Evaluating the Safety of Coal Combustion Product (CCP) Beneficial Use

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Gradient

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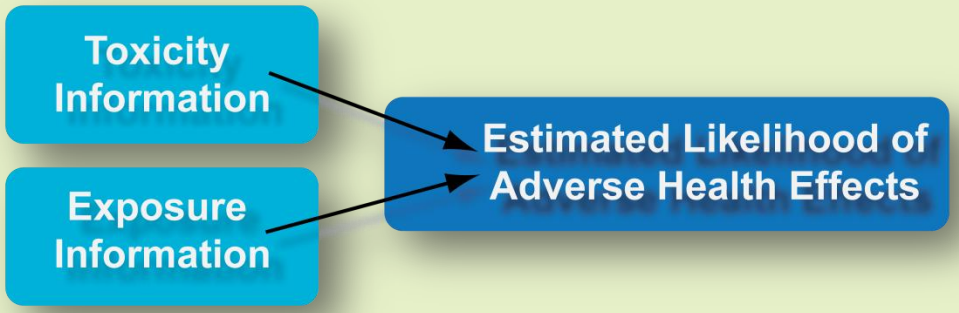
Risk Assessment Basics



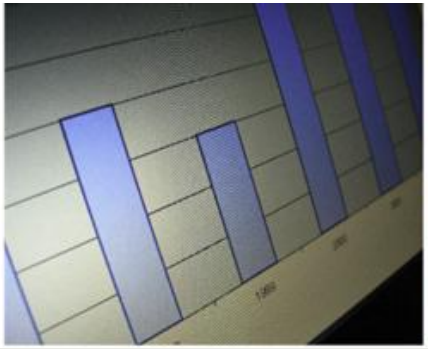
Risk Assessment

- Used to determine likelihood of adverse effects
- Integrates toxicity and exposure information
- Typically uses approaches that overestimate risk
  - Exceeding risks ≠ adverse effects

Risk Assessment Basics

Used for:

- Regulatory decisions
- Determining clean-up levels
- Addressing community concerns
- Assessing general causation in toxic tort litigation
- Evaluating product safety

Risk Assessment in CCP Regulation

- In 2007, US EPA completed RA evaluating CCP disposal in landfills and surface impoundments:
  - "Above-ground" exposure pathways pose no risk
    - soil ingestion, inhalation, gardening, beef and dairy, and erosion and overland transport
  - Drinking water ingestion via leaching to groundwater
    - For landfills arsenic and thallium elevated risk (90th %ile)
    - For surface storage, arsenic (50th %ile), boron, lead, cadmium, cobalt, molybdenum risk (90th %ile)

Risk Assessment in CCP Regulation

- Concerns with 2007 risk assessment
  - Used a "one-size-fits-all approach"
    - Extreme amount uncertainty and variability
  - Many assumptions were overly conservative
- Revised risk assessment due out in December 2009 to support hazardous waste determination

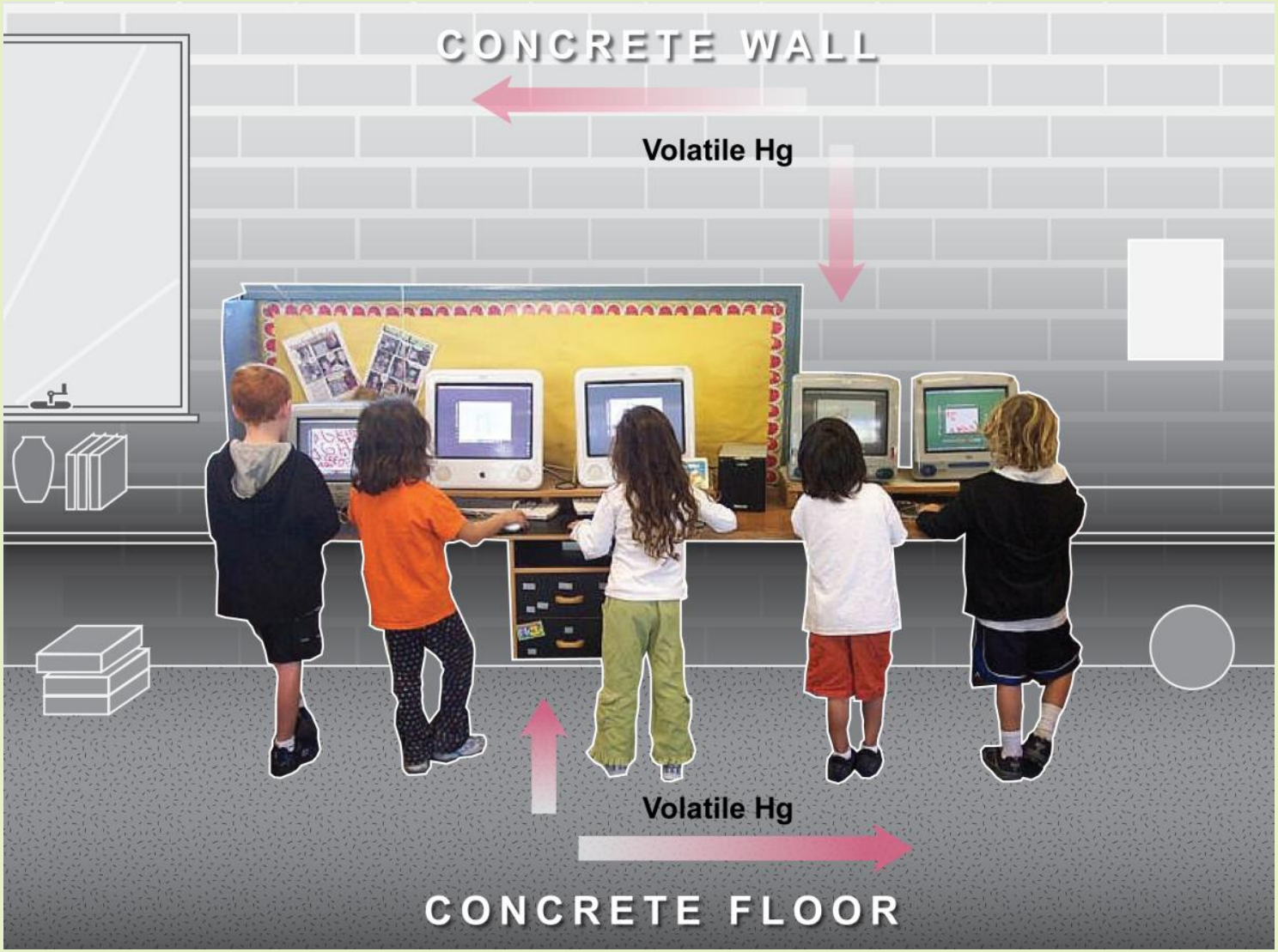
Beneficial Use Risk Assessment

- Unclear how beneficial use will be addressed in hazardous waste determination
- Information on risks associated with CCP uses are limited:
  - Concrete/Cement
  - Wallboard
  - Structural Fill
  - Soil Amendments

Beneficial Use Risk Assessment

- Examples of Gradient risk evaluations:
  - Mercury inhalation risks from:
    - Use of FGD gypsum-wallboard in home or classroom
    - Use of CFA-concrete in classroom
    - CFA used as a structural fill
    - CFA concrete and FGD-gypsum disposed in landfill

Classroom Scenario: Concrete

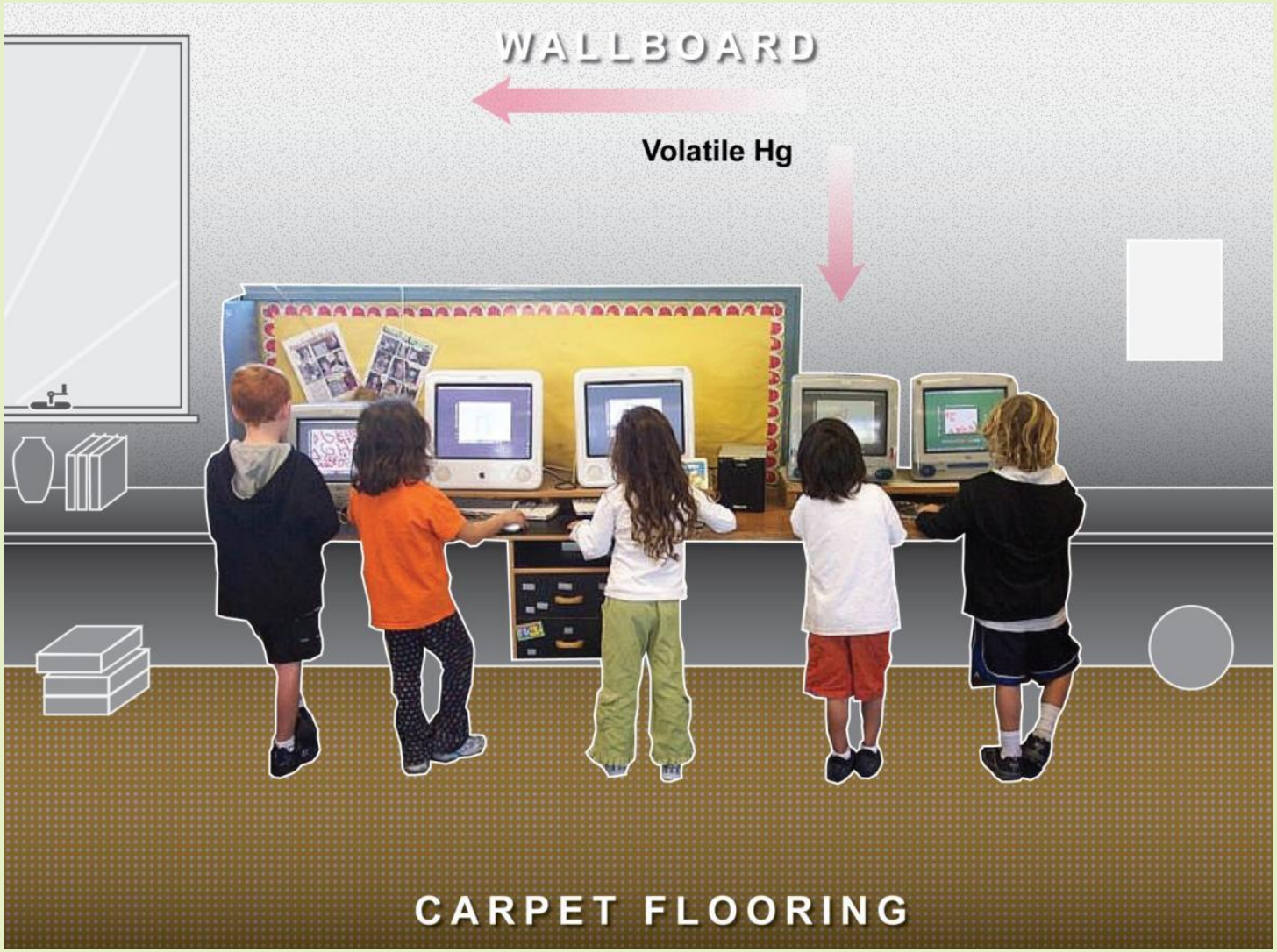


Concrete Risk Assessment

Approach: Use “Typical” or “High-end” exposure scenario to evaluate risk

Question	“Typical” Scenario Inputs
Who?	Children
What?	Mercury volatilizing from concrete used in walls and floors (mean levels modeled from lab data)
Where?	In classroom
When?	6.7 h/d, 260 d/yr, 16 yrs
How?	Inhalation of indoor air
Estimate exposure and compare to “safe” mercury level?	

Classroom Scenario: Wallboard

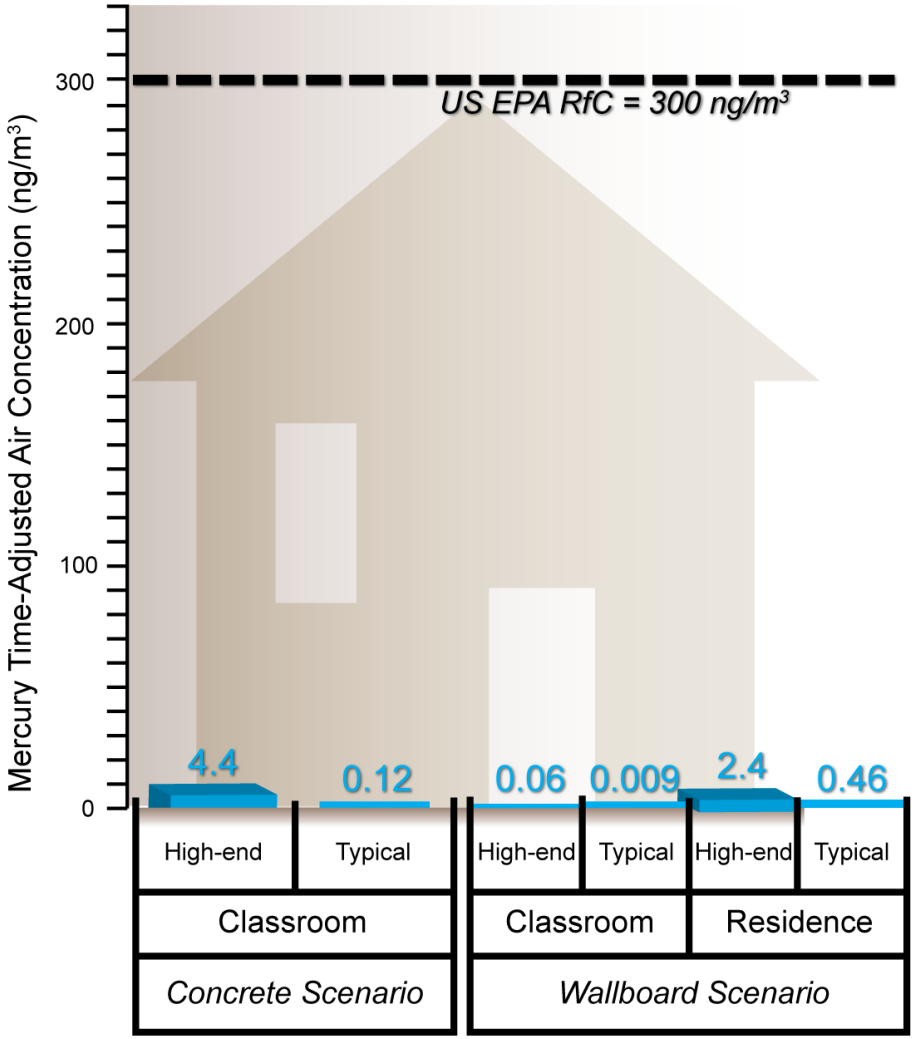


Wallboard Risk Assessment

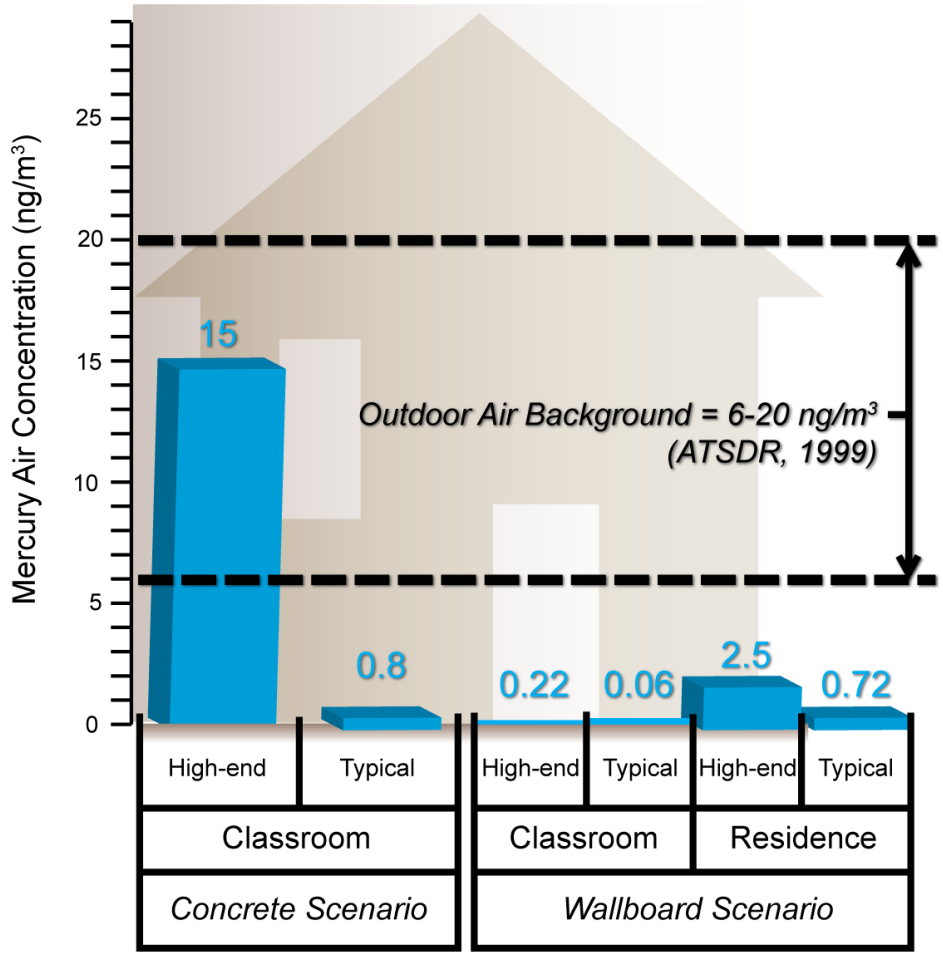
Approach: Use “Typical” or “High-end” exposure scenario to evaluate risk

Question	“Typical” Scenario Inputs
Who?	Children, Adults
What?	Mercury volatilizing from wallboard (modeled mean levels from lab data)
Where?	In home or in classroom
When?	6.7 h/d, 200 d/yr, 16 yrs (Classroom) 24 h/d, 350 d/yr, 30 yrs (Home)
How?	Inhalation of indoor air
Estimate exposure and compare to “safe” mercury level?	

Modeled Mercury Exposures Compared to US EPA's Reference Concentration



Estimated Indoor Concentrations Compared to Background



Outdoor Scenario: Structural Fill & C&D Landfill

Wallboard and Concrete Disposal Risk Assessment

Approach: Use “Typical” or “High-End” exposure scenario to evaluate risk

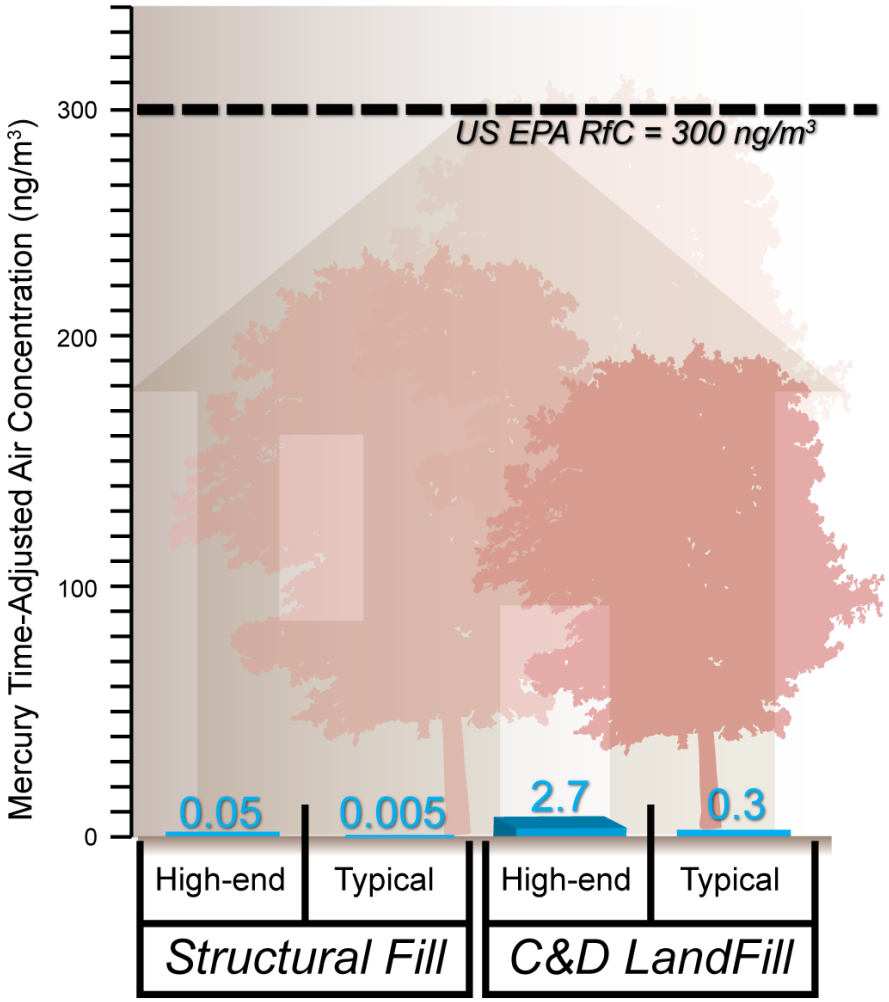
Question	“Typical” Scenario Inputs
Who?	Children, Adults
What?	Mercury volatilizing from wallboard and concrete made with CCPs in a C&D landfill (modeled from lab data)
Where?	Outside a residence
When?	16 h/d, 350 d/yr, 30 yrs
How?	Inhalation of outdoor air
Estimate exposure and compare to “safe” mercury level?	

Structural Fill Risk Assessment

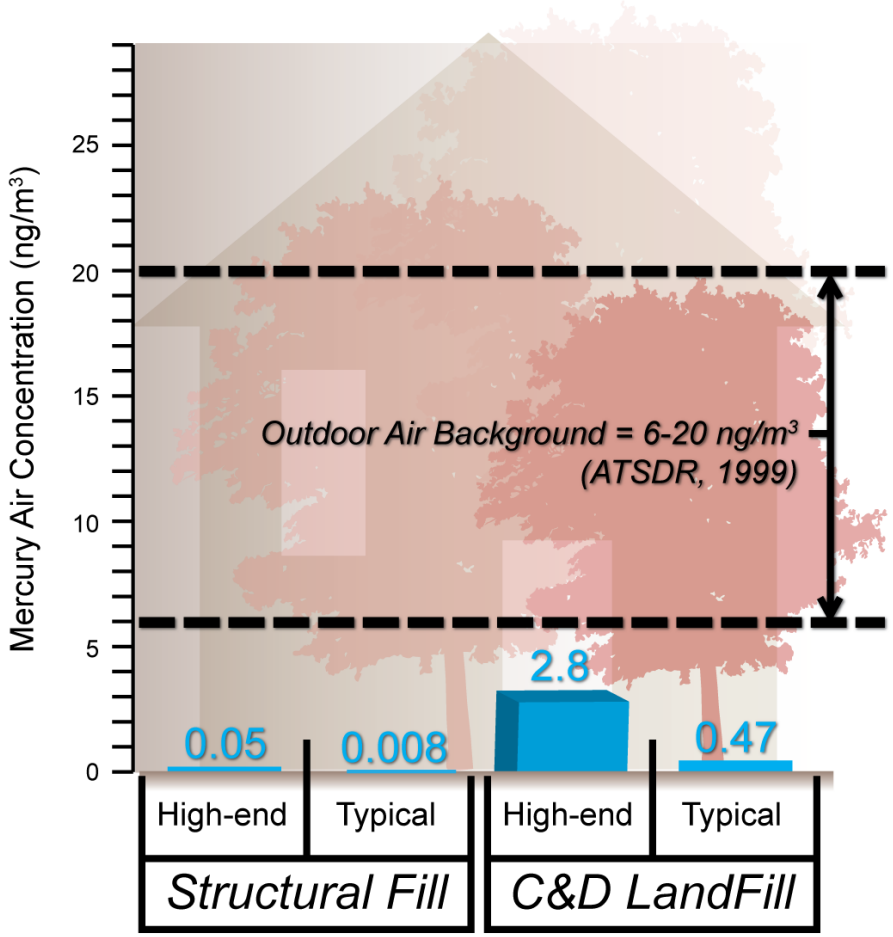
Approach: Use “Typical” or “High-End” estimates of exposure to evaluate risk

Question	“Typical” Scenario Inputs
Who?	Children, Adult
What?	Mercury volatilizing and in blowing dust from CFA structural fill
Where?	Outside a residence
When?	16 h/d, 350 d/yr, 30 yrs
How?	Inhalation of outdoor air
Estimate exposure and compare to “safe” mercury level?	

Modeled Mercury Exposures Compared to US EPA's Reference Concentration



Estimated Indoor and Outdoor Concentrations compared Outdoor Background



Beneficial Use Risk Assessment: Closing Thoughts

- Screening risk assessments have shown that mercury risk from wallboard, concrete, and structural fill do not pose health risk
- Risk assessments for potential exposures to other compounds in CCP by multiple pathways should be examined to demonstrate safety of beneficial uses of CCPs
- More data amenable to risk assessment needed for reliable evaluations

Thanks!

Email questions to:

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