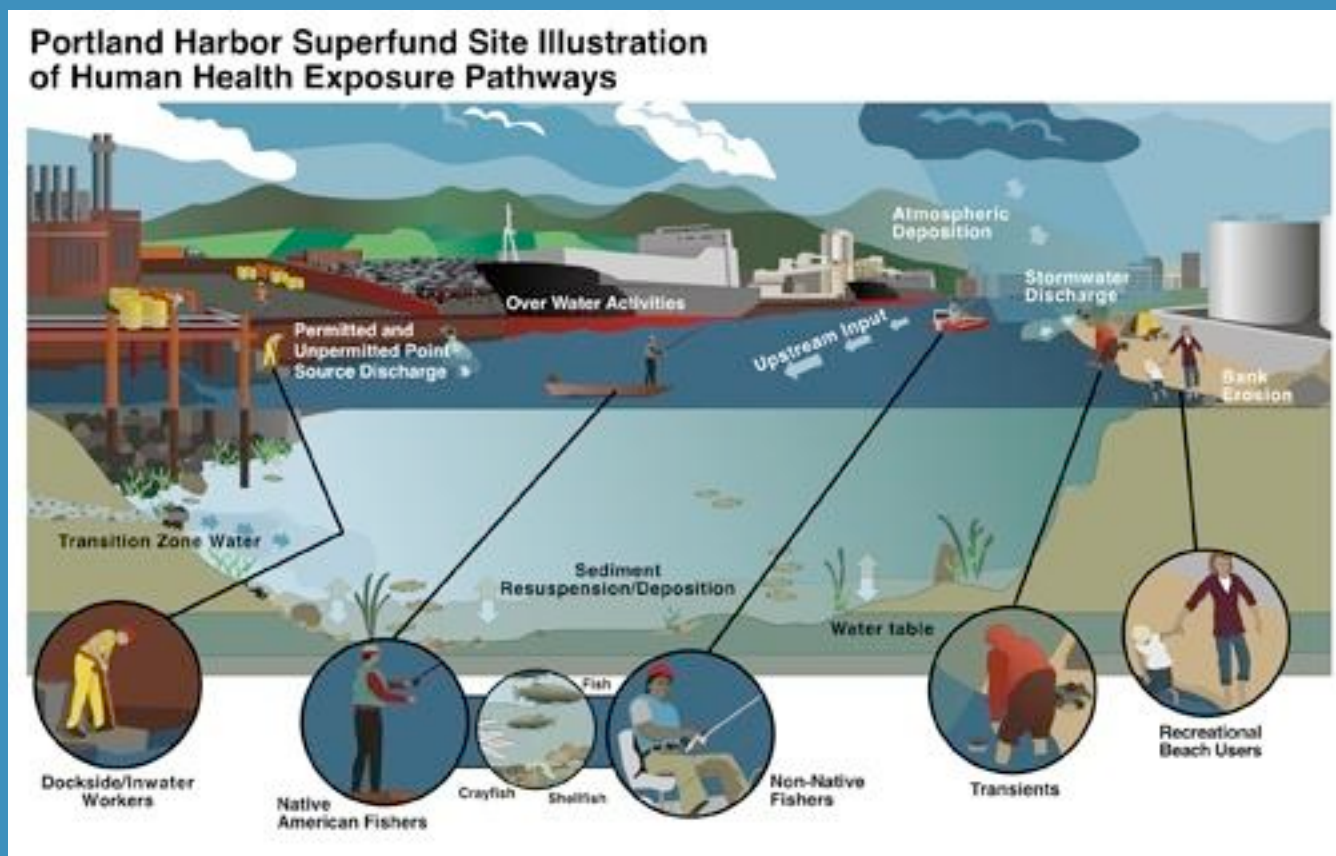


# Portland Harbor Site Human Health Exposure Pathways



# Portland Harbor Site Exposure Scenarios for Evaluation

	Beach Sediment Ingestion and Dermal Adsorption	In-water Sediment Ingestion and Dermal Adsorption	Surface Water Ingestion and Dermal Adsorption	Groundwater Seeps Ingestion and Dermal Adsorption	Fish/Shellfish Ingestion	Infant Consumption of Human Milk
Workers	○	○				●
Transients	●		●	●		
Beach Users	○		●			
Fishers	○	●			●	●
Divers		○	○			●
Domestic Users			●			

- Does not exceed EPA risk values (no further action) (Cancer risks less than  $1 \times 10^{-6}$  and Hazard Index less than 1)
- Within EPA acceptable risk range (may be considered in FS) (Cancer risks between  $1 \times 10^{-6}$  and  $1 \times 10^{-4}$  and Hazard Index less than 1)
- Exceeds EPA acceptable risk range (will be considered in the FS) (Cancer risks above  $1 \times 10^{-4}$  and/or Hazard Index greater than 1)

# Examples of Two Receptor Exposure Assumptions

	Fisher		Beach User	
	Fish	Sediment	Sediment	Water
<b>Intake Rate</b>	19 meals per month 10 meals per month 2 meals per month	Face, hands, forearms and lower legs (beach) Hands and forearms (in-water) Soil ingestion rates	Face, hands forearms and lower legs (beach) Soil ingestion rates	Entire body Approx. 2 ounces per hour ingested
<b>Exposure Duration and Frequency</b>	365 days per year 30 years	2 or 3 days a week 30 years	5 days per week in summer, 1 day per week in spring/fall, 1 day per month in winter 30 years (adult) 6 years (child)	2 days per week in summer (adult) 5 days per in summer (child) 30 years (adult) 6 years (child)
<b>Uncertainties</b>	Preparation methods Maximum concentrations Species consumed Site use Toxicity values	Beach use Site use Amount of contact Sediment adherence Toxicity values	Beach use Site use Amount of contact Sediment adherence Toxicity values	Swimming frequency Dermal adsorption Toxicity values

# Risk Assessment Methods

## Exposure Assessment

Fish ingestion rate  
(142, 73, or 17.5 grams/day)

Tissue concentration for each  
chemical  
(maximum or average)

Percent of species in diet  
(100 or 25 percent)

Percent of tissue type (fillet or  
whole body) in diet  
(100 percent)

Percent of fish consumed  
from Portland Harbor  
(100 percent)

Length of Exposure  
(365 days/year for 30 years)

## Toxicity Assessment

Noncancer Reference Dose  
for each chemical  
(Threshold dose. Based on  
no observed or lowest  
observed effect level  
combined with a safety factor  
typically of 100-1000)

Cancer Slope Factor for each  
chemical  
(Upper bound estimate of the  
probability of response over a  
lifetime. Typically based on a  
linear extrapolation assuming  
no threshold)

## Risk Characterization

Noncancer Hazard Index  
(Indication of potential for  
noncancer adverse effects)

Cancer Risks  
(Probability that an individual  
will develop cancer over a  
lifetime of exposure)

# Fish Consumption Example

- Ingestion rates: 175 g/day (23 meals per month), 142 g/day (19 meals per month), 73 g/day (10 meals per month), 17.5 g/day (2 ½ meals per month)
- Fish consumption at specified ingestion rate every day for 30 years (non-tribal) or 70 years (tribal)
- All fish consumed are assumed to be from Portland Harbor
- Use of maximum and average tissue concentrations
- Tissue concentrations do not change over time or due to preparation methods
- Includes single species diet where only one type of fish, either fillet or whole body, is consumed