memo

To: Traci Iott, CTDEP, Water Supplies
Thru: Mary Lou Fleissner, DPH, Director EEOH
From: Gary Ginsberg, Toxicologist, DPH/EEOH
Date: 1/7/02

re: Stratford Army Engine Plant Baseline Risk Assessment

In response to your memo dated Oct. 15, 2001, we have reviewed the document referenced above. As you requested our review has focused upon recreational uses of the site including potential exposures to river sediments, surface water, fish ingestion, and exposure to perimeter soils. The following comments summarize our review of these portions of the risk assessment.

Exposure Assumptions

Adult recreational: Tables 10.4-11 thru 10.4-15

Fraction Soil Ingested – 0.25 in average case to 0.5 in RME case. This should be 1.0 on the assumption that every visit to the site is seen as an exposure event in which the daily soil ingestion could come from that event.

Matrix Effect for Soil Ingestion – 0.5 in avg. case to 1.0 in RME case. This should be 1.0 in both cases since matrix interference with oral bioavailability is chemical-specific and site-specific and is relative to the animal bioassay from which the toxicity data were generated. Without substantiative, site-specific evidence for an alterative factor, the health protective matrix effect of 1.0 should be used.

Dermal Surface Area Exposed – 5230 cm2 average case to 7780cm2 in RME case. These values should be replaced by 5700 cm2 as per USEPA, 2001 (RAGS, Part E, Suppl. Guidance for Dermal Risk Assessment, Review Draft, 9/01). However, this substantial degree of contact (nearly 30% of body SA) should be applied only to the warmest 4 months of exposure. Lower assumptions for SA exposed can be used for the remainder of the year.

Dermal Fraction from contaminated source – 0.25 in avg. case to 0.5 in RME case. This should be adjusted to 1.0 in each case.

Exp. Frequency for Dermal Contact – this should be adjusted for sediments as described above.

Fraction of Surface Water ingested from Contaminated Source – 0.25 in avg. to 0.5 in RME cases. This should be adjusted to 1.0.

Fish Ingestion: Assumption that 50% of fish ingestion is from shellfish and 50% from finfish does not cover those who select one or the other resource. Therefore, the assessment should be conducted separately for finfish and shellfish, i.e., all fish ingestion (13.6 to 20.2 g/d) comes from either shellfish or finfish ingestion.

Fraction Fish Ingested from Contaminated Source: 0.01 in ave. case to 0.1 in RME case. These values should both be adjusted to 1.0. The RME fish ingestion amount of 20.2 g/d (or about 2.7 meals/month assuming one meal is 0.5 pounds or 227 g fish) is not large relative to the percentiles of fish consumption provided in recent USEPA documents for recreational fisherman (Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Vol. 2: Risk Assessment and Fish Consumption Limits, App. B, EPA823-R-99-008). Thus, the assumption of 2.7 fish meals/month from the affected region of the Housatonic allows for other types of fish ingestion to occur in this receptor (e.g., storebought fish, fish caught from other locations) and should not be diminished with the FC parameter.

Child recreational: Tables 10.4-16 thru 10.4-20

Soil Ingestion Rate: 100 mg/d avg case and 200 mg/d in RME case. This can be adjusted to 100 mg/d in RME case since this is an older child recreational scenario which should not involve the degree of hand-to-mouth activity associated with younger children and the 200 mg/day ingestion assumption.

Fraction Soil Ingested – 0.5 in average case to 1 in RME case. This should be 1.0 for both cases as described above for adults.

Matrix Effect for Soil Ingestion – 0.5 in avg. case to 1.0 in RME case. This should be 1.0 in both cases as described above for adults.

Dermal Surface Area Exposed – 5230 cm2 average case to 7780cm2 in RME case. The avg value is acceptable but based upon data presented by USEPA on total body surface area and dermal contact surface area for children in this age range (6-15 yrs old), the RME surface area assumption is too high (USEPA, 2001; USEPA, Children's Exposure Factors Handbook, 2000). It is reasonable to set both the avg and RME surface area assumptions to5230 cm2. However, this substantial degree of contact (nearly 40% of body SA) should be applied only to the warmest 4 months of exposure. Lower assumptions for SA exposed can be used for the remainder of the year.

Dermal Fraction from contaminated source – 0.5 in avg. case to 1.0 in RME case. This should be adjusted to 1.0 in each case.

Fraction of Surface Water ingested from Contaminated Source – 0.5 in avg. to 1.0 in RME cases. This should be adjusted to 1.0 for both cases.

Exp. Frequency for Surface Water Ingestion – 120 d/yr in ave. case to 160 d/yr in RME case. This should be adjusted downwards so that water ingestion is occurring during the 6 warmest months of the year (77 day/year for avg. and 103 d/yr in RME case).

Surface Area and Exposure Frequency for Contact with Surface Water – 5230 for avg. case and 7780 for RME case. These values seem reasonable for parts of the body that could get wet from contact with surface water. However, this would not be expected for the frequency assumed in this scenario (120-160 d/yr). This scenario should encompass only the 6 warmest months of the year, leading to EF values of 77 and 103 d/yr for avg and RME cases, respectively.

Fish Ingestion: Assumption that 50% of fish ingestion is from shellfish and 50% from finfish does not cover those who select one or the other resource. Therefore, the assessment should be conducted separately for finfish and shellfish, i.e., all fish ingestion (7 to 10 g/d) comes from either shellfish or finfish ingestion.

Fraction Fish Ingested from Contaminated Source: 0.01 in ave. case to 0.1 in RME case. These values should both be adjusted to 1.0 as for adults.

Commercial Fisherman: Tables 10.4-6 thru 10.4-10

Fraction of Fish ingested from contaminated source: 0.01 avg. case to 0.1 RME case. These values should be adjusted to 1.0 in each case since the amounts of fish consumed per day (35 to 85 g) represents only 1 to 2.6 fish meals per week, an amount that could come from a single readily available source that a subsistence or commercial fisherman might rely upon. The FC assumption of unity for fish ingestion is consistent with the FC value in the risk assessment for commercial fisherman contact with other media (surface water and sediment).

Exposure Duration for Fish Consumption – 6.6 yrs in avg. case to 21.9 yrs in RME case. These should be adjusted to 9 (avg.) or 30 (RME) yrs based upon average and RME times of residence at one location. It should not be based upon the median working tenure since this scenario is not attempting to cover just a worker exposure but it also needs to cover the potential exposures to subsistence fishers.

Dermal Contact Surface Area for Sediment Exposure: It is confusing to have 2 lines for this parameter (SA_1 and SA_2); the RME value of 6980 cm2 should be used on the first line in place of 2020 cm2, thus avoiding the need for two lines.

Adherence Factor – a lower value (0.17) is used for the summertime exposure but it is not clear why such a decrease in sediment coverage of the skin would occur in this season.

General Exposure and Risk Assessment Issues

Percent Dermal Absorption: Numerous tables present concentrations in soil or sediment as adjusted for the dermal exposure route by applying a dermal absorption factor of either 1% for organic compounds or 0.1% for inorganic compounds (e.g., Table 10.4-24). However, these values are well below the most current and also earlier USEPA guidance (USEPA, 2001; USEPA, 1992 – Dermal Exposure Assessment: Principles and Applications). In these documents USEPA recommends the following dermal absorption factors from soil and sediment: PCBs – 14%; PAHs – 13%; other organics without specific data – 10%; inorganics – 1% is a reasonable range. These values should be used in this risk assessment.

Presentation of Finfish Tissue Sampling and Results: The report does not describe which types of finfish are represented by the data in Table A1-3, Table 10.4-27 and in other tables. Since a large predator species that is a strong bioaccumulator of PCBs (striped bass) was sampled along with much smaller prey species that are not bioaccumulators (mummichogs, silvesides), data should be presented separately for these very different types of samples. Further, the fish size and lipid content should be presented together with the PCB body burden results for proper analysis and intrepretation of the data. The human health risk assessment should focus most upon the striped bass results in terms of fish consumption risk since the other species are unlikely to be caught or consumed. However, since the bass have a large range, they are less likely to reflect local contamination, so the smaller species can be used to make some judgement regarding whether fish body burdens are higher due to the site. The current assessment suggests that this is the case, but it needs to be further described according to specific fish species (relative to background results), to clarify these issues. For example, the area with the greater PCB body burdens in finfish (Marine Basin) had considerably lower PCBs in sediment. This needs to be discussed in light of the types of fish samples collected, the results in each species and the degree to which they reflect local conditions.

Another problem with the fish sampling data is the high detection limits for mercury. Given that mercury is a very common fish contaminant, the high detection limits are evidently the reason that this element was non-detect in the fish. Also, the fact that on-site sediments have somewhat elevated mercury concentrations (Tables 10.2-26 and 10.2-30) leads to the possibility that the data would have shown elevated fish body burdens relative to background had lower detection limits been achieved. This should be discussed in the report. The statement on page 10-62 that mercury was not assessed in the risk assessment because there are no toxicity factors for it is incorrect. USEPA has RfDs for mercuric chloride and methyl mercury and an RfC for inorganic-metallic mercury. Therefore, mercury detected in sediments or in fish can be evaluated with these toxicity values.

Presentation of Shellfish Sampling Results: It appears from Figure 1.1 that ribbed mussel samples were taken from a broad area of intertidal flats beginning at Stratford Point and heading down to and around the US Coast Goard Station and then further south and east into Lordship Beach. Given that the bulk of lead contamination would be expected in the immediate vicinity of the gun club at Stratford Point, some discussion and perhaps reanalysis is needed to separate out the risks from shellfish consumption near the point versus from other harvested areas.

The description of risks stemming from metals contamination of shellfish is incomplete. The risks from lead contamination are briefly compared back to FDA Shellfish Guideline concentrations (pages 10-37 to 10-38) with the caveat that the FDA guidelines were not established for use in risk assessment. We agree that the FDA guidelines are only a point of reference for evaluation of metals in shellfish and that other methods should also be used to evaluate risks from lead in this medium. Risks from lead exposure are normally evaluated via USEPA's Integrated Lead Uptake/Biokinetic Model. This approach can be applied to both the shellfish and finfish data and can be added to the lead blood level predictions table on Page 10-35. The results for lead should be moved into the Risk Characterization Section (10.6) rather than in the Exposure Assessment section (10.4). The cancer risks from arsenic in shellfish are quantitated without description of the difference in toxicity between organic forms of arsenic commonly present in shellfish vs. inorganic arsenic. The sampling results were in ribbed mussels but blue mussels and oysters are more commonly consumed, with the oysters from this region taken as seed oysters and subsequently grown to full size in less contaminated zones. The risk assessment should discuss the relevance of the ribbed mussel results to the more commonly eaten species and to the issue of depuration.

Recreational Use Risks – Perimeter Surface Soils: These risks will need to be re-evaluated when new risk calculations are presented. However, it is noted that the Aroclor 1260 concentrations range up to 74 ppm, which is well above the CTDEP Remediation Standard Regulations of 1 to 10 ppm for PCBs (residential to industrial commericial targets). This level of contamination needs to be evaluated against the alterative cleanup target concentration appropriate for this recreational use scenario to determine if such "hotspots" are more than 2 times above the target. This will require calculation of an alternative direct exposure cirtierion for PCBs in soil if it is judged that the risks based upon the 95% UCL soil concentration are in an acceptable range.