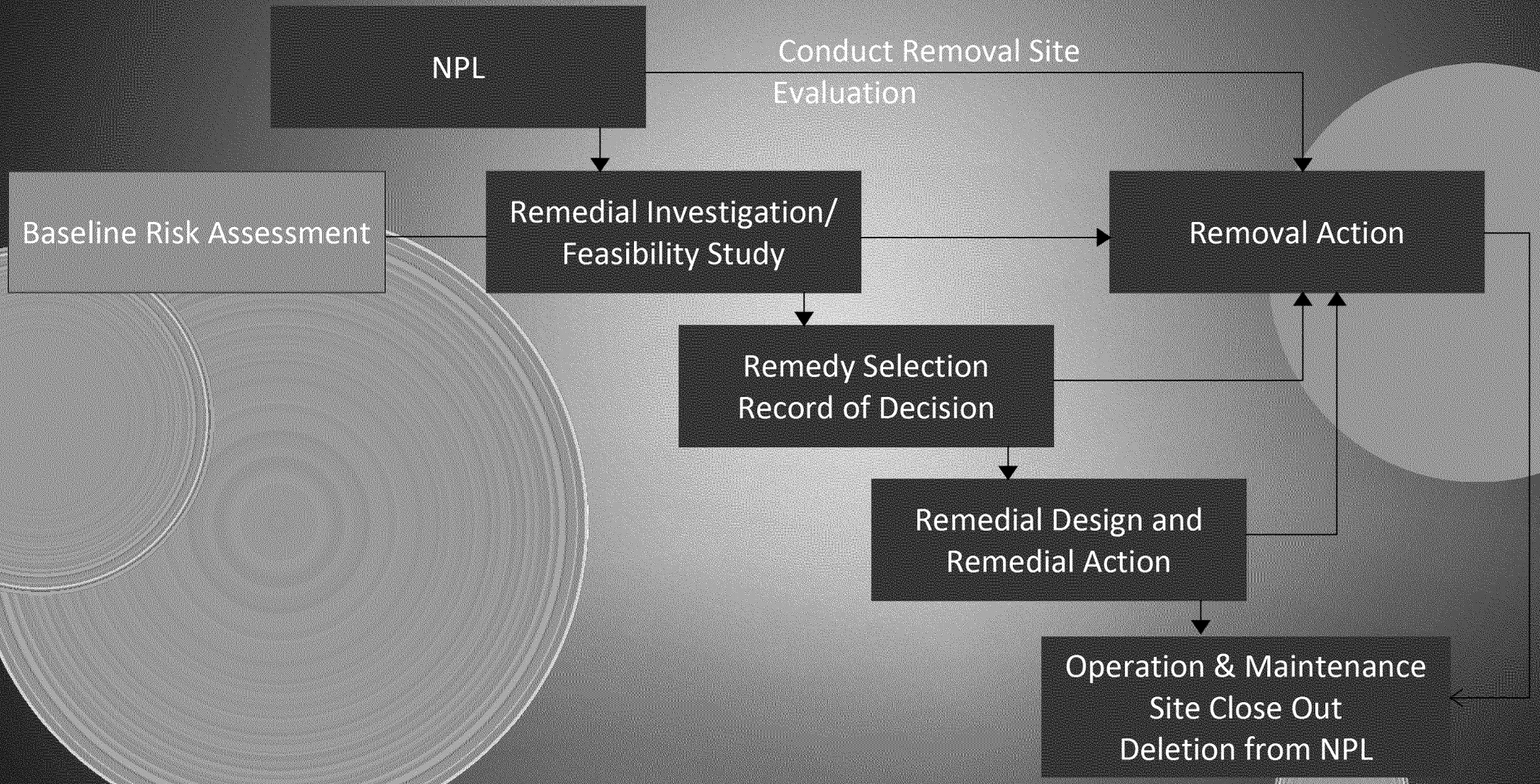
Key Provisions of CERCLA

(Comprehensive Environmental Response, Compensation and Liability Act)

- Provides legal authority to respond to a release of:
  - A hazardous substance
  - Any pollutant or contaminant that may present an imminent and substantial endangerment
- Authorizes three types of response actions:
  - Removal action
  - Remedial action
  - Enforcement action

How Are NPL Sites Handled?



Overview of the Remedial Investigation/Feasibility Study Process

* RI/FS supports selection of the remedy
* RI characterizes the site
* Baseline Risk Assessment (BLRA) characterizes human health risks associated with exposures at the site
* FS develops and analyzes remedial action alternatives

On-site stakeholder discussions

Baseline Risk Assessments

* Purpose - evaluate threat with no action
* National Control Plan (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

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

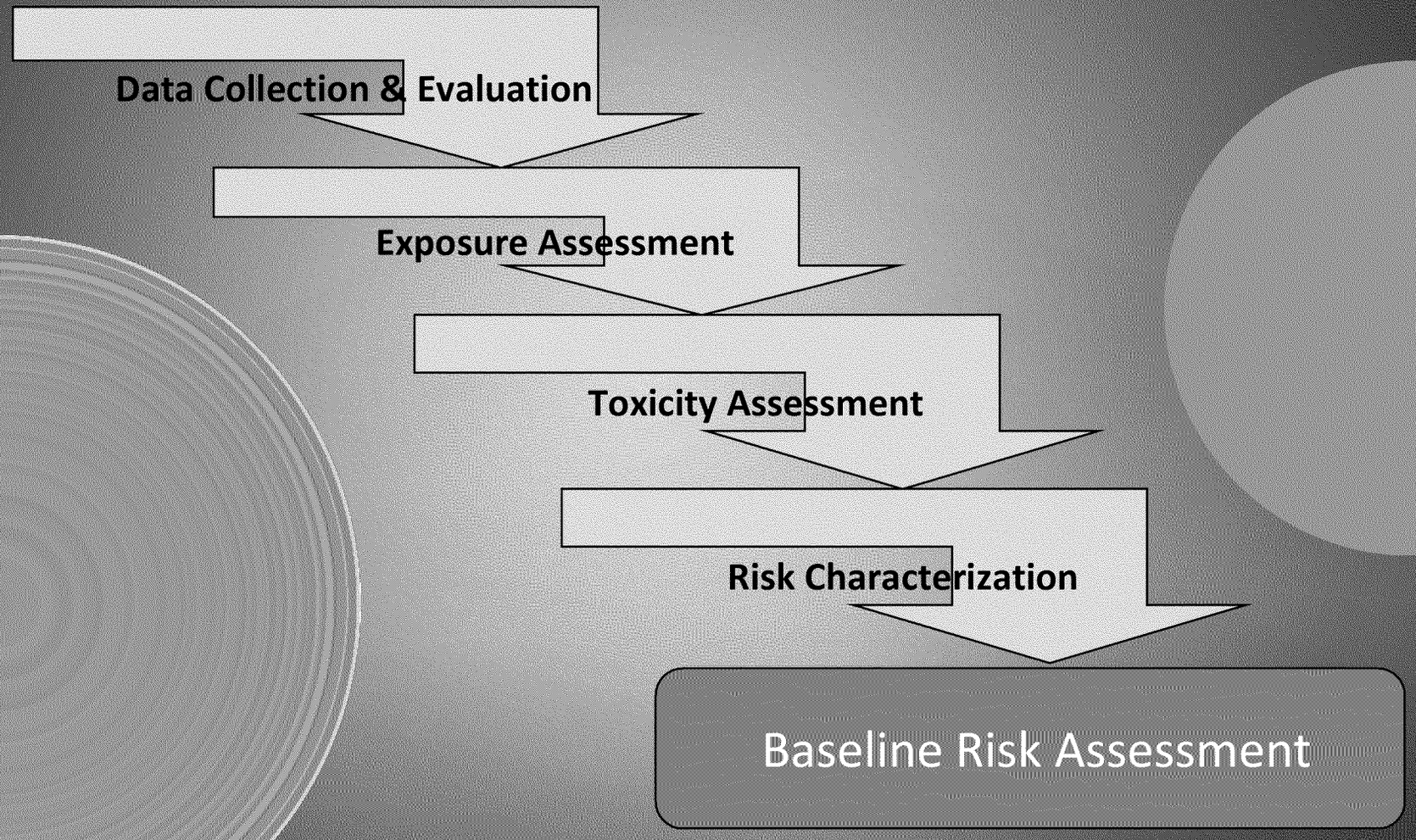
The Risk Assessment Equation

* 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 (i.e., a complete exposure pathway), risk is <u>zero</u>

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

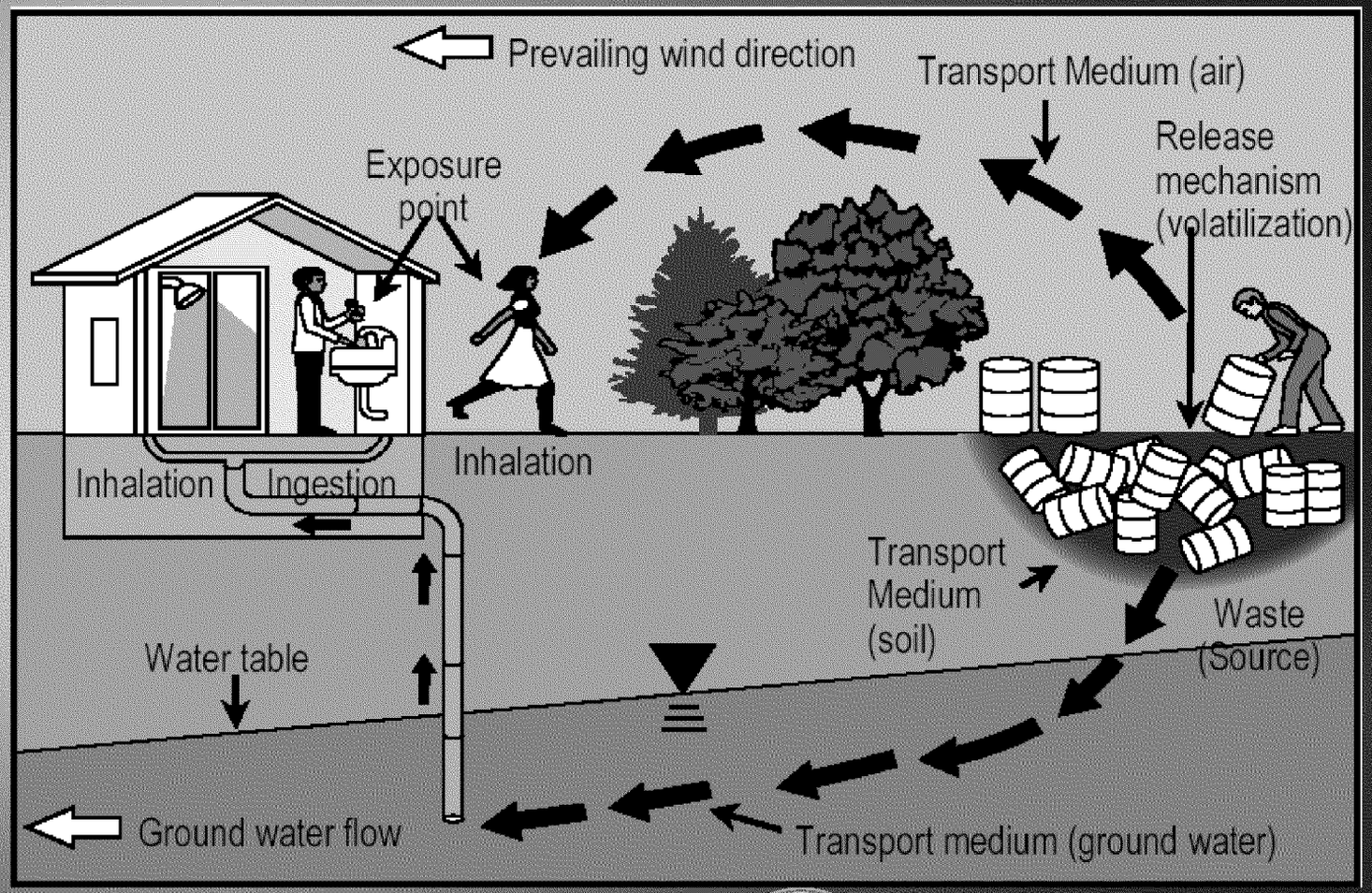
Exposure Assessment

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

Toxicity Assessment

- 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

Carcinogenic Risk Range: Triggering Action

- Compare quantified carcinogenic risks to the target risk range
  - Risks that exceed 10^{-4}
  - Risks that fall within the target range
  - Risks that are lower than 10^{-6}

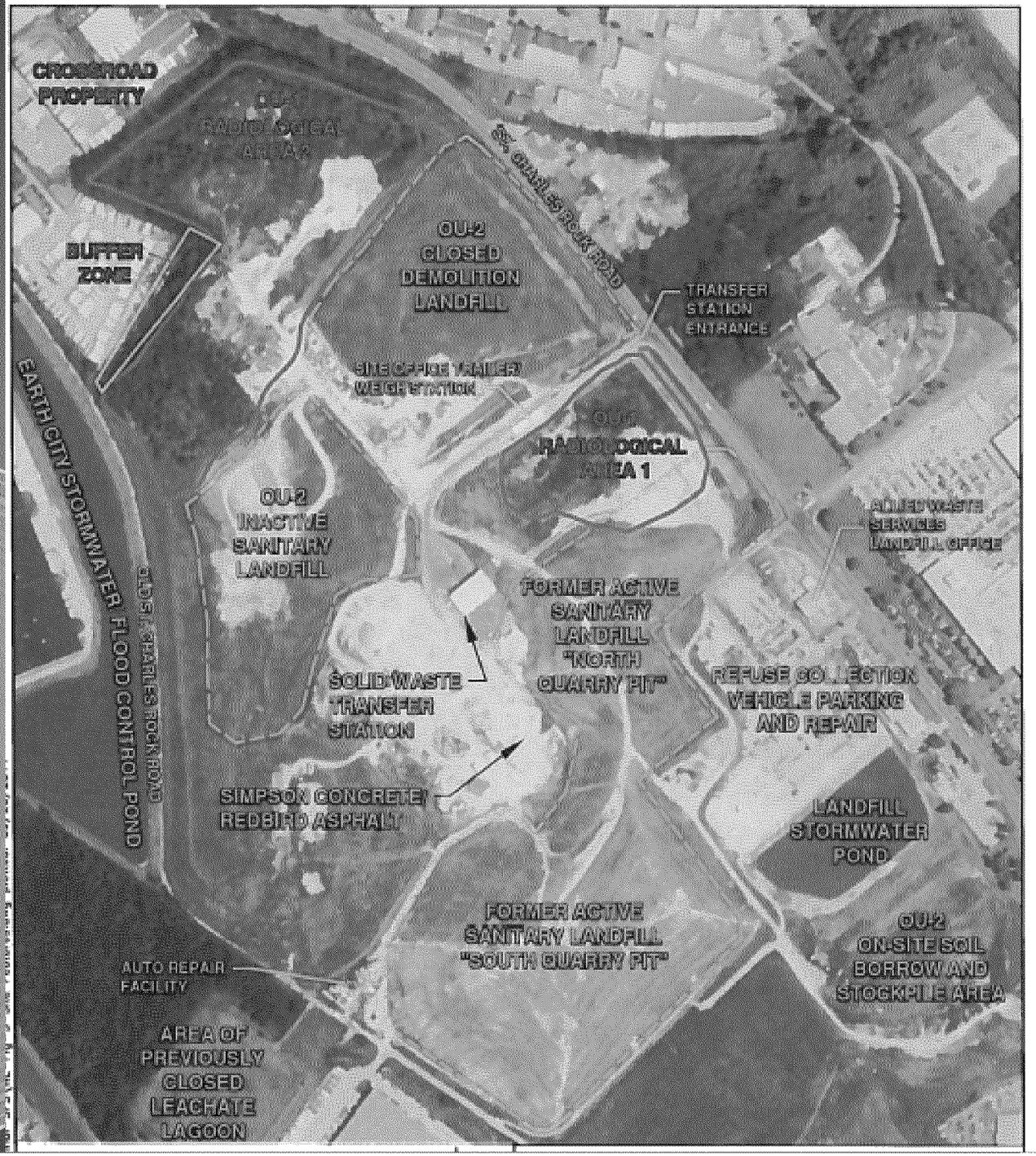
Noncancer Hazard Quotient (HQ)

* Is expressed as a ratio
* Indicates likelihood of adverse health effects
* Is not a statistical probability

$$HQ = \left(\frac{\text{Exposure level}}{\text{Reference dose}} \right)$$

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


CROSSROAD PROPERTY
RADIOLOGICAL AREA 2
BUFFER ZONE
OU-2 CLOSED DEMOLITION LANDFILL
OLD CHARLES ROCK ROAD
TRANSFER STATION ENTRANCE
SITE OFFICE WATER WEIGH STATION
RADIOLOGICAL AREA 1
EARTH CITY STORMWATER FLOOD CONTROL POND
OU-2 INACTIVE SANITARY LANDFILL
ALLIED WASTE SERVICES LANDFILL OFFICE
FORMER ACTIVE SANITARY LANDFILL "NORTH QUARRY PIT"
SOLID WASTE TRANSFER STATION
REFUSE COLLECTION VEHICLE PARKING AND REPAIR
SIMPSON CONCRETE/ REDBIRD ASPHALT
LANDFILL STORMWATER POND
FORMER ACTIVE SANITARY LANDFILL "SOUTH QUARRY PIT"
OU-2 ON-SITE SOIL BORROW AND STOCKPILE AREA
AUTO REPAIR FACILITY
AREA OF PREVIOUSLY CLOSED LEACHATE LAGOON

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

- 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

* Contaminants of Potential Concern
  * Radiological: uranium-238, uranium-235, thorium-232, and associated decay products (uranium-234, thorium-230, radium-226, lead-210, protactinium-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

- 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

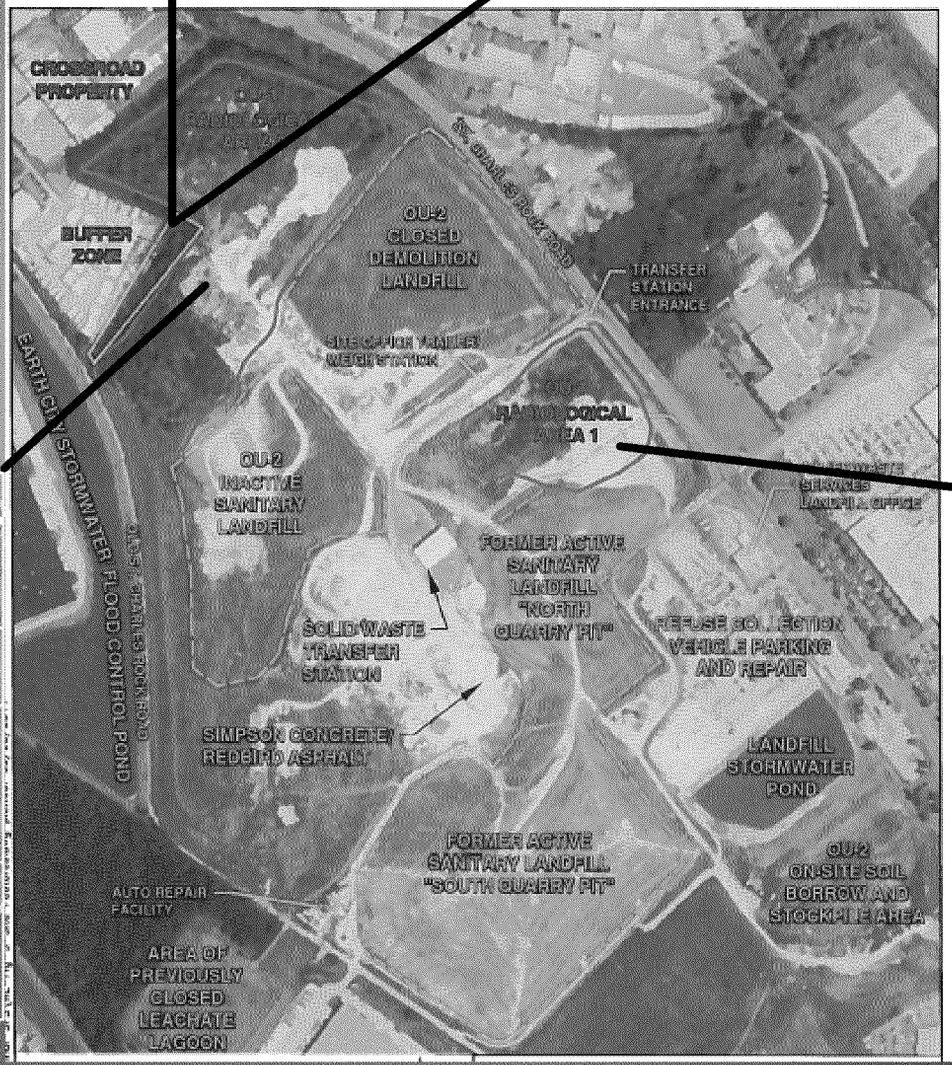
Summary of the West Lake Landfill OU-1 Baseline Risk Assessment

- Health Risks Under Future Conditions
  - Radionuclides
    - Calculated risks from radiological COPCs for some potential future exposure scenarios are at the upper end of, or exceed the target risk range of 1E-06 to 1E-04
  - Non-Radionuclides
    - Non-radiological contaminants are not expected to cause unacceptable risks for the scenarios evaluated.

OU-1, Ford Property (Current Scenario)		
Potential Receptor	Location	Radionuclide Cancer Risk
Groundskeeper	On Area	6E-07

OU-1, Ford Property (Future Scenario)		
Potential Receptor	Location	Radionuclide Cancer Risk
Groundskeeper	On Area	6E-07

OU-1, Area 2 (Current Scenario)		
Potential Receptor	Location	Radionuclide Cancer Risk
Groundskeeper	Adjacent to Area 2	4E-05



OU-1, Area 1 (Current Scenario)		
Potential Receptor	Location	Radionuclide Cancer Risk
Groundskeeper	Adjacent to Area 1	1E-05

OU-1, Area 2 (Future Scenario)		
Potential Receptor	Location	Radionuclide Cancer Risk
Groundskeeper	On Area 2	2E-04
Adjacent Building User	Area 2 (Paved and used for parking)	4E-05
Storage Yard Worker	On Area 2	4E-04

OU-1, Area 1 (Future Scenario)		
Potential Receptor	Location	Radionuclide Cancer Risk
Groundskeeper	On Area 1	6E-05
Adjacent Building User	Area 1 (Paved and used for parking)	1E-05
Storage Yard Worker	On Area 1	1E-04

*Target Risk Range is 1E-06 to 1E-04

Questions or Comments?

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