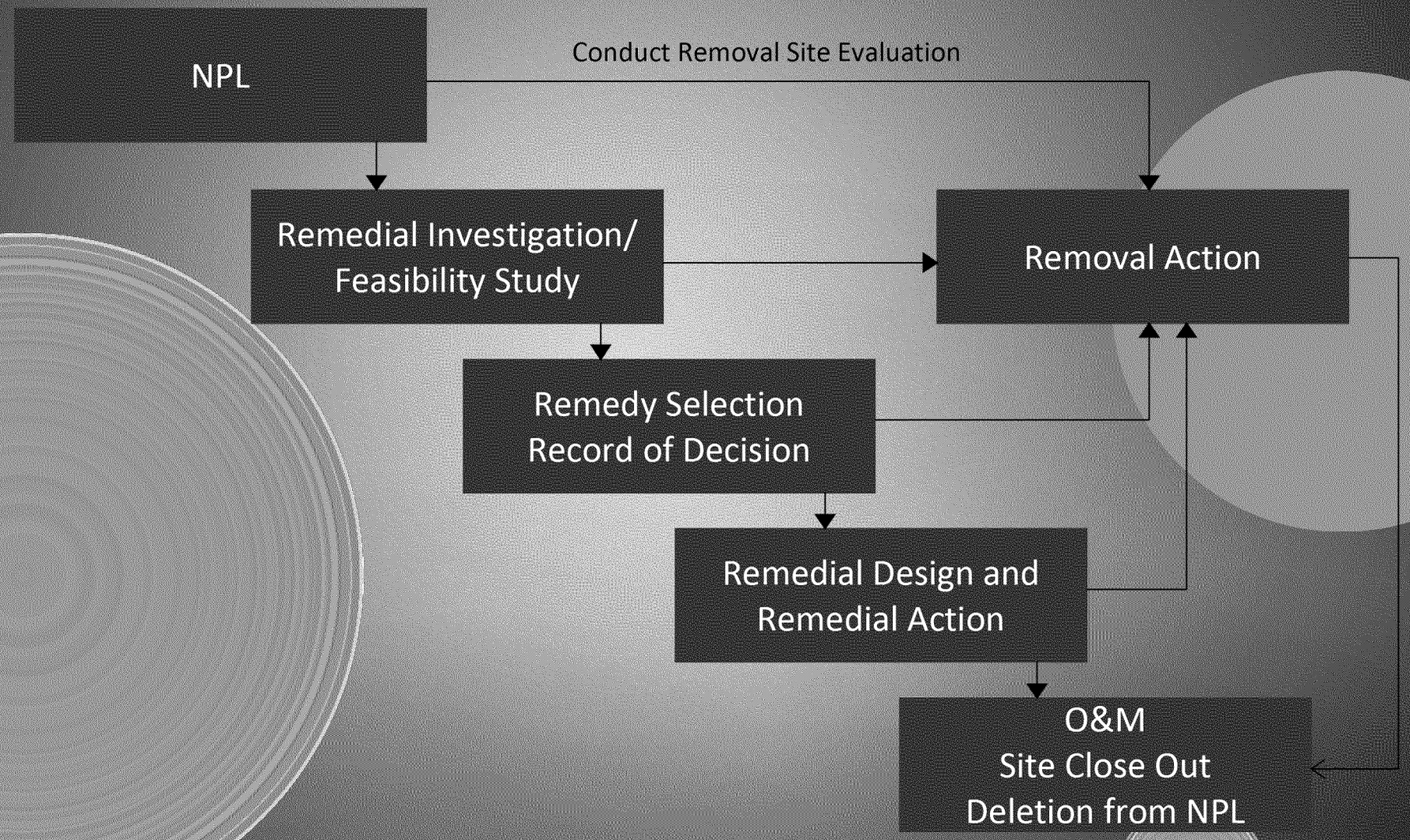
Key Provisions of CERCLA

- Provides legal authority to respond to a release of:
  - A hazardous substance
  - Any pollutant or contaminant that may present an imminent and substantial endangerment
- Excludes petroleum
- Authorizes three types of response actions:
  - Removal action
  - Remedial action
  - Enforcement action
- Requires amendment to the National Contingency Plan (NCP) to address the response authorities

Key Provisions of CERCLA

- Authorizes three types of response actions:
  - Removal action
    - Shorter term, lower cost, quickly implemented, reduces obvious threats
  - Remedial action
    - Longer term, higher cost, requires study, addresses both short- and long-term threats
  - Enforcement action
    - PRPs fund or conduct removal or remedial actions

How Are NPL Sites Handled?



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Overview of the RI/FS Process

- RI/FS supports selection of the remedy
- RI characterizes the site
- FS develops and analyzes remedial action alternatives
- Various lead agencies may conduct the RI/FS

On-site stakeholder discussions

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Baseline Risk Assessments

- Purpose - evaluate threat with no action
- NCP requirements
  - Lead agency shall conduct site-specific baseline risk assessment
  - Characterize current and potential threats
- Quantification of risks
  - Establish acceptable exposure levels
  - Help set priorities

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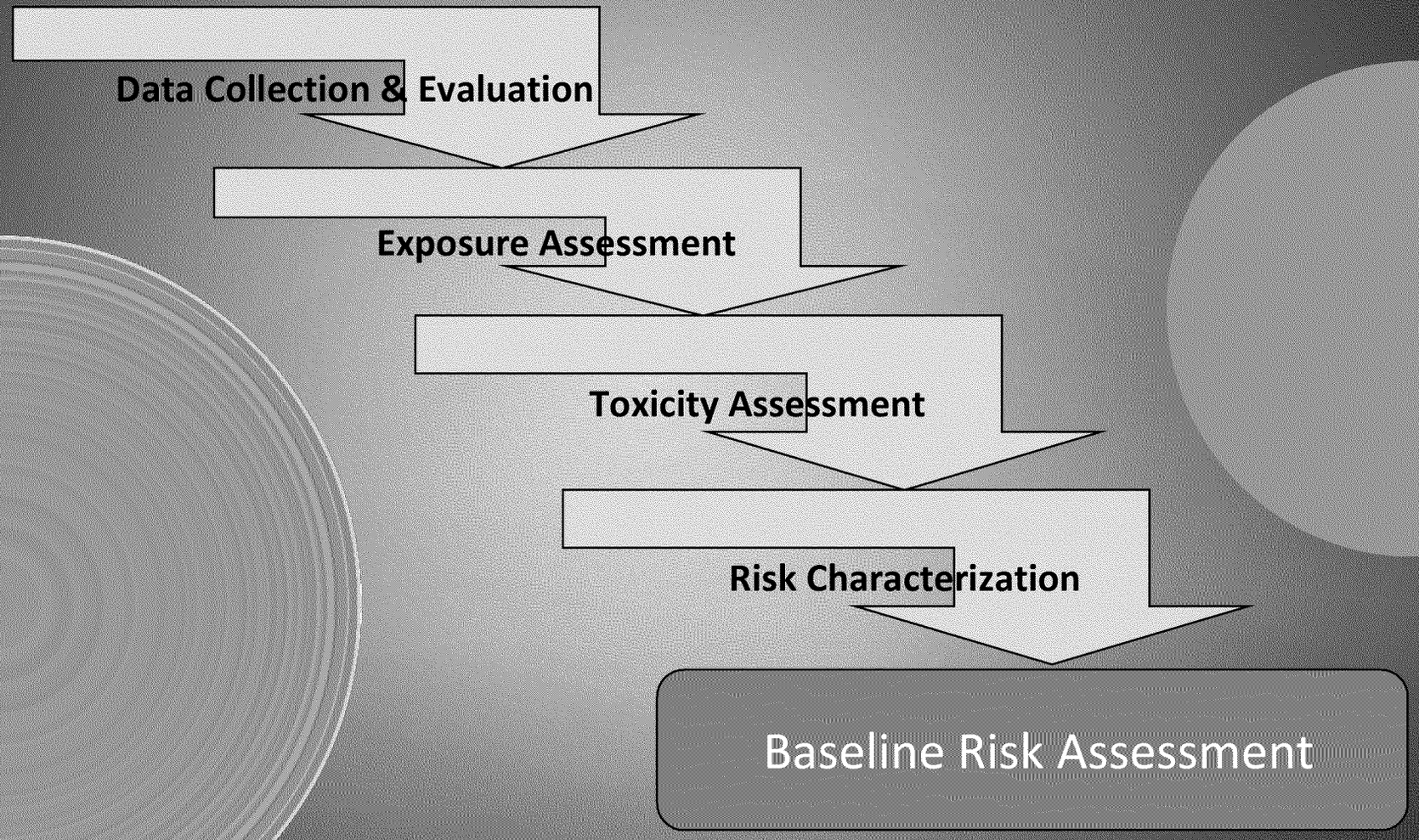
Baseline Risk Assessments

* A Baseline Risk Assessment *IS*:
  * An analysis of the potential adverse health effects (*current* or *future*) caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these releases (i.e., under an assumption of no action).
* A Baseline Risk Assessment does *NOT*:
  * Link individual illnesses to *past* chemical exposures
  * Prove that a specific toxic substance caused an individual's illness

The Risk Assessment Equation

- Risk = Toxicity x Exposure
- Risk is a function of toxicity (the inherent ability of a chemical to do harm) and exposure (the amount of chemical that an individual contacts)
- In the absence of exposure, risk is zero

Components of the Baseline Risk Assessment



Data Collection & Evaluation

* Collect samples - air, water, soil, etc.
* Sample results reveal the types and amounts of chemicals present at the site
* Develop a list of contaminants at the site

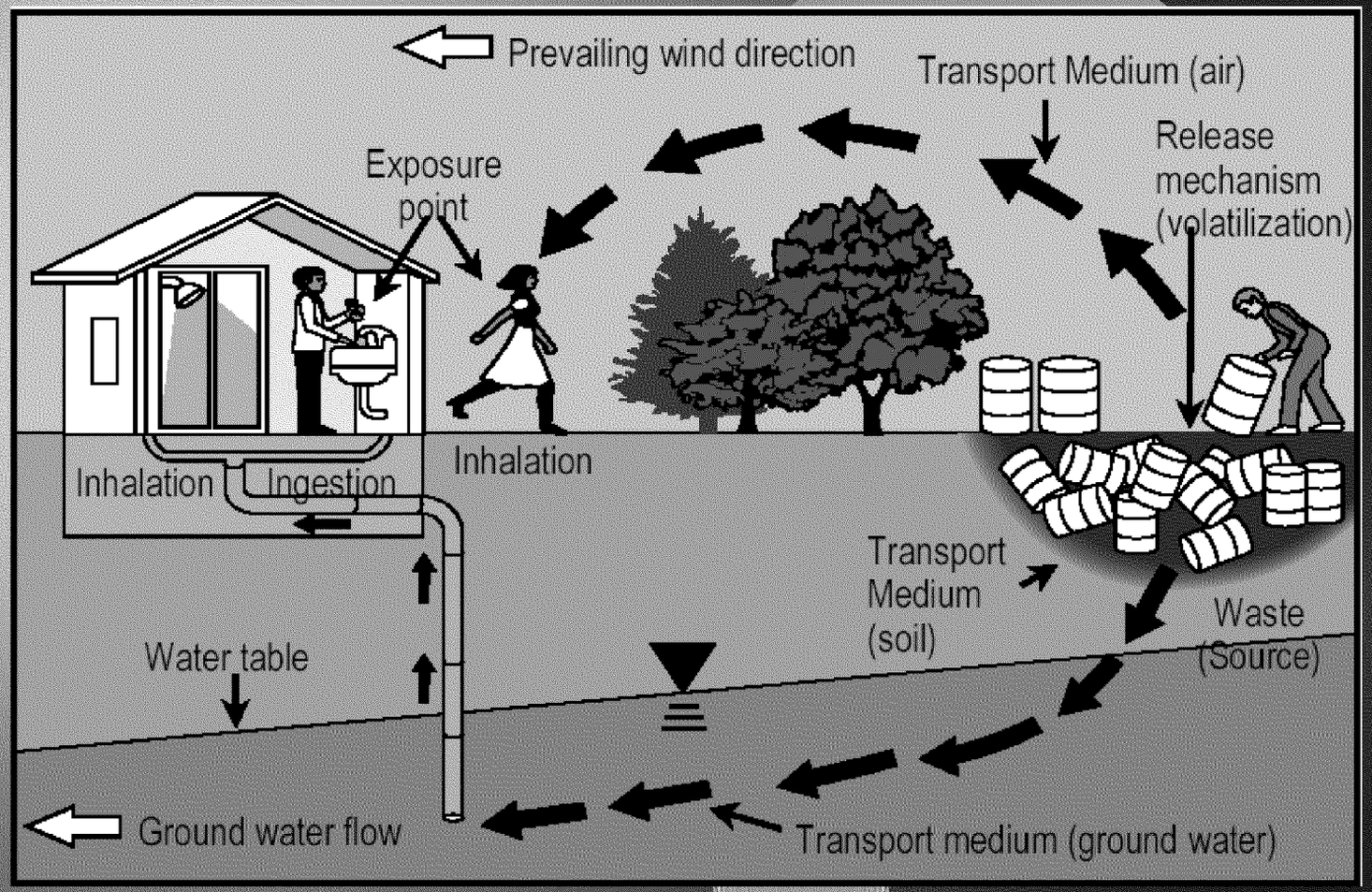
Exposure Assessment

How much of the chemical are people being exposed to over what period of time?

- Characterize the exposure setting
  - Physical environment (Urban, rural, parkland, stream, etc.)
  - Potentially exposed populations
    - Who will be exposed?
      - residential, recreation, workers, trespassers
      - adults, children
    - How long will people be exposed?
    - How often will people be exposed?

Exposure Assessment

* Identify <u>exposure pathways</u>
  * Exposure medium (soil, air, water, food)
  * How much of each chemical people may be exposed to
  * Exposure routes (ingestion, inhalation, dermal)



From: http://dec.alaska.gov/spar/csp/guidance/humhealth_ra.pdf

Toxicity Assessment

Is the chemical harmful to humans?
What amount of injury is this level of exposure likely to cause?

- Hazard Identification
  - Determine if chemical can cause adverse health effect
  - Is adverse health effect likely to occur in humans
  - Cancer and noncancer effects are evaluated separately
- Dose-Response Assessment
  - Quantifies the relationship between exposure and adverse health effects
  - Cancer Effects
    - Assume there are no exposures that have “zero risk”
    - Estimate the probability of cancer developing
  - Noncancer Effects
    - Typically become more severe as exposure to a chemical increases
    - Threshold values developed for noncancer causing chemicals

Risk Characterization

What is the extra risk to human health caused by this amount of exposure to this chemical/chemicals?

- Integrate results of the data collection & evaluation, exposure assessment, and toxicity assessment
- Quantify the excess individual lifetime cancer risk
  - Cancer risk is expressed as a probability (1 in 10,000 or 1E-04 or 0.0001)
  - Superfund manages cancer risk within a target risk range of 1E-06 to 1E-04
- Quantify the noncancer hazard quotient (HQ)
  - Compare exposure or intake to the dose that is unlikely to cause adverse health effects
  - A hazard quotient is not a probability
  - HQ > 1 indicates the potential exists for adverse health effects
- Assess and Present Uncertainty

Summary of the West Lake Landfill OU-1 Baseline Risk Assessment (2000)

- Operable Unit 1 consists of:
  - Two localized areas – Areas 1 and 2
  - Ford Property
- Objectives
  - Estimate potential health risks associated with the site if no cleanup action was taken
  - Identify the areas, environmental media, and contaminants that pose the primary human health concerns
  - Identify any existing data gaps so that additional information can be collected to support cleanup decisions
  - Provide a baseline for comparing the protectiveness of cleanup alternatives in the Feasibility Study

Summary of the West Lake Landfill OU-1 Baseline Risk Assessment

* Data Collection and Evaluation
  * Data for OU1 were evaluated to establish
    1. Detected chemicals that are site-related
    2. Data that are of sufficient quality for use in the risk assessment
* Contaminants of Potential Concern
  * Radiological: uranium-238, uranium-235, thorium-232, and associated decay products (U-234, Th-230, Ra-226, Pb-210, Pa-231)
  * Nonradiological: arsenic, aroclor-1254 (Area 1); arsenic, lead, uranium, and aroclor 1254 (Area 2)

Summary of the West Lake Landfill OU-1 Baseline Risk Assessment

- Exposure Assessment
  - Routes of Exposure
    - External radiation from contaminated soil
    - Inhalation of dust and gas
    - Dermal contact with contaminated soil
    - Incidental Ingestion of soil
  - Potential Receptors
    - Current Use
      - Groundskeeper – Working adjacent to OU-1
      - Groundskeeper – Ford Property
    - Future Use
      - Groundskeeper – Working on OU-1
      - Groundskeeper – Ford Property
      - User of a building adjacent to Areas 1 and 2 who uses areas for parking
      - Outdoor Storage Yard Worker

Summary of the West Lake Landfill OU-1 Baseline Risk Assessment

- Toxicity Assessment
  - Hazard Identification
  - Dose-Response Assessment
    - Carcinogenic Slope Factors
    - Noncarcinogen Reference Doses

Summary of the West Lake Landfill OU-1 Baseline Risk Assessment

- Risk Characterization
  - Health Risks Under Current Conditions
    - All receptor scenarios produce risks that are within the target risk range of 1E-06 to 1E-04
  - Health Risks Under Future Conditions
    - Radionuclides
      - Carcinogenic risks to future workers involved in outdoor storage uses on Areas 1 and 2 were calculated to be 1E-04 and 4E-04, respectively
      - The potential risks to a future onsite groundskeeper working in Areas 1 and 2 were calculated to be 6E-05 and 2E-04, respectively
    - Non-Radionuclides
      - Non-radiological contaminants are not expected to cause unacceptable risks for the scenarios evaluated.

Summary of the West Lake Landfill OU-2 Risk Assessment (2005)

- Operable Unit 2 consists of:
  - Areas where landfill activities were conducted at the West Lake Landfill, with the exception of OU-1, Areas 1 and 2
- Presumptive Remedy Approach:
  - Followed the Presumptive Remedy Approach for CERCLA Municipal Landfill Sites
  - *Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites* (U.S. EPA, 1991)

Summary of the West Lake Landfill OU-2 Risk Assessment

* Containment as a Presumptive Remedy
  * Source areas of the municipal landfill sites
  * Does not address exposure pathways outside the landfill

Source Contaminant Exposure Pathways Addressed by Presumptive Remedy
Direct contact with soil and/or debris prevented by landfill cap;
Exposure to contaminated groundwater within the landfill area prevented by ground-water control;
Exposure to contaminated leachate prevented by leachate collection and treatment; and
Exposure to landfill gas addressed by gas collection and treatment, as appropriate.

Summary of the West Lake Landfill OU-2 Risk Assessment

- Risk Characterization:
  - Qualitative
  - Carcinogenic contaminants exceeding standards in Groundwater in the West Lake Landfill
    - Arsenic, Benzene, and Vinyl Chloride
  - Non-carcinogenic contaminants exceeding standards in Groundwater in the West Lake Landfill
    - Iron, Manganese, Chloride, Total Dissolved Solids, and Fluoride

Summary of the West Lake Landfill OU-2 Risk Assessment

* Conclusion:
  * Based on the presumptive remedy approach for municipal landfills, contaminants were identified in groundwater at concentrations that exceeded standards.
  * Based on these findings, consideration of remedial action under the presumptive remedy approach was warranted.