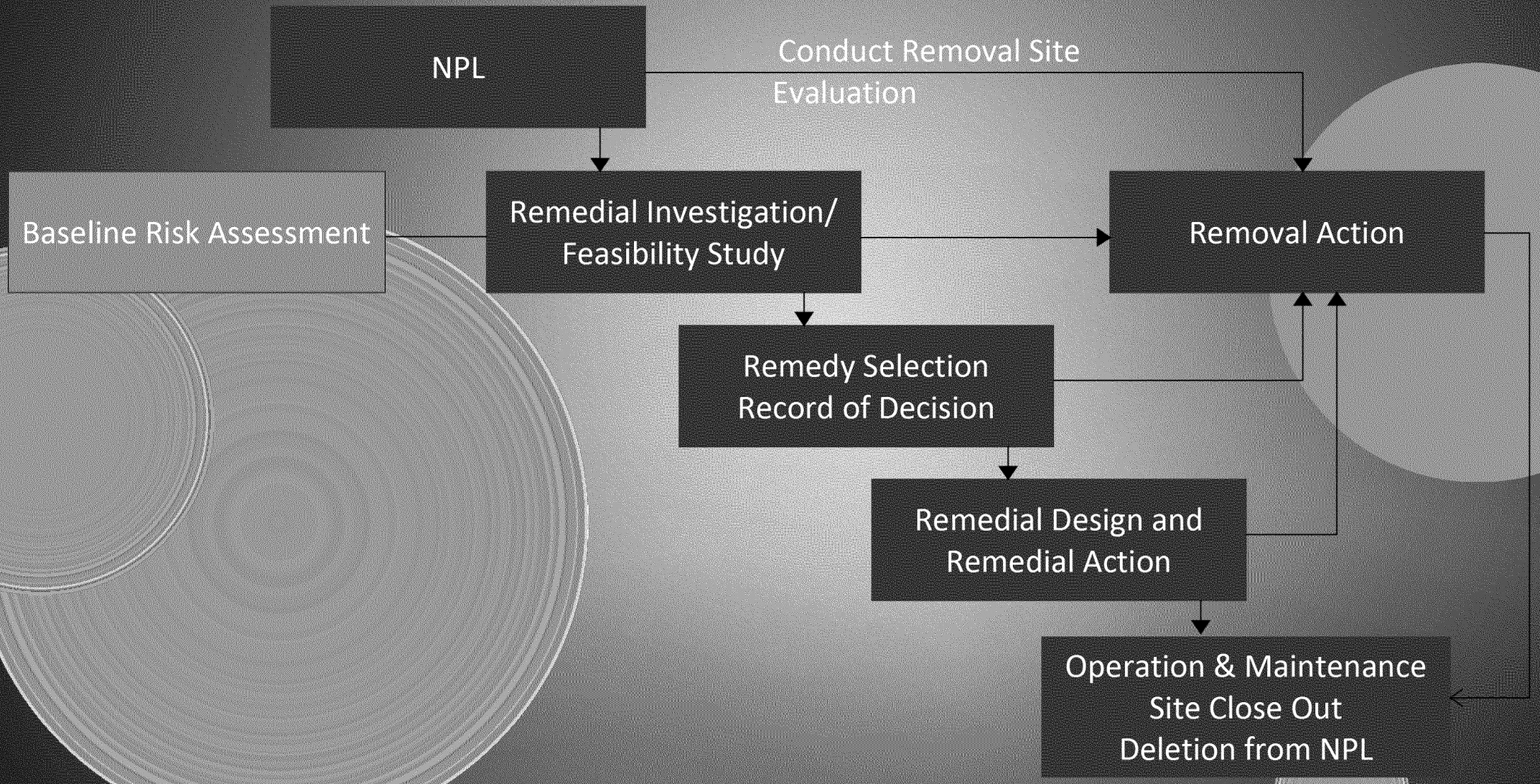
Key Provisions of CERCLA

(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

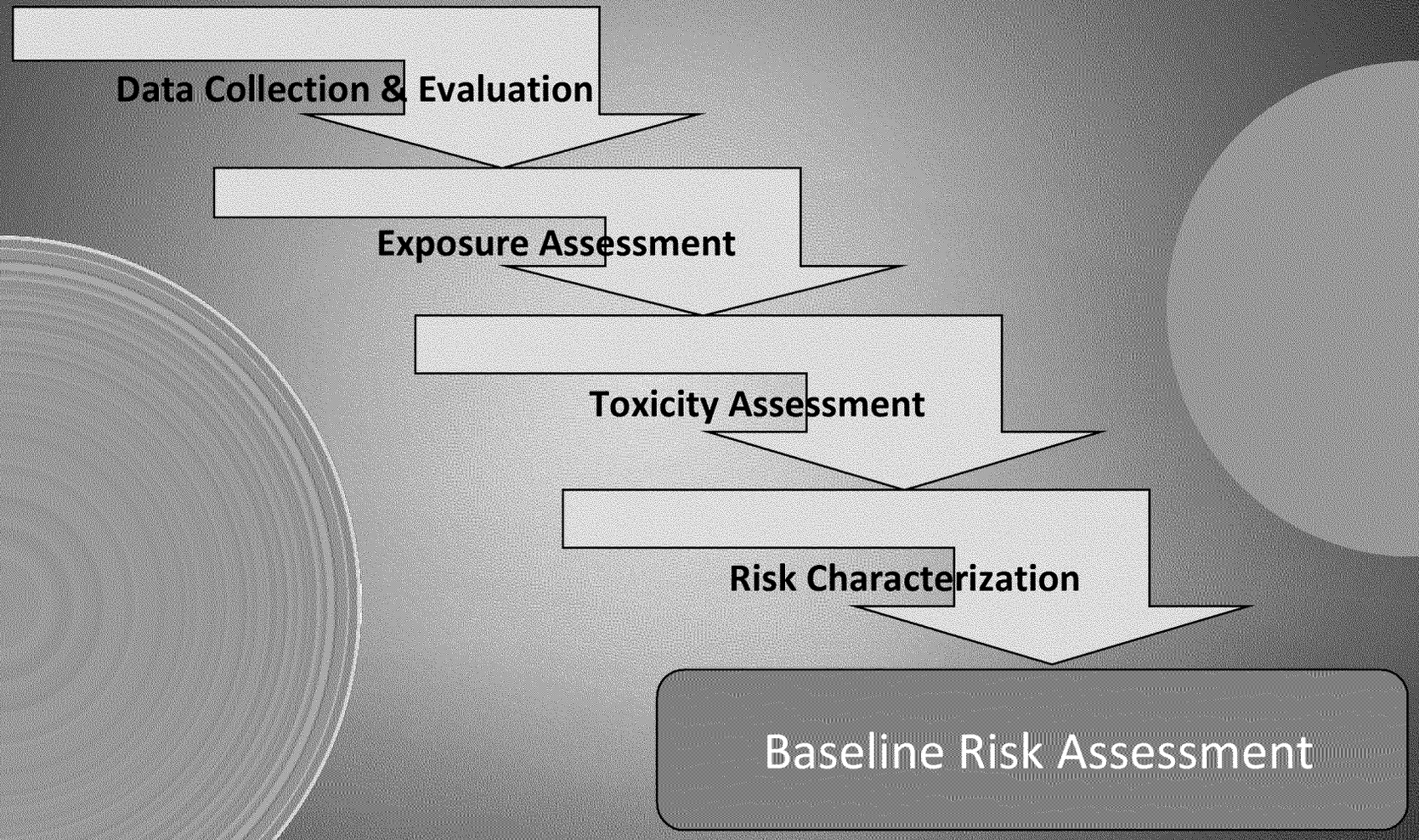
The Risk Assessment Equation

* 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 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

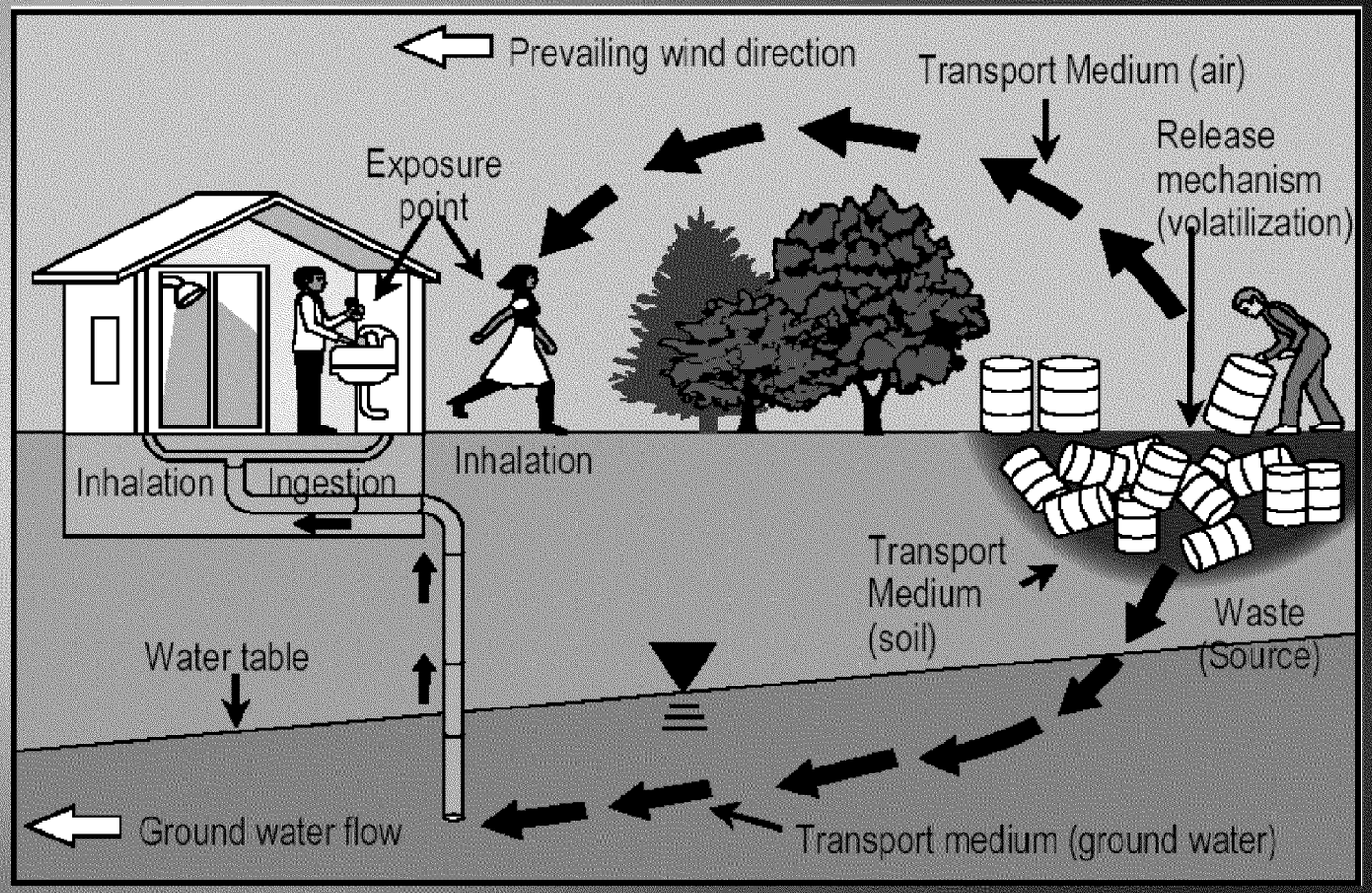
Exposure Assessment

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

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}

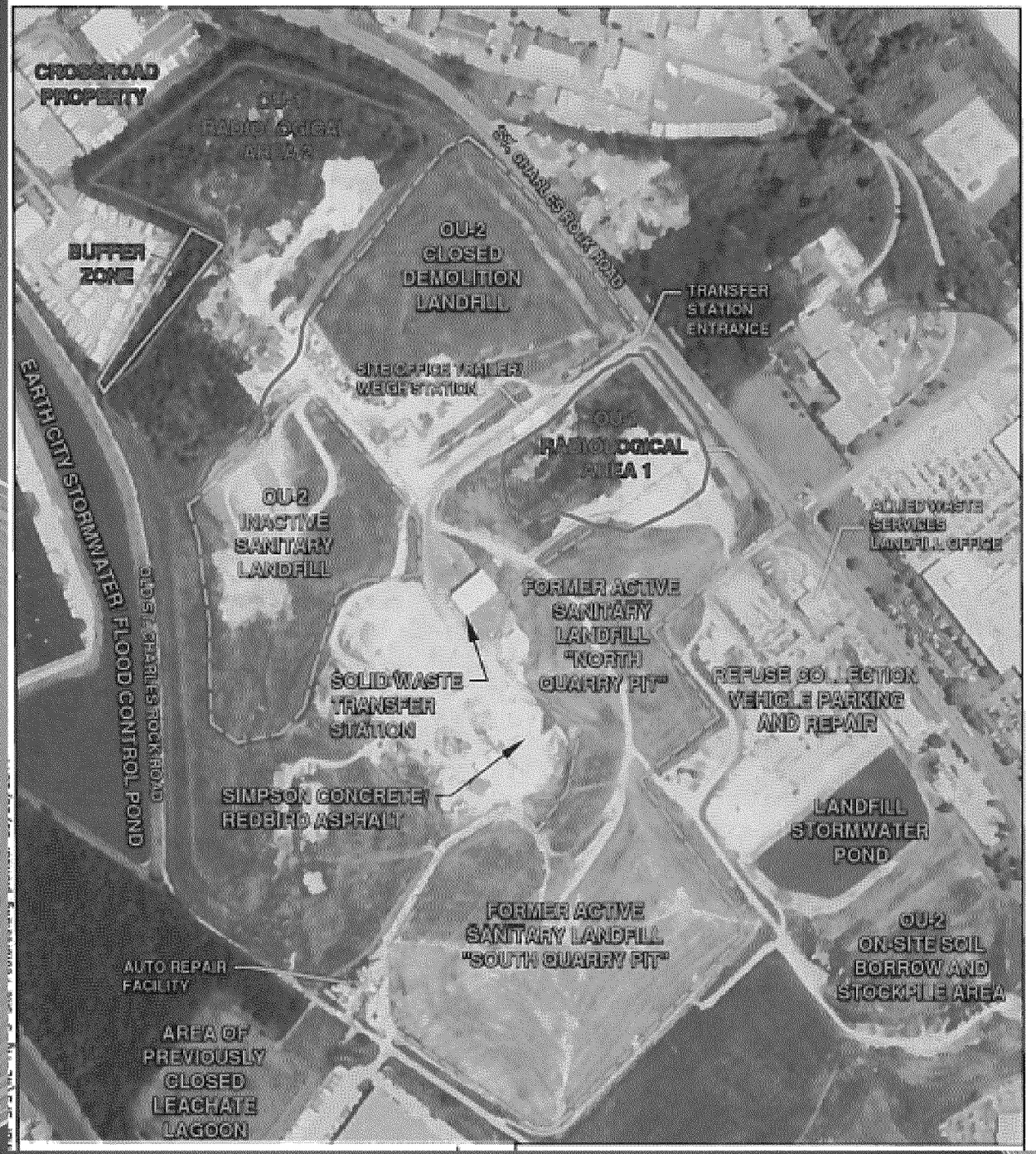
Noncancer Hazard Quotient (HQ)

* 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
OU-1 RADIOLOGICAL AREA 2
BUFFER ZONE
OU-2 CLOSED DEMOLITION LANDFILL
GRAVEL ROCK ROAD
TRANSFER STATION ENTRANCE
SITE OFFICE TRAILER WEIGH STATION
OU-1 RADIOLOGICAL AREA 1
OU-2 INACTIVE SANITARY LANDFILL
ALLIED WASTE SERVICES LANDFILL OFFICE
EARTH CITY STORMWATER FLOOD CONTROL POND
CLOSED TRAILER ROCK ROAD
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

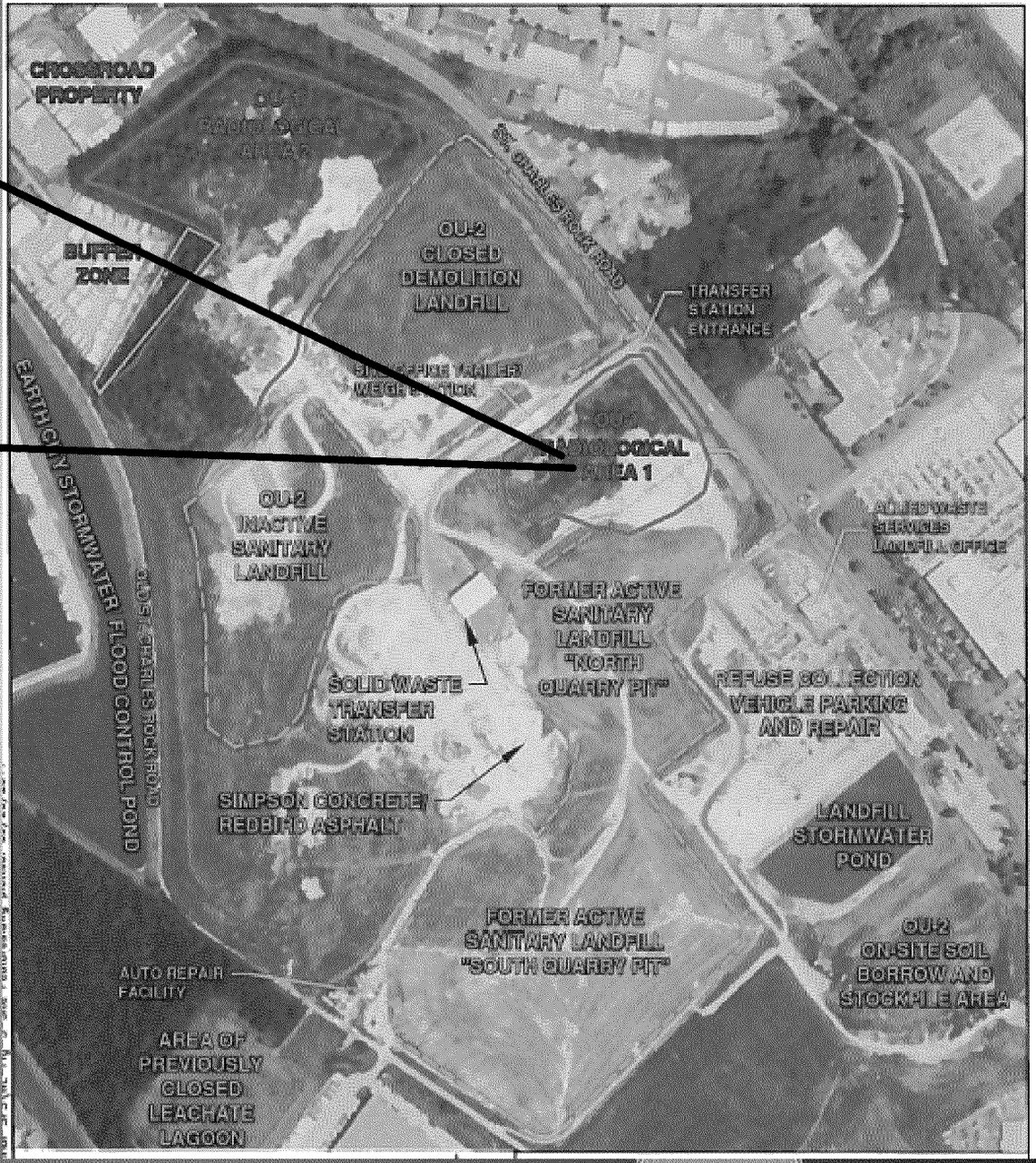
- Risk Characterization
  - Health Risks Under Current Conditions
    - All receptor scenarios produce risks that are within the target risk range of 1E-06 to 1E-04

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

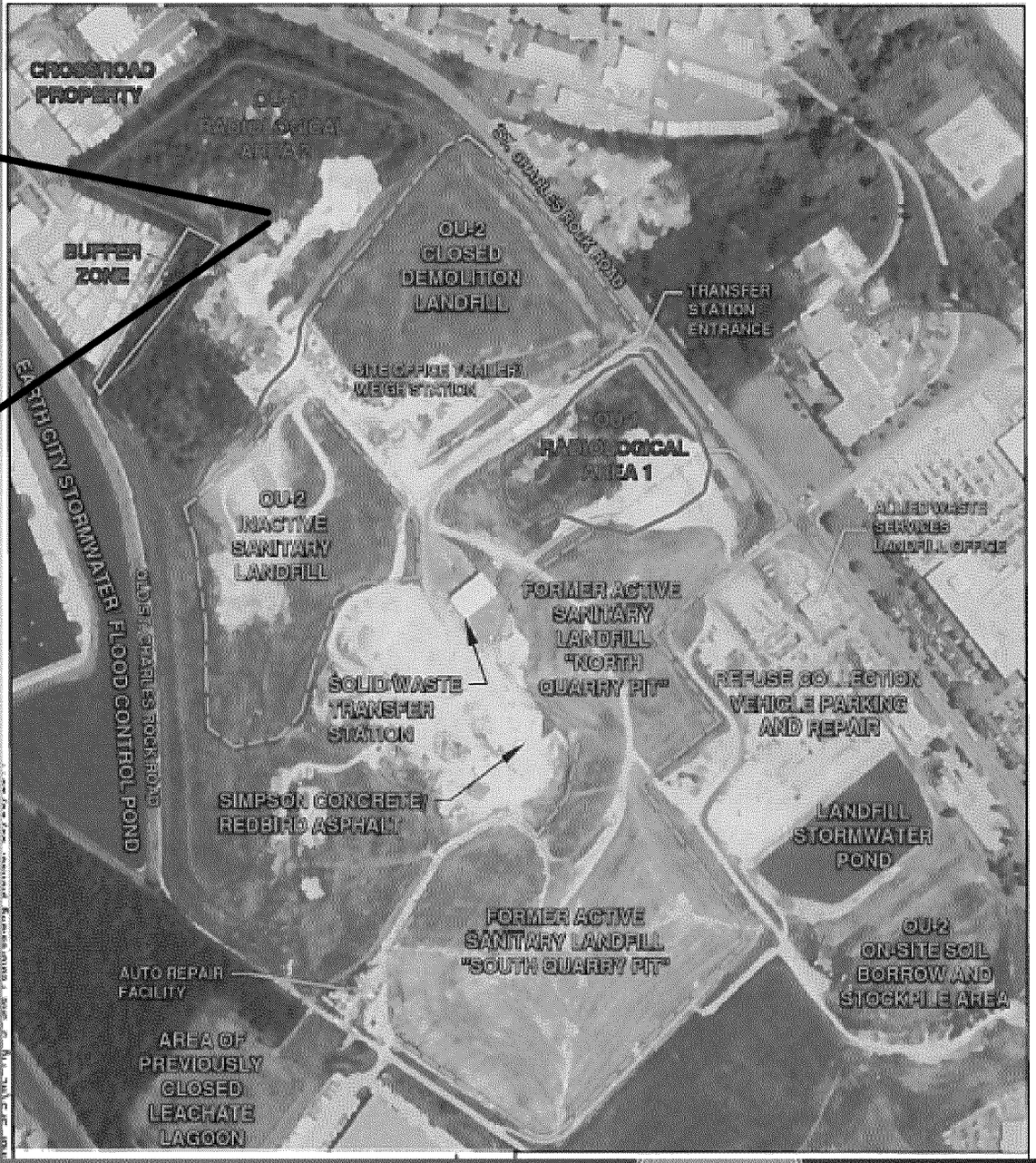
OU-1, Area 1 (Future Scenario)		
Potential Receptor	Location	Radionuclide Cancer Risk
Groundskeeper	On Area 1	6E-05
Adjacent Building User	Area 1 (Paved and used for parking)	1E-05
Storage Yard Worker	On Area 1	1E-04



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

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

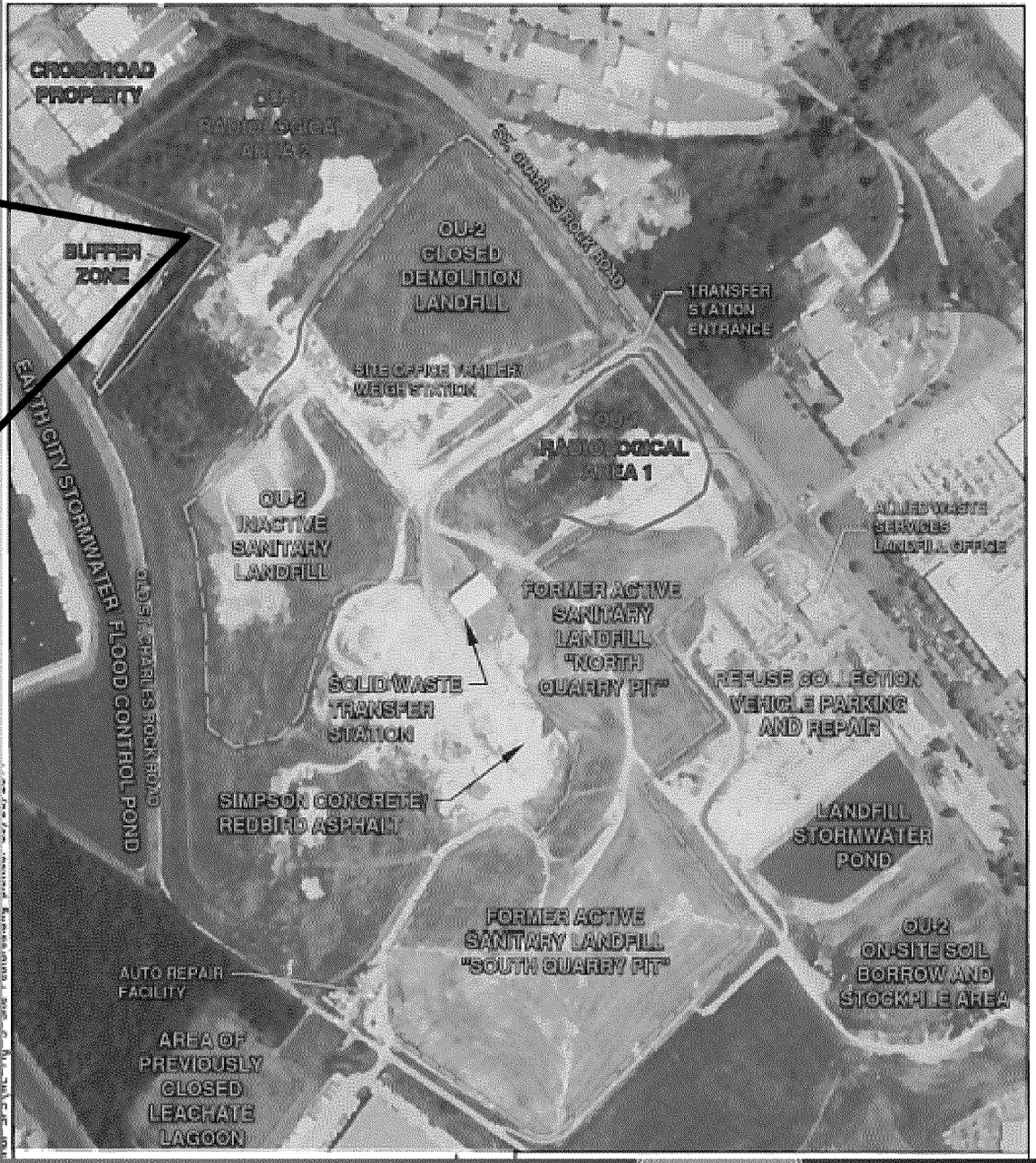
OU-1, Area 2 (Future Scenario)		
Potential Receptor	Location	Radionuclide Cancer Risk
Groundskeeper	On Area 2	[illegible]
Adjacent Building User	Area 2 (Paved and used for parking)	4E-05
Storage Yard Worker	On Area 2	4E-04



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

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



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

Questions or Comments?

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