

700 South 1600 East PCE Plume

Risk Assessment 101

October 26, 2016

Michael Novak, P.G.— CH2M

- ❑ What is risk assessment?
- ❑ Where does it fit in the cleanup process?
- ❑ What goes into a risk assessment?
- ❑ What results from a risk assessment?
- ❑ How Does Risk Assessment Differ from Public Health Assessment?

What is Risk Assessment?

What is Risk Assessment?

Risk
Assessment
101

- ❑ The scientific process to:
 - ❑ Evaluate the toxicity of contaminants
 - ❑ Evaluate potential for human and ecological exposure
 - ❑ Estimate the likelihood that an exposed population or ecosystem will be adversely affected.

*Where Does Risk Assessment
Fit in the Cleanup Process?*

Where Does Risk Assessment Fit in the Cleanup Process?

Risk Assessment 101

Investigation

- Preliminary Assessment
- Site Investigation
- Remedial Investigation

Remediation

- Feasibility Study
- Proposed Plan/ Record of Decision
- Remedial Design/Action
- Five-year Review
- Remedial Action Completion

Where Does Risk Assessment Fit in the Cleanup Process?

Risk Assessment 101

Investigation

- **Preliminary Assessment**
- **Site Investigation**
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- Exposure scenarios
- Screening levels

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□ **Baseline Risk Assessment**

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- **Preliminary Remediation Goals**

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- Remedial goals
- Risk communication

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□ **Optimize remedies**

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- ❑ Changes in science
- ❑ Updated risks

Where Does Risk Assessment Fit in the Cleanup Process?

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Remediation

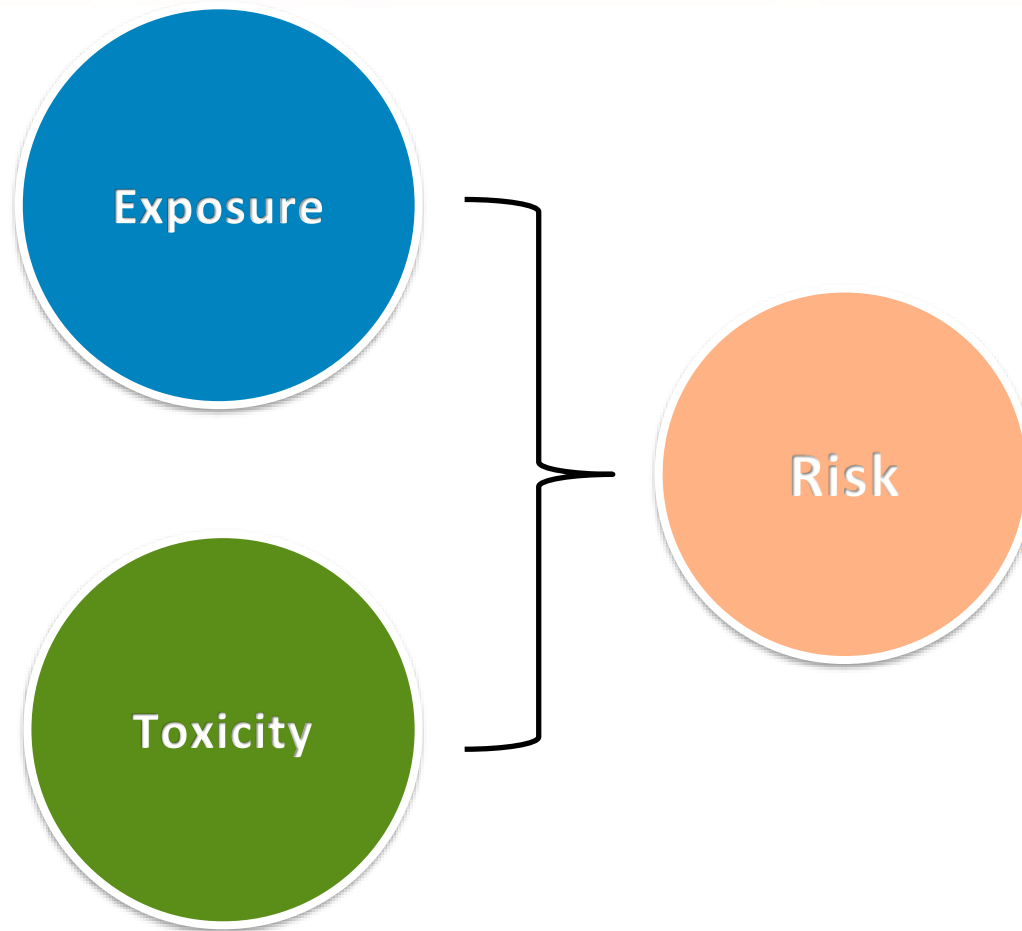
- Feasibility Study
- Proposed Plan/ Record of Decision
- Remedial Design/Action
- Five-year Review
- **Remedial Action Completion**

- **Attainment of remedial goals**

What Goes Into a Risk Assessment?

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What Goes Into a Risk Assessment?

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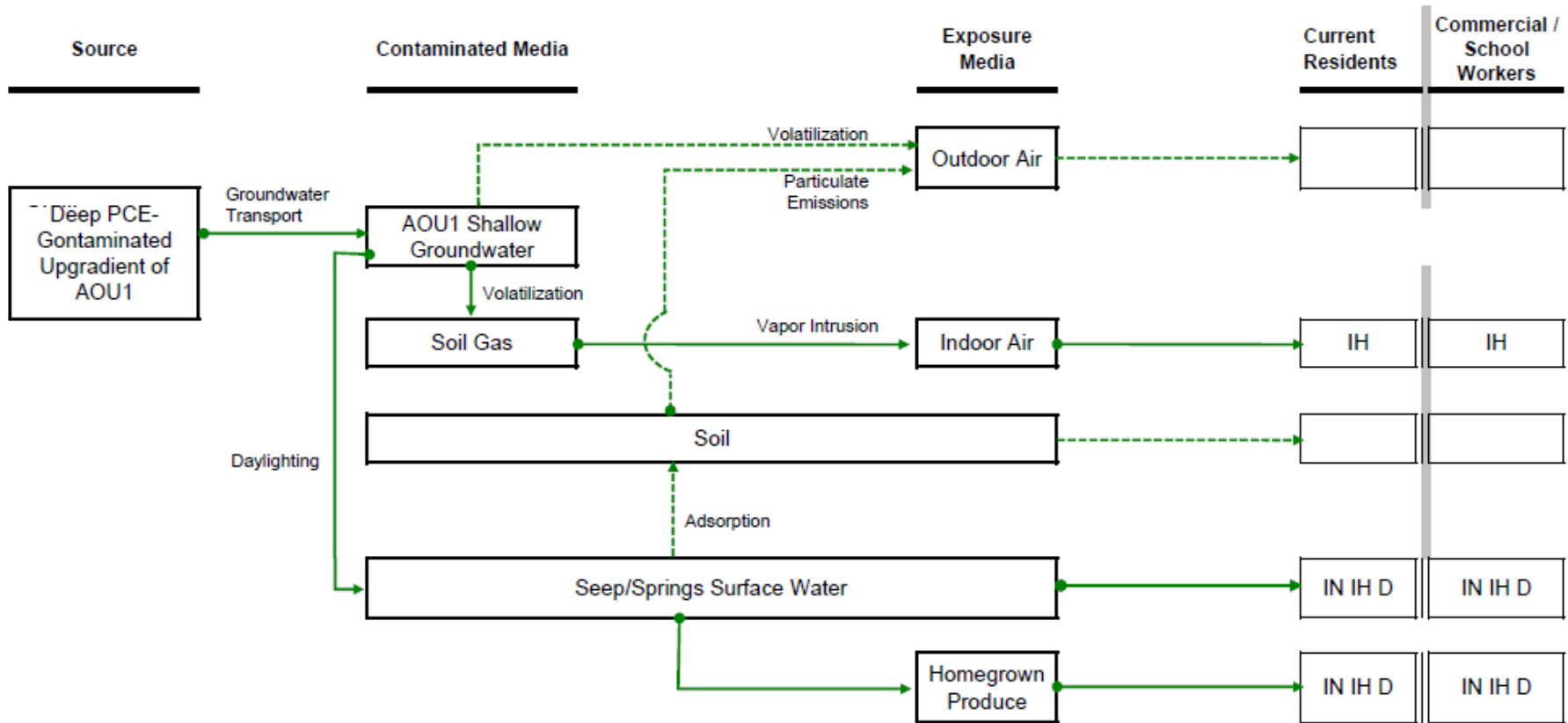


Exposure

- What chemicals?**
- What media?**
- What concentrations?**
- What pathways?**
- How much, how often,
how long?**

What Goes Into a Risk Assessment?

Risk Assessment 101



Conceptual Site Exposure Model

What Goes Into a Risk Assessment?



Exposure

- What chemicals?**
- What media?**
- What concentrations?**
- What pathways?**
- How often, how long?**



**Reasonable
Maximum
Exposure**

What Goes Into a Risk Assessment?

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Toxicity

- ❑ **Effects (cancer, non-cancer)**
- ❑ **Severity**
- ❑ **Uncertainty**

What Goes Into a Risk Assessment?

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Where does the information come from?

**Risk Assessment Guidance for Superfund
Volume I: Human Health Evaluation Manual
(Part F, Supplemental Guidance for Inhalation Risk Assessment)**

**OSWER TECHNICAL GUIDE FOR ASSESSING
AND MITIGATING THE VAPOR INTRUSION
PATHWAY FROM SUBSURFACE VAPOR
SOURCES TO INDOOR AIR**



LEARN THE ISSUES SCIENCE & TECHNOLOGY LAWS & REGULATIONS ABOUT EPA

Integrated Risk Information System (IRIS)

Analyte	Carcinogenic SL TR=1.0E-6 (ug/m ³)	Noncarcinogenic SL HI=1 (ug/m ³)
Tetrachloroethylene	1.1E+01	4.2E+01

EPA Regional Screening Level Tables

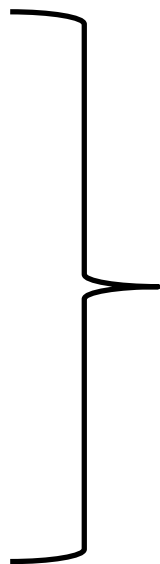


- Utah cleanup rules
- Federal cleanup rules

What Results From a Risk Assessment?

What Results From a Risk Assessment?

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$$C_w \bullet \frac{IR \times EF \times ED}{BW \times AT} = Dose_{LifeAvg}$$

$$Dose_{LifeAvg} \bullet SF_o = ELCR$$

$$Dose_{LifeAvg} \bullet \frac{1}{RFD_o} = HQ$$

What Results From a Risk Assessment?

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Risk

- Cancer**
- Noncancer**

What Results From a Risk Assessment?

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Risk

- Cancer**
- Noncancer**

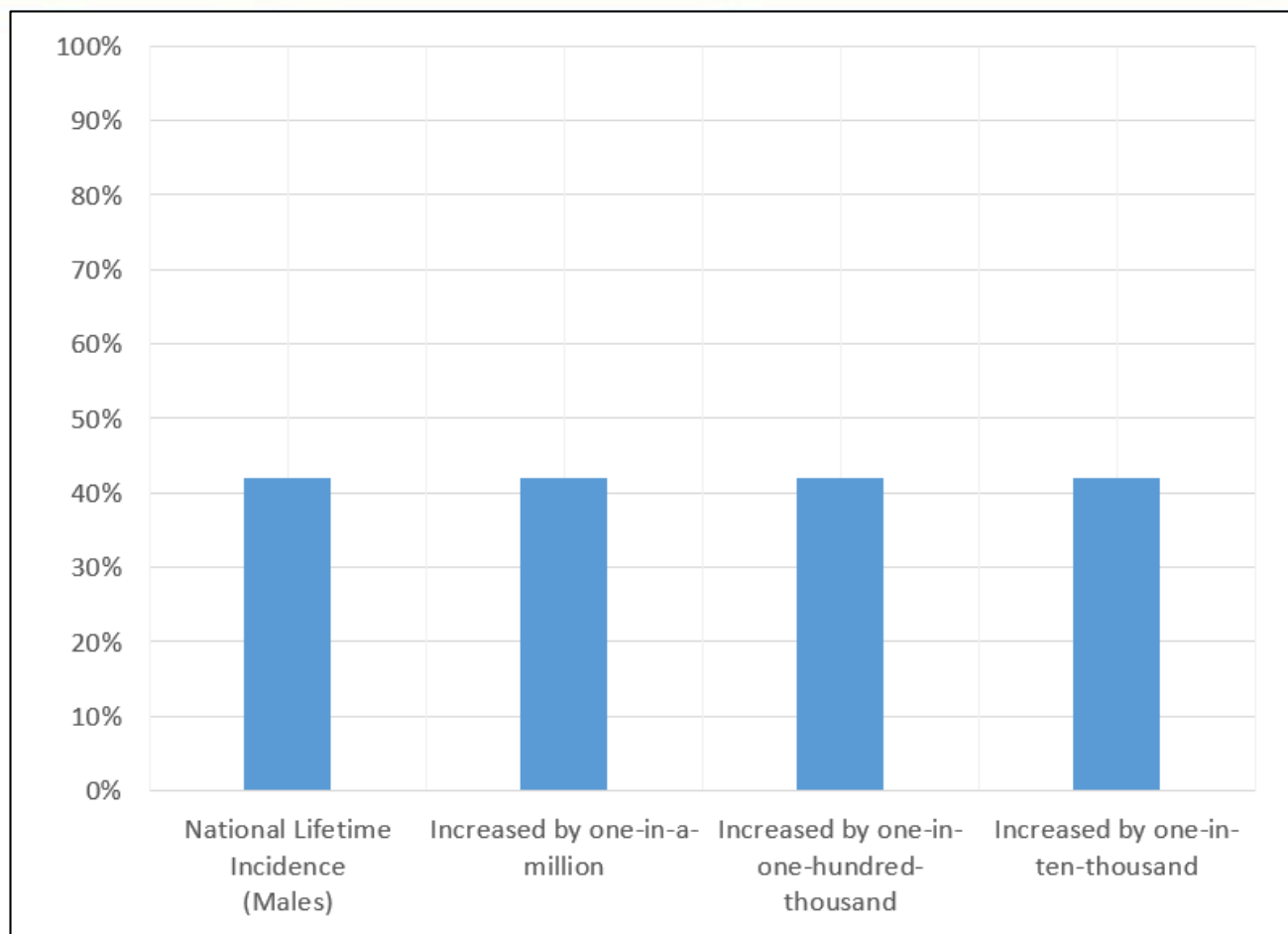
- Excess lifetime cancer risk:**
 - “Incremental probability of an individual developing cancer over a lifetime as a result of exposure to the potential carcinogen” (EPA, Risk Assessment Guidance for Superfund)**
 - Acceptable range = one-in-a-million to one-in-ten-thousand**

What Results From a Risk Assessment?

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Risk

Excess lifetime cancer risk

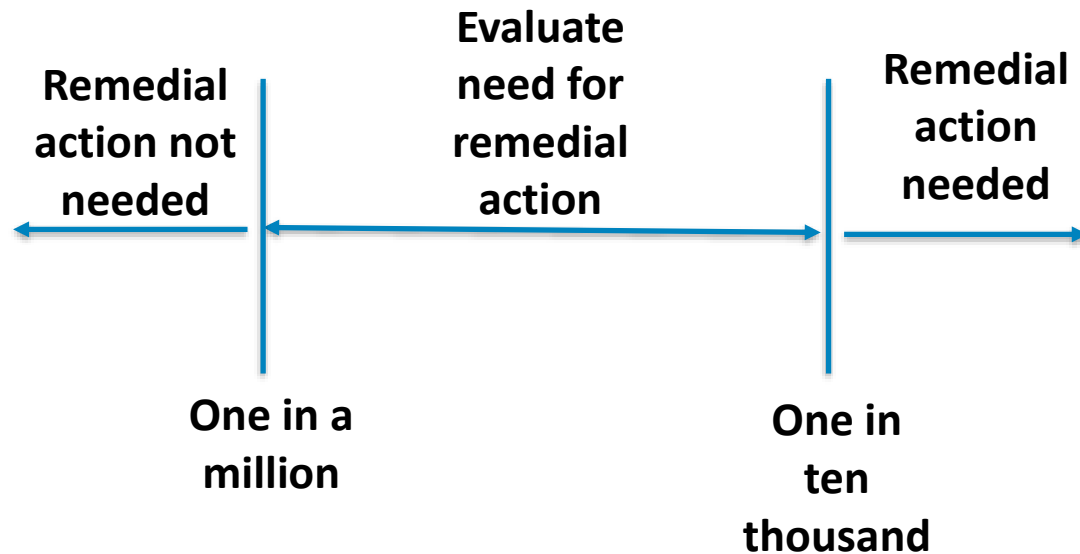


What Results From a Risk Assessment?

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**Excess lifetime
cancer risk**



What Results From a Risk Assessment?

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Risk

- ❑ Cancer
- ❑ Noncancer

- ❑ **Hazard Quotient** = Ratio of exposure level to reference dose
- ❑ **Reference dose** = “...exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime.”

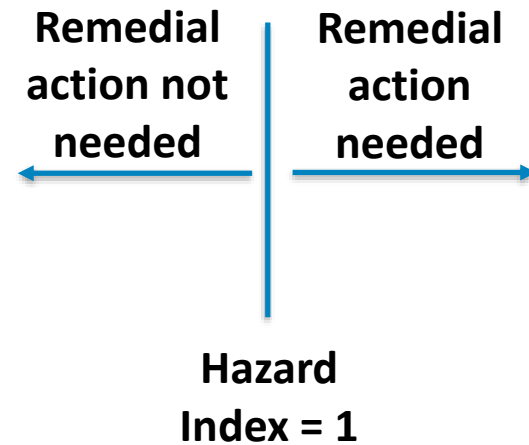
What Results From a Risk Assessment?

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- ❑ Cancer
- ❑ Noncancer

- ❑ **Noncancer Hazard Index** = sum of Hazard Quotients for multiple chemical and exposure pathways





Exposure

Uncertainty Evaluation (examples)

- Site characterization
- Modeled exposure concentrations
- Duration, frequency, etc.



Toxicity

- Animal to human
- Exposure route

How Does Risk Assessment Differ from Public Health Assessment?

What Results From a Risk Assessment?

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How Does Risk Assessment Differ from Public Health Assessment?

Baseline Risk Assessment	Public Health Assessment
Current & future exposures. All media/pathways regardless of whether exposure is currently occurring.	Current conditions/exposures. Specific community health concerns (e.g., cancer).
Calculation based.	Calculations and evaluation of community health outcome data
Comparison to regulatory target risks. Assess what cleanup is needed	Explains whether exposures are truly likely to be harmful under site-specific conditions and recommends actions to reduce or prevent such exposures.

Questions?