, where each run increases the lead concentration in a specified medium by a user-defined amount (Selection 4);

- Plots of geometric mean blood lead levels versus environmental lead levels for the medium whose values are varied (Selection 1).

Selection 1 cannot be used unless the user has previously created an output file from the Computation Menu, designated *.PBM. Selections 4 or 5 cannot be used unless the user has previously created an output file from the Computation Menu, designated *.LAY.

The overlaid probability density functions give most users a better idea of how the probability of exceeding a blood lead level of concern increases with each increment in environmental lead. The exceedance probability distributions may be used to estimate the increases in the fraction of elevated blood lead levels or to visually estimate the environmental lead levels corresponding to a specified fraction of non-protected children above the level of concern.

3.4.1.2   Uses of Batch Mode Analysis (Option 4)

Results from multiple exposure scenarios can be accumulated using the batch mode options. For sensitivity analyses involving constant concentrations in air, water, dust, soil, or an alternate medium whose intake is constant, it is possible to create a batch mode input file in which each line represents a different case for the analysis. However, with Option 4 it is only possible to carry out sensitivity analyses in which the cases differ on the basis of concentration. Other types of sensitivity analyses require the accumulation of single runs in an overlay file.

Another application in which batch mode methods are useful is a Monte Carlo analysis in which all the modelled variability is assigned to differences in the environmental concentrations. The results can be stored in a batch mode output file which may then be used for statistical analyses.

3.4.2   Detailed Instructions on Output Options

3.4.2.1   Save Output from a Single Run

1. Develop an exposure scenario.

2. Run the model (Selection 2 on Computation Menu, or F5 from any Data
    Entry Menu).

3. Save results (Selection 2 after running the model). Results may be
    appended to the file RESULTS.TXT, or added to an overlay plot file
    defined by the user with name [name].LAY.

4. Results may be sent to a printer.

3.4.2.2   Save Output from Multiple Runs for Probability Plots (Option 3 on Range
   Selection Menu)

1. Develop an exposure scenario

2. Use the Multiple Runs option (Option 2) on the Computation Menu.
    1- Select the medium (Soil, Dust, Air, Water, Diet)
    2- Select the lower and upper values for the medium
    4- OUTPUT CHOICES
        - Select number of steps from small to large
        - Send results to overlay file RANGE(#+ 1).LAY, where the output
           file is automatically named by increasing the index of the largest
           numbered (#) current RANGE#.LAY file.

3. Results may be sent to a printer.

3.4.2.3   Save Output from Multiple Runs for Media-Level Plots (Option 3 on the
   Computation Menu)

1. Develop an exposure scenario

2. Use the Media Run option (Option 3) on the Computation Menu.
    1- Select the medium (Soil, Dust, Air, Water, Diet)
    2- Select the lower and upper values for the medium
    4- OUTPUT CHOICES
        - Select number of steps from small to large
        - Change the age range for calculating mean blood lead.
        - Send results to overlay file MEDBLD(#+ 1).PBM, where the output file is
           automatically named by increasing the index of the largest current
           MEDBLD#.PBM file.

3. Results may be sent to a printer.

3.4.2.4 Save Output from a Batch Mode Run (Option 4 on the Computation Menu)

1. Create a batch mode input data file, [name].DAT.

2. Use the Batch Mode Run option (Option 4) on the Computation Menu.

3. Load the [name].DAT file you have created.

4. Rename the output data file [newname].* if required in the Run step.

5. Run the model.

The output data sets are named [newname].ASC and [newname].TXT, or [name].ASC and [name].TXT if not renamed.

3.4.2.5 Probability Plots for Single Runs

For Current Runs Using Option 2 on Output Menu:

1. Run the model with user-defined exposure scenario in Option 2 on Output Menu.

2. Then choose Selection 2 or 3 in the Graphics Selection Menu.

3. Choose the Age Range.

4. Print graph, without exiting, by using the F10 key, then selecting printer type.

If the user has exited from the current Run, but has not done any further runs, then Steps 3 through 5 can be executed by returning to the Graphics Menu and executing Option 2 or 3.

For Current Runs Using Option 2 on Output Menu:

1. Run the model with user-defined exposure scenario in Option 2. If the user has aborted the runs in Option 2, but has not done any runs since, then the last complete run may be plotted as above. The procedure is:

2. Select Option 3 in the Main Menu, then option 2 on the Output Menu.

3. Then choose Selection 2 or 3 in the Graphics Selection Menu.

4. Choose the Age Range.

5. Print graph, without exiting, by using the F10 key, then selecting printer type.

3.4.2.6   Probability Plots for Multiple Runs

1. Run the model with user-defined exposure scenario in Option 2 on the Computation Menu. Do not abort the runs in Option 2.

2. Select Option 3 in the Main Menu, then Option 2 on the Output Menu.

3. Then choose Selection 4 or 5 in the Graphics Selection Menu.

4. Identify the *.LAY data set to plot.

5. Choose the Age Range.

6. Print graph, without exiting, by using the F10 key, then selecting printer type.

3.4.2.7   Multi-Level Plots for Blood Lead Versus Media Lead

1. Run the model with user-defined exposure scenario in Option 2 on the Computation Menu.

2. Select Option 3 in the Main Menu, then Option 2 on the Output Menu.

3. Then choose Selection 1 in the Graphics Selection Menu.

4. Identify the MEDBLD#.PBM data set to plot.

5. Print graph, without exiting, by using the F10 key, then selecting printer type.

Batch mode files can be used for display or documentation through the statistics module on the Batch Mode Menu, Option 4.

3.4.3   Recommendations on Multi-Level Soil Lead Exposure Scenarios

The IEUBK model carries out multi-level analyses by increasing the concentration of the user-specified medium by equal steps at each run, and holding everything else constant. When evaluating different soil lead exposure scenarios, it may be preferable to keep a constant soil-to-dust coefficient so that dust lead exposure increases with increasing soil lead exposure. This can be done by first invoking the Multiple Source Analysis for dust and defining the dust lead to soil lead coefficient. This is particularly important if some component of the soil lead abatement is expected to permanently alter the soil to dust pathway.