Risk Findings For Bloomington Streams

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Human Health Risk Approach

- Risks produced for Clear Creek (Lemon Lane Landfill), Richland Creek (Neal's Landfill), and Stout's Creek (Bennett's Dump)
- Most recent data applied
- Where data available, risks determined for PCBs and dioxin-like PCBs
- Fish ingestion greatly dominates risk (except at Bennett's Dump)

Evaluation Approach

- What risks may be associated with consuming fish at various rates?
- Are PCB levels above state water quality criteria?
- Are PCB levels in fish above state fish consumption advisory levels?

Rates of Fish Consumption (fillets)

- Standardized EPA approaches
- Reasonable maximum exposure (RME) low income (110 g/day; three ½ lb meals/week)
- RME recreational (59 g/day; 1 to 2 ½ lb meals per week
- Average low income (43 g/day; one ½ lb meal per week)
- Average recreational angler (15 g/day; two ½ lb meals per month)
- Site-specific (1 to 3 g/day – Stout's Creek); one ¼ lb meal/month

Other Risk Parameters

- 50% PCB loss from cooking and cleaning
- 30 year exposure
- Apply most protective cancer and non-cancer factors
- For children, lower body weight, assume 2-3 times higher intake per body weight for non-cancer effects

Dioxin-like PCB Data

- Convert to dioxin toxic equivalent (TEQ)
- Compare favorably with PCB based data
- If EPA proposed dioxin factor is approved risks would be increased by about 6 fold
- Superfund policy: EPA Aroclor based data is fully acceptable; TEQ approach is not required

Clear Creek (Lemon Lane Landfill)

- RME recreational angler eating 1 to 2 ½ lb meals per week of green sunfish (lower in PCBs than suckers) at Country Club Road
- Cancer risk of 1.5 in 10,000
- Non-cancer risk (hazard index [HI] of one or lower is acceptable)
- HI of 8.8 (adult) and 22 for a child (no more than 6 meals per year)

Comparison to Other Health Criteria

- PCB levels in Clear Creek sunfish (fillets) 7 times higher than state criteria for fish advisories
- PCB levels in whole sunfish 74 times higher than levels needed to meet state Ambient Water Quality Criteria

Risks at Other Clear Creek Locations

- PCB levels still very elevated at Fluckmill and Strain Ridge Roads
- Depending upon criteria applied, levels are 10 to 140 times either state advisory levels or water quality criteria

Other exposures in Clear Creek and Quarry Springs

- **Clear Creek** -- dermal contact with and incidental ingestion of surface water: risks less than one in a million and hazards less than one
- **Clear Creek** -- similar low risks and hazards from bank and floodplain soil and sediment exposure
- **Quarry Springs** – risks less than one in 100,000 and hazards less than 1 from dermal contact with and incidental ingestion of surface water, sediment, and surface soil

Richland Creek (Neal's Landfill)

- RME recreational angler eating 1 to 2 ½ lb meals per week (Vernal Pike)
- Cancer risk of two in 10,000 (no clear decline in risk over time)
- HI of 10.9 (adult) and 22 for a child (no more than 6 meals per year)
- State Road 48, cancer risks three in 100,000 and HI 2-4 (adults); 8-12 children

Comparison to Other Criteria

- Sunfish (Vernal Pike) are 7 times state criteria used for fish advisories; about 40 times water quality criteria
- At State Road 48, bass are 2-4 times state levels for fish advisories

Stout's Creek (Bennett's Dump)

- Evaluated fish consumption
- Sediments (skin contact and ingestion)
- Surface water (skin contact and ingestion)

Fish Consumption (Site-specific)

- Cancer risk of 2.9 in 100,000 (green sunfish and sucker fillets) for PCBs (Acuff Road [BD-2])
- Cancer risk about 2 in 100,000 to 1 in 10,000 for dioxin-like PCBs (current vs. proposed dioxin cancer or potency factor)
- HIs of 1.7 (adult) and 4.3 (child) for PCBs
- HIs of less than 1 (adult and child) for dioxin-like PCBs

Comparison to Other Criteria

- Green sunfish fillets are 14 times state fish advisory criteria
- Whole green sunfish are 64 times state ambient water quality criteria

Exposure to Sediment and Water

- Ingestion and dermal contact with sediment gives cancer risks much lower than a one in million (<1E-07) and non-cancer HIs about 0.02 each
- For water, incidental ingestion gives cancer risks under one in a million and non-cancer HI of about 0.002
- Dermal contact with water gives cancer risks of about 3 in 100,000 and HI of about 2.0, indicating border-line concern

Summary

- Fish consumption dominates risk (except at Bennett's Dump)
- Clear and Richland Creeks have elevated risks from fish consumption using standard risk approaches
- PCB levels in fish generally range from

  10-100 times fish consumption advisory levels or ambient water quality criteria
- On-going PCB water discharges and contaminated sediments and soils

Viacom's Arguments and EPA Responses

- There are not enough fish
- People don't eat those amounts of fish, because streams are too small
- Ambient Water Quality Criteria should not apply
- EPA should use other PCB toxicity factors
- Dioxin TEQ approaches have uncertainty

Evaluation of the Fish Ingestion Pathway

- Biomass considerations – amount of edible fish tissue potentially available
- Exposure point concentrations (EPC)

Biomass Considerations

- Four fish tissue ingestion rates considered (15 to 110 g/day) (Lemon Lane and Neal's Landfill)
- Site-specific fish tissue ingestion rates (1 to 3 g/day) (Bennett's Dump)
- Quantitative assessment based on population estimates (Bennett's Dump)
- Qualitative assessment based on stream characteristics (Lemon Lane Landfill and Neal's Landfill)

Evaluation of Stream Productivity Quantitative Assessment (Bennett's Dump)

- Determine number of fish in stream
- Determine number of fish of "harvestable" size
- Determine number of fish required to support each ingestion rate
- Compare number of required to number of available fish of "harvestable" size
- Ratio should not exceed about 10 percent

Evaluation of Stream Productivity Qualitative Assessment (LLL and Neal's)

- Habitat assessment – presence of eddies, riffle areas, pools, and runs/glides
- Stream width and depth
- Fishing and other signs of human activity
- Number, species, and size of fish observed or expected

Fish Tissue EPCs

- Fillet and whole body samples collected
- Converted whole body results to fillet equivalents
- Total PCBs vs. WHO dioxin toxic equivalents (TEQ)
- Species-specific (Bennett's) vs. habitat niche-specific (e.g., pelagic [green and longear sunfish, rock bass, and largemouth bass] and benthic [white sucker, northern hogsucker, and redhorse]) (Lemon Lane)

Generic Exposure Equation

$$D = (C \times CR \times EF \times ED)/(BW \times AT)$$

- D = Dose (mg/kg-day)
- C = Concentration (mg/kg)
- CR = Contact rate (kg/day)
- EF = Exposure frequency (days/year)
- ED = Exposure duration (years)
- BW = Body weight (kg)
- AT = Averaging time (days)

Surface Water, Sediment, and Soil Exposures

- Recreational activities: fishing, wading, swimming, hiking, and hunting
- Observed along Bloomington area streams (including Clear Creek), but not along Stout's Creek
- Proximity of residential areas and recreational facilities to streams

Surface Water, Sediment, and Soil Exposures (continued)

- Dermal exposure and incidental ingestion
- Dermal exposures based on skin surface area, adherence factor, and absorption factor
- Incidental ingestion – surface water based on swimming rate; soil and sediment based on defaults