Can the IEUBK model be used to develop a site-specific fish advisory?

Example illustrating an approach one may use to develop a fish advisory using the IEUBK:

Example and procedure to use in developing the fish consumption limits

At a hypothetical site, the 95% UCL on the arithmetic mean soil lead concentration in the residential area was calculated at 300 mg/kg. Indoor dust lead concentrations are not available, so the Multiple Source Analysis derived value for dust lead concentration of 200 mg/kg (rounded down from 210 mg/kg) was used for the model runs.

In this example, the 95% UCL on the arithmetic mean of soil concentration is used because it is assumed that a person could live and fish anywhere on the site. When calculating the soil concentration term for an entire site, it is assumed that a person will randomly come in contact with soil at each grid equally for the total number of grids over the duration of exposure. At this hypothetical site, it is assumed that a person has an equal and random chance of living at any grid or house on the entire site. Therefore, the 95 % UCL on the arithmetic mean will capture the true mean of the site soil concentration no matter where the person lives on the site. An arithmetic mean, or other central tendency value, might be appropriate in other situations, such as when attempting to represent a central estimate of the lead concentration in soils that a child is likely to ingest (e.g., for a residential yard or specific play area). The use of the arithmetic mean is predicated on the presumption that, in the absence of detailed child-specific data, a reasonable central assumption is that a child will have equal contact with soils across a residential lot. This soil contact is assumed to occur on a routine, repeated basis. In the assessment of a residential environment, site-specific measurement data on soil concentrations in a child's yard or other exposure unit are necessary

Procedure:
1-   The dietary lead intakes from all sources for ages 0 to 84 months were incrementally changed to come up with a 5% probability for exceeding 10 µg/dL (5% P10) using a soil lead concentration of 300 mg/kg and dust lead concentration of 200 mg/kg. The results are shown in Table 1.

Table 1. Dietary lead intake associated with 5% above 10 µg/dL.

Age Group (months)	Dietary Lead Intake (µg lead/day)
6 to 11	6.8
12 to 23	8.8
24 to 35	9.9
36 to 47	9.8
48 to 59	9.8
60 to 71	10.3
72 to 84	11.3
Average	9.5

2-   Subtract the model default diet lead intake from the dietary lead intake associated with the 5% probability of exceeding 10 µg/dL for each age group. This is the acceptable dietary intake that could be allocated to site-specific locally caught fish (µg lead/day).

3-   Divide the result from step 2 by the fish lead concentration (µg lead/gram fish). The result is the acceptable amount of fish that can be consumed per day (gram fish/day).

4-   Multiply the result from step 3 by the number of days in a month (30.44 days/month). The result is the amount of fish that can be consumed in a month (gram fish/month).

5-   Divide product from step 4 (gram fish/month) by the amount of fish consumed per meal (gram fish/meal) to calculate the advisable number of fish meals per month.

6-   The amount of all meat consumed per day for each age group is provided as default values in the IEUBK model. Under the alternate dietary value, fish concentration and percent consumed of all meat are two input parameters in the model. For each fish concentration, find the diet percent that is associated with a P10 = 5%. Use the diet percent to get the average grams of fish for all age groups. Divide the average grams of fish obtained by the grams of fish associated with the average 10% and high-end 50% grams of fish out of all grams of meat consumed.

7-   Multiply the result by 30.44 days to get the acceptable number of fish meals per month at that site at the P10 = 5%.

8-   Table 2 was produced according to the above procedure.

Table 2. Monthly Fish Consumption Limits for Non Carcinogenic Health Effects for Young Children - Lead

Lead Conc. in Fish Tissues (mg/kg)	Soil Lead Conc. (mg/kg)	Dust Lead Conc. (mg/kg)	Meals Per Month average (9.4 g) (10% daily meat intake as fish)	Meals per month: high end (47 g) (50% daily meat intake as fish)	Meals Per Month for 3-oz fish meals (85 g) (children only)	Meals Per Month for 8-oz fish meals (227 g)
0.01	300	200	> 30	> 30	> 30	> 30
0.05	300	200	> 30	> 30	24	9
0.1	300	200	> 30	22	12	4
0.125	300	200	> 30	17	10	4
0.15	300	200	> 30	15	8	3
0.2	300	200	> 30	11	6	2
0.25	300	200	> 30	9	5	2
0.3	300	200	> 30	7	4	1
0.35	300	200	> 30	6	3	1
0.4	300	200	28	6	3	1
0.45	300	200	25	5	3	1
0.5	300	200	24	4	2	1
0.6	300	200	18	4	2	1
0.7	300	200	16	3	2	1
0.8	300	200	14	3	1	1
0.9	300	200	12	2	1	6/YR
1	300	200	11	2	1	NONE
1.5	300	200	7	1	1	NONE
2	300	200	6	1	1	NONE
2.5	300	200	4	4	6/YR	NONE
3	300	200	4	1	NONE	NONE
4	300	200	3	1	NONE	NONE
4.5	300	200	2	6/YR	NONE	NONE
5	300	200	2	NONE	NONE	NONE
6	300	200	2	NONE	NONE	NONE
7	300	200	2	NONE	NONE	NONE
8	300	200	1	NONE	NONE	NONE
9	300	200	1	NONE	NONE	NONE
10	300	200	1	NONE	NONE	NONE
23	300	200	6/YR	NONE	NONE	NONE
25	300	200	NONE	NONE	NONE	NONE

NONE = No consumption recommended.
6/YR = Consumption of no more than 6 meals per year is recommended

> 30 = Although consumption of more than 30 meals/month is allowed, EPA advises limiting consumption to 30 meals in 1 month (1 meal per day).