

# Kirtland Air Force Base Fuel Leak Cleanup

**Presenters:** Kathryn Lynnes, Air Force  
Diane Agnew, New Mexico Environment Department  
Brian Renaghan, Air Force Civil Engineer Center



**Risk Assessment Summary**  
**September 28, 2017**



# Welcome



**Kate Lynnes**  
**Air Force Senior Advisor**



# A Partnership for Success

A collaborative technical team is solving the complex hydrogeologic and engineering challenges posed by the fuel leak with support from Albuquerque's neighborhood groups



US Army Corps of Engineers



Sundance Consulting Inc.

Westside Coalition  
Neighborhood Assoc.

Siesta Hills  
Neighborhood Assoc.



ABQ City Council  
District 6 Coalition of  
Neighborhood Assocs.



Elder Homestead  
Neighborhood Assoc.

Christ United Methodist Church HAWLEY GEOMATTERS

Thomson and Associates





**Col Nickell**  
**Air Base Wing Vice Commander**

# Project Status Report

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**Diane Agnew**

New Mexico Environment Department (NMED)

Hydrologist

# Regulatory Framework for Cleanup

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- Site investigation and cleanup activities at BFF follow a specific regulatory process known as Corrective Action
- Process steps and requirements are spelled out in:
  - 1 - state and
  - 2 - federal regulations
- Additional requirements for Corrective Action are detailed in:
  - 3 - Part 6 of the Kirtland AFB Hazardous Waste Treatment Facility Operating Permit (RCRA permit)
- Corrective Action process includes submittal of a RCRA Facility Investigation report (RFI) to include all data collected during investigation
- Risk Assessment (RA) Reports are also a requirement under RCRA and the Kirtland AFB RCRA Permit
- The RFI and the RA support the Corrective Action process.

# Recent Regulatory Decisions

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- In March 2017, NMED updated the “NMED Risk Assessment Guidance for Site Investigations and Remediation”
  - The RA is the guidance document for human health and ecological risk assessments completed at sites in New Mexico
- Sometimes, an RA may be submitted as part of a RFI report or as part of a Corrective Measures Evaluation
- In this case, the BFF RA Report is a stand-alone document, for important reasons.

# RFI vs. Risk Assessment (RA)

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## ***RCRA Facility Investigation***

Gather data to define the nature and extent of contamination and support the CME.

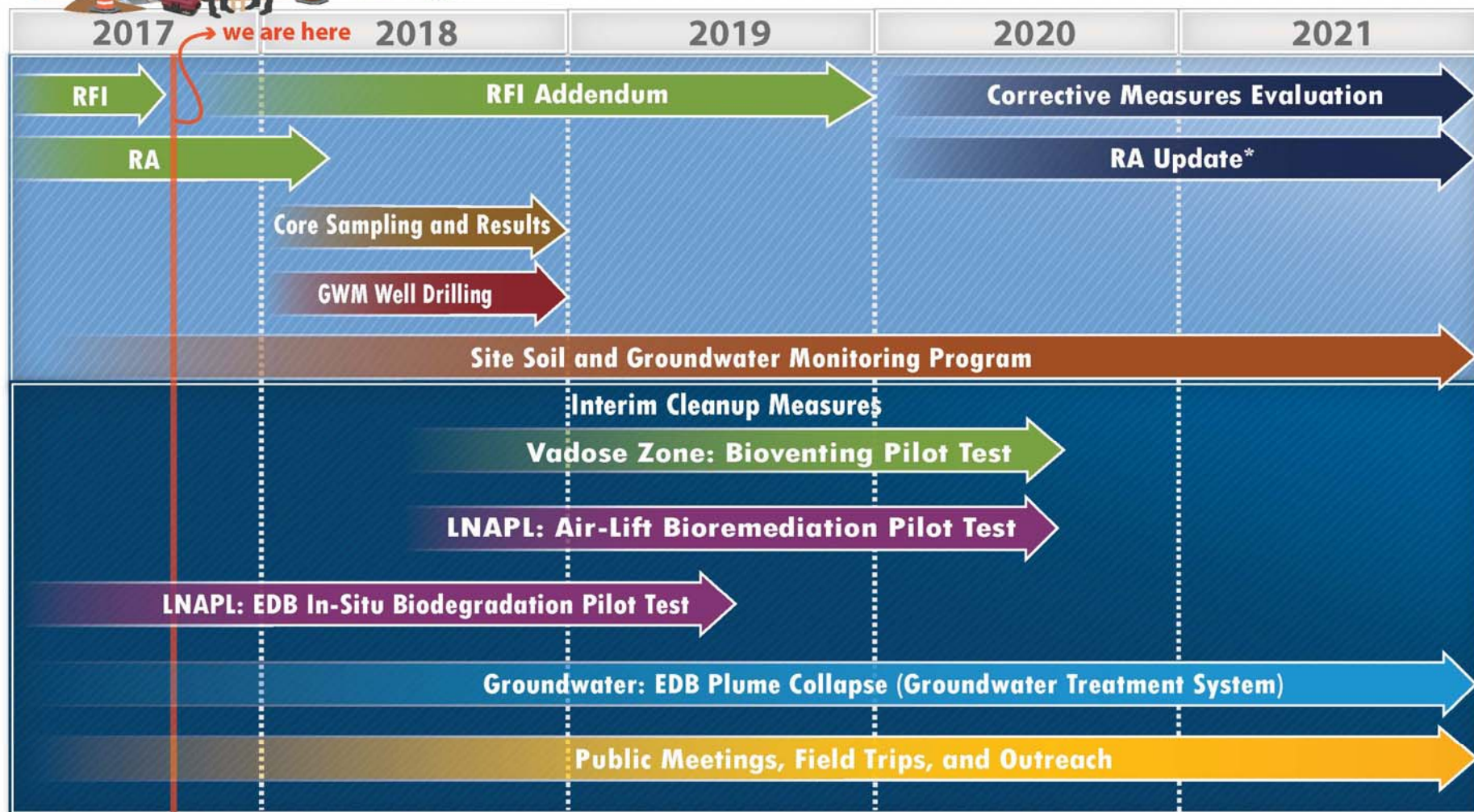
- Gather information on the source of the release
- Gather information on the physical aspects of the environment that affect migration and fate of release
- Develop a conceptual site model

## ***Risk Assessment***

Analyze the potential for adverse human health or ecological effects from contamination.

- Identify the hazards using site-specific data
- Assess potential exposure pathways using site fate and transport models
- Characterize the risk





» EDB - Ethylene Dibromide • LNAPL - Light Non-Aqueous Phase Liquid • RA - Risk Assessment • RFI - RCRA Facility Investigation Report

\* Risk numbers may be re-evaluated during CME if necessary

# RCRA Facility Investigation (RFI) Report

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- The RFI has three major areas of concern, as detailed in NMED's August 3, 2017 letter
  - Incomplete characterization of the dissolved-phase groundwater plume(s)
  - Technically incomplete and biased concentration trend analysis and estimation of degradation rates
  - Incomplete delineation of vertical and horizontal extent of light non-aqueous phase liquid (LNAPL)
- The Technical Working Group met on September 6-8, 2017 to discuss RFI issues
- NMED will formally submit comments on the RFI path forward via letter in October 2017

# What's next for the RFI Report?

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- RFI Report will be refined and improved, including:
  - Revisions to January 2017 RFI Report
  - Submittal of an RFI Addendum with additional data to be collected to close data gaps and update site conceptual model
- Data collection will be based on a series of work plans that are in production now and will be submitted for NMED review and approval
- In this way, the earlier submitted RFI with 2015 data can be made dynamic to reflect the water table levels of 2017 along with current and planned activities.

# Road Map for RFI and RA in 2017

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- Formal NMED comments on RFI Report
- Submittal of work plan to NMED for the installation of groundwater monitoring wells
- Finalization of Vadose Zone coring work plan to address existing LNAPL data gaps
- Formal NMED response to Risk Assessment Report

**Next Project Update Public Meeting with Technical Deep Dive**

November 14, 2017

5:30 – 8:00 p.m.

African American Performing Arts Center



# Risk Assessment

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**Ms. Kathryn Lynnes**

# Risk Assessment

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- Air Force submitted the Risk Assessment to NMED on July 21, 2017 and it is currently under review by NMED
- It evaluates:
  - Possible risks to human health
  - Possible ecological risks
- The report is organized by media (soil, soil gas and groundwater) and location (on-Site and off-Site)

# Key Findings of the Risk Assessment

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## Off-Base

- There are no risks to local residents from soil because there was never any surface soil contamination off-Base
- There are no gardening risks above the EDB plume
- There are no risks to recreational users of Bullhead Park
- There are no drinking water risks to residents because no groundwater contamination from BFF has affected community drinking water wells (Water Authority and VA Medical Center).

# Key Findings of the Risk Assessment

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## On-Site

- There are no risks to industrial workers from surface soil or soil vapor
- There are no risks to construction workers from surface soil or soil vapor
- There are no on-Site drinking water risks because no groundwater contamination from BFF has affected KAFB drinking water wells

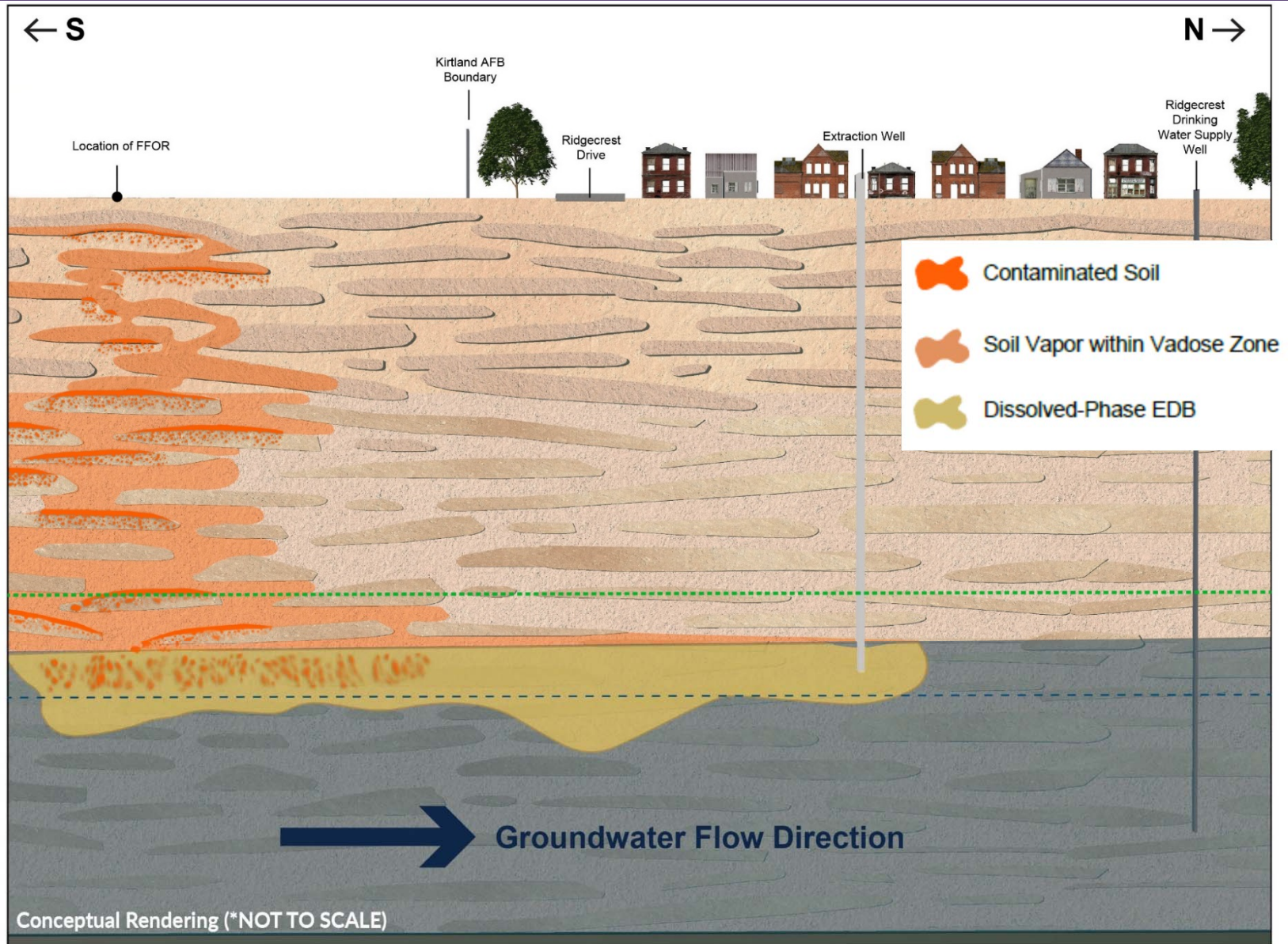


# Risk Assessment: Data Used

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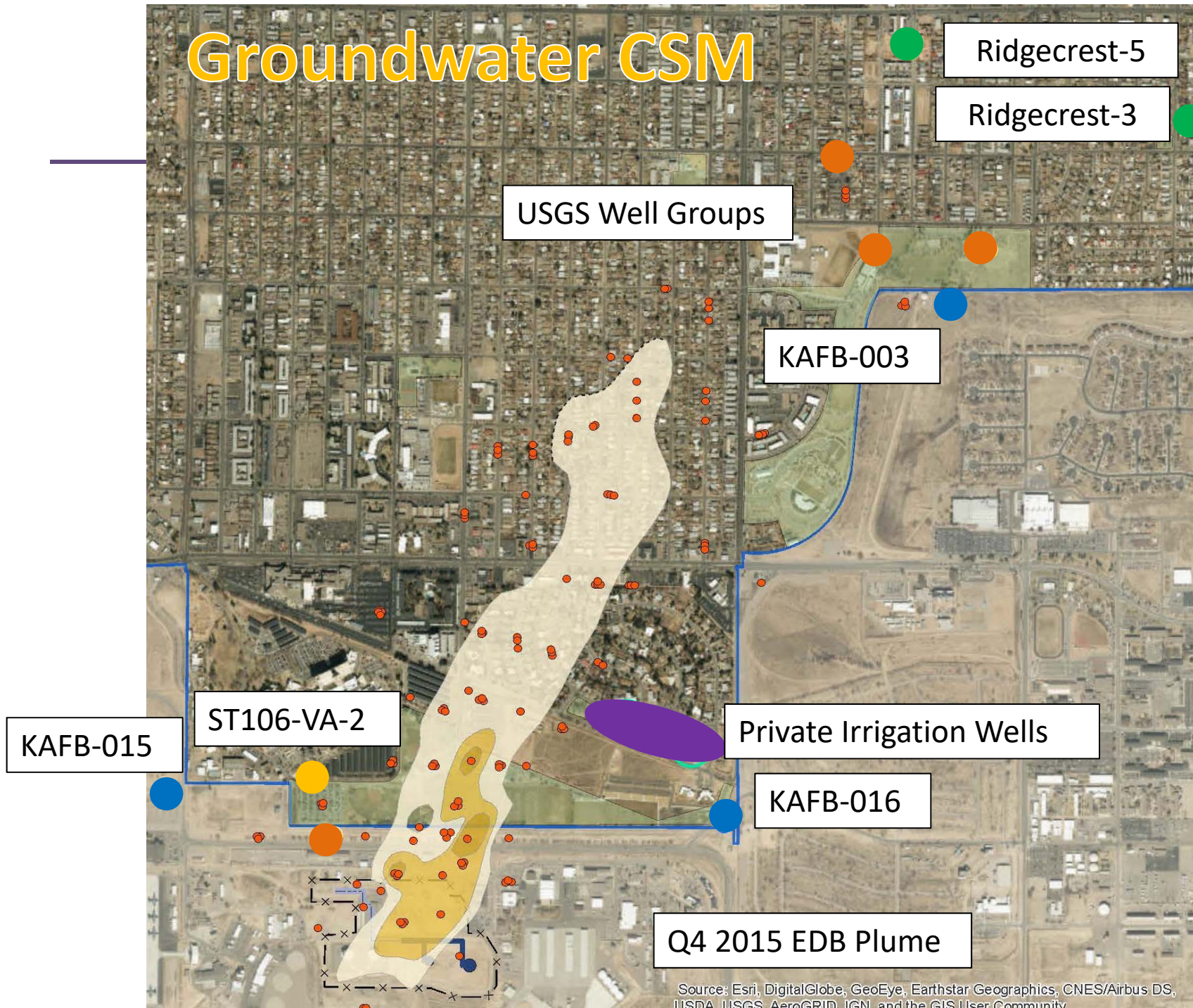
- The Risk Assessment used data from the RFI Report and Quarterly Monitoring Reports – focus on fuel constituents
  - The highest concentrations in the affected media were compared to NMED criteria
- These data, land use, and other factors were used to develop a conceptual site exposure model (CSEM)

# Conceptual Site Exposure Model



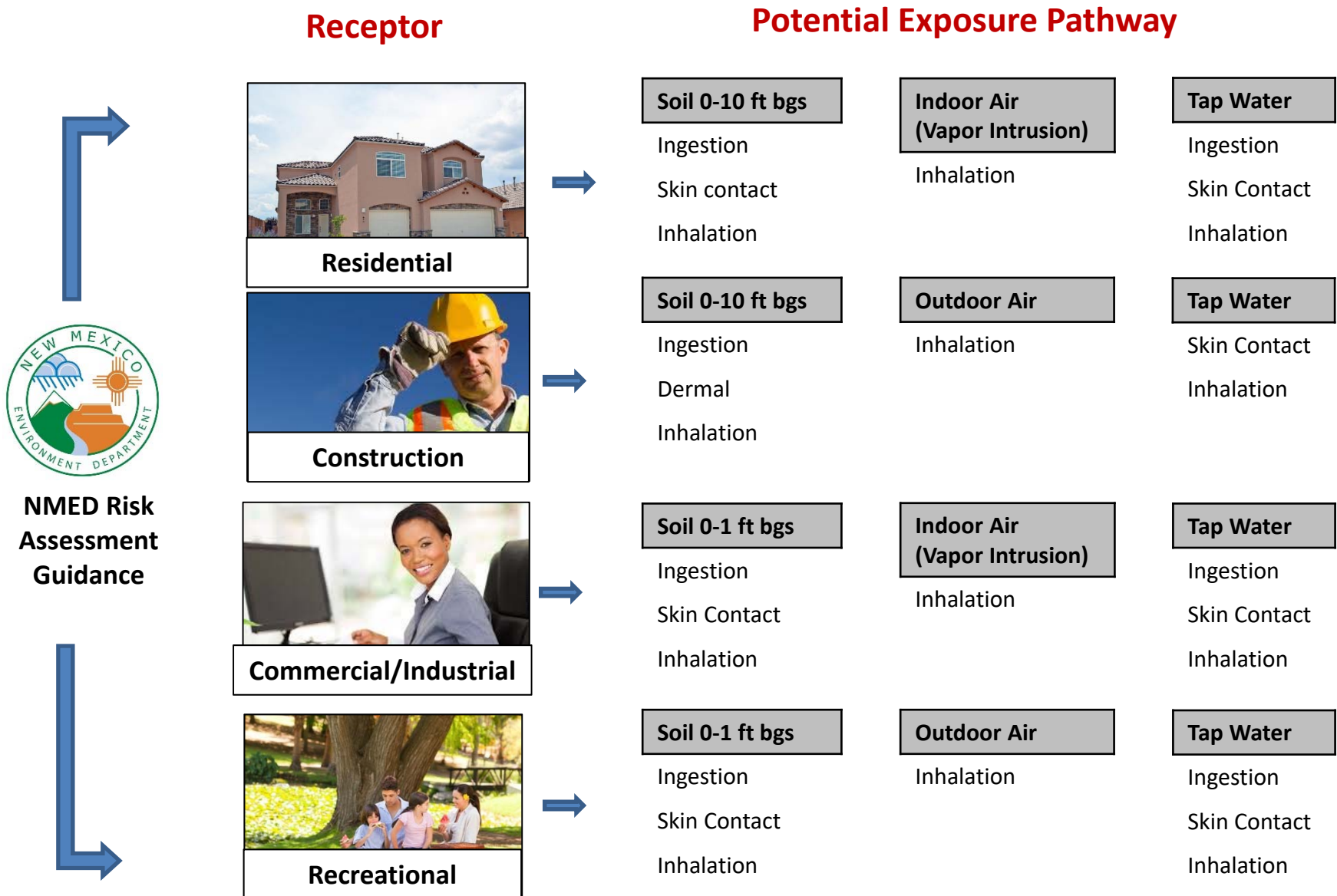


# Groundwater CSM



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

# Human Health Risk Assessment Overview





# Land Use

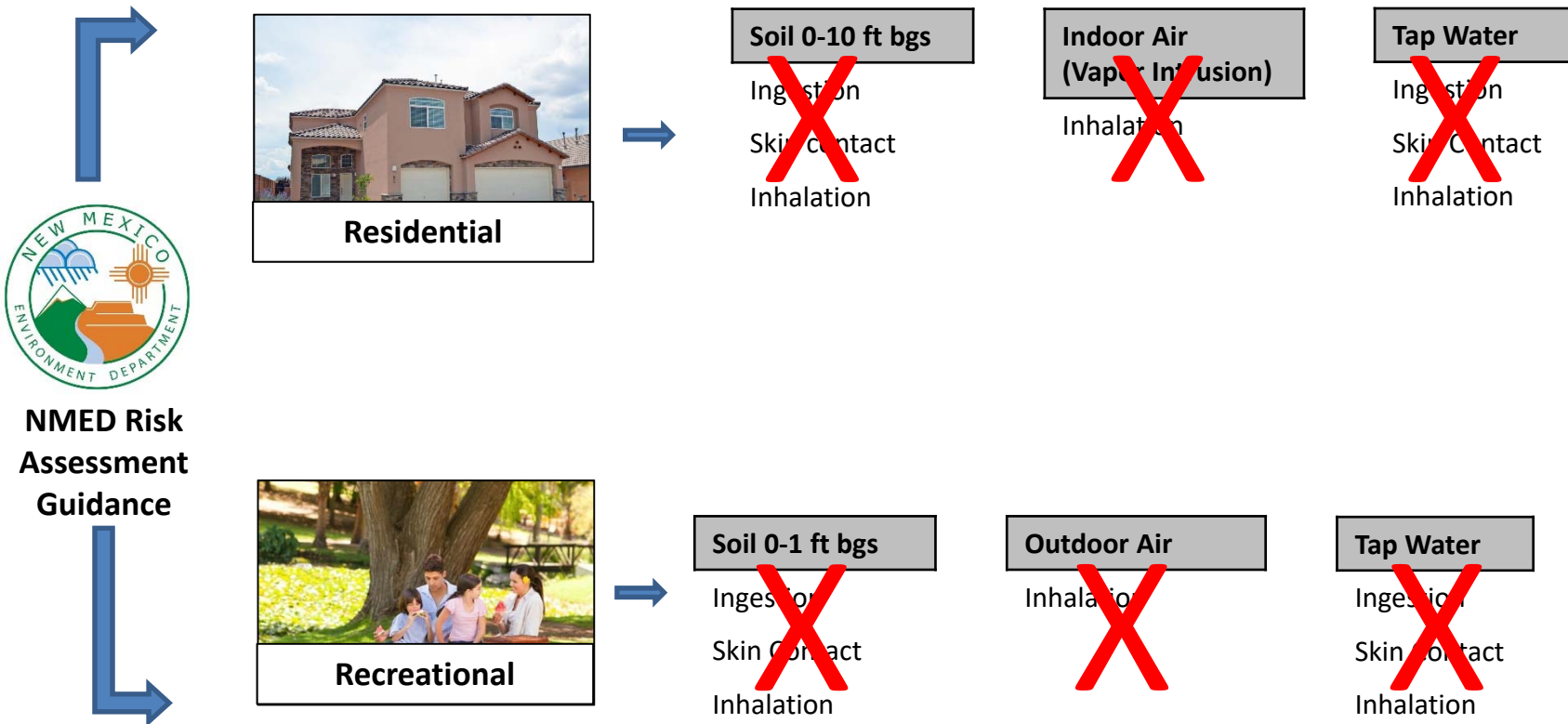
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- The Risk Assessment evaluates current and future land use both on-Site and off-Base
  - On-Site land use is primarily industrial
  - Off-Base land use includes recreational, residential and commercial
- Land use controls:
  - On-Site land use is highly controlled
  - Off-Base land use is subject to zoning restrictions
  - Office of State Engineer enacted a restriction on private well installation in and 500 ft around the plume boundary

# Exposure Pathways Off-Base

## Receptor

## Potential Exposure Pathway



# Exposure Pathways On-Site

## Receptor

## Exposure Pathway



NMED Risk Assessment Guidance

**Construction**

**Soil 0-10 ft bgs**  
Ingestion  
Dermal  
Inhalation

**Outdoor Air**  
Inhalation

~~X~~

**Tap Water**  
Skin Contact  
Inhalation

~~X~~

**Commercial/Industrial**

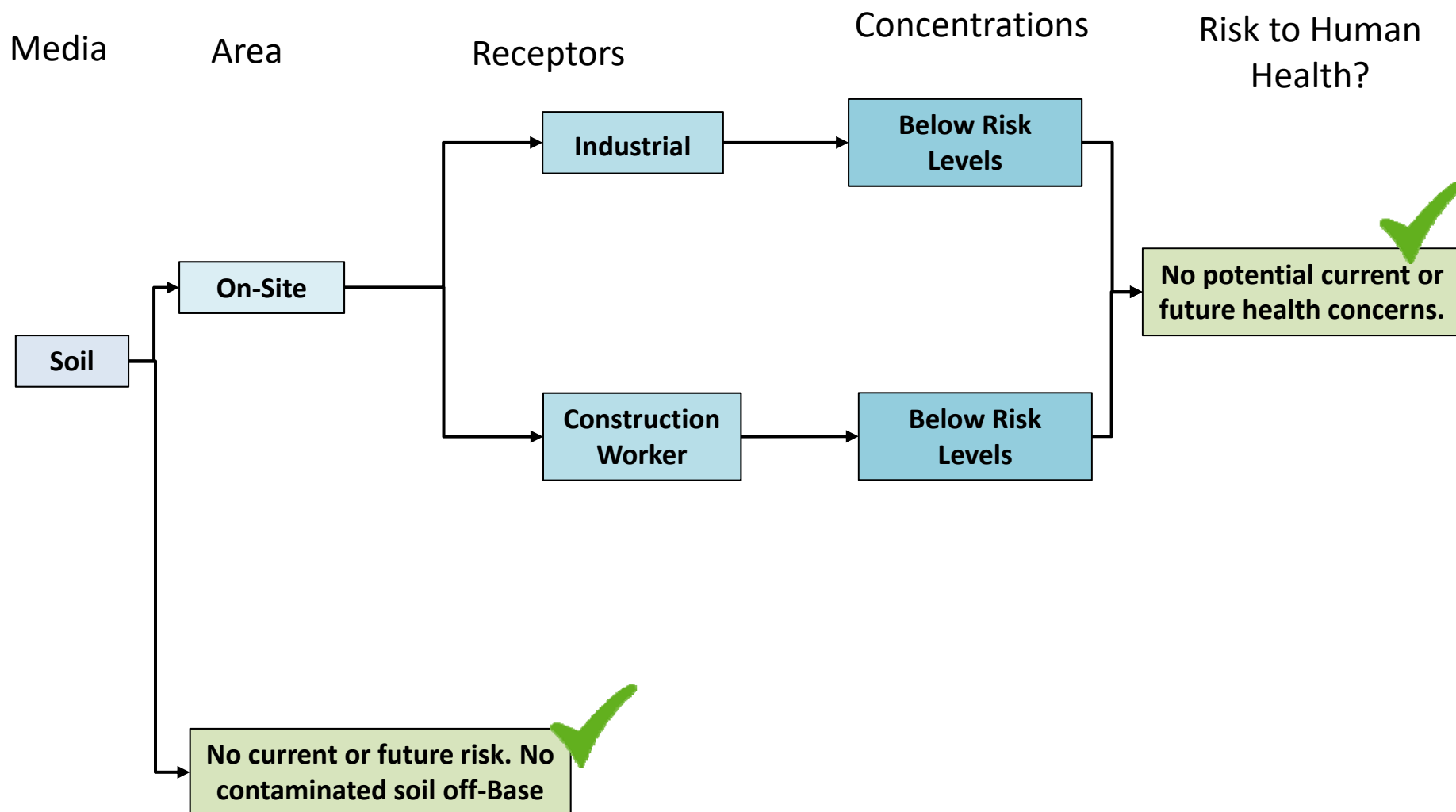
**Soil 0-1 ft bgs**  
Ingestion  
Skin Contact  
Inhalation

**Indoor Air (Vapor Intrusion)**  
Inhalation

**Tap Water**  
Ingestion  
Skin Contact  
Inhalation

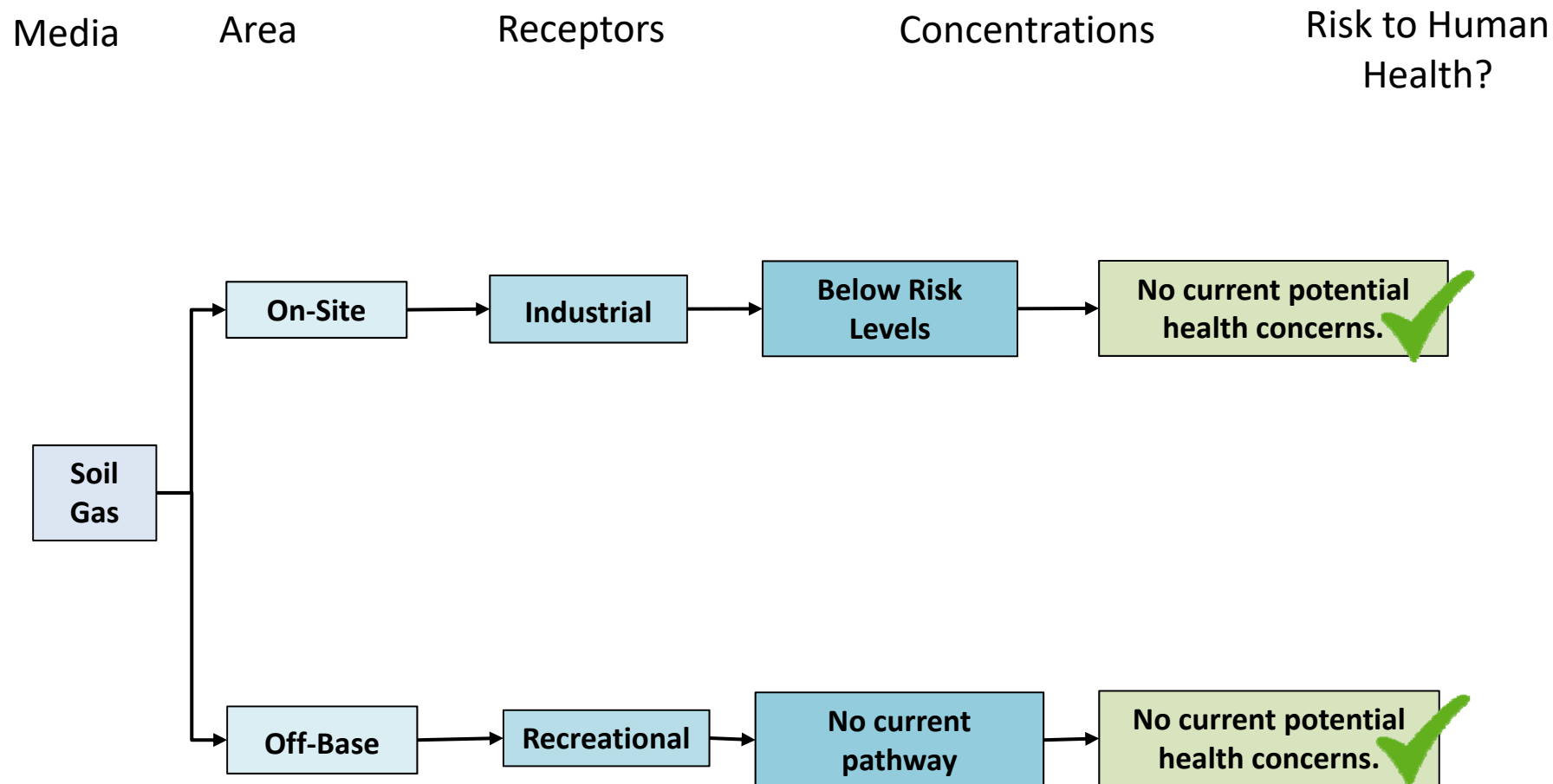
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# Risk Assessment Results: Soil

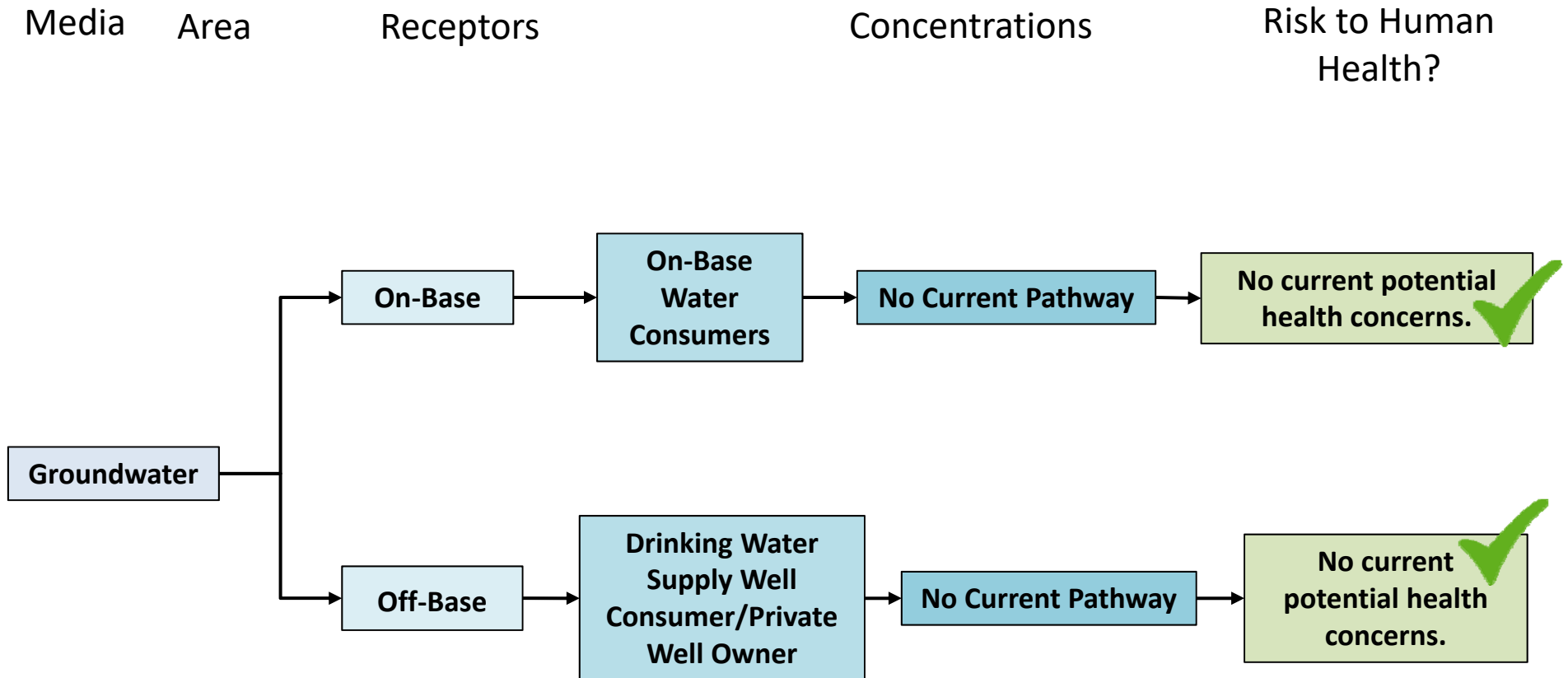




# Risk Assessment Results: Soil Gas



# Risk Assessment Results: Groundwater



# Path Forward

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- Risk Assessment a snapshot in time – used current site data
- Risk Assessment will be revisited during CME process to address:
  - New data in the RFI Addendum Report
  - Identify the need for formal land use controls

# Questions and Answers

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- One question/comment per turn at the microphone
- We request that each question/comment be limited so that everyone has an opportunity to be heard
- Comment cards have been made available:
  - Return completed comment cards to NMED and/or Air Force staff
  - Questions will be incorporated into the Kirtland AFB BFF project website:

[www.kirtlandjetfuelremediation.com](http://www.kirtlandjetfuelremediation.com)

# How do I get more information?

## **Contact NMED:**

Allison Majure	Communications Lead	(505) 827-2855	<a href="mailto:Allison.majure@state.nm.us">Allison.majure@state.nm.us</a>
Diane Agnew	Technical Lead	(505) 222-9555	<a href="mailto:diane.agnew@state.nm.us">diane.agnew@state.nm.us</a>

**NMED Website and Listserv:** [www.env.nm.gov/kabfuelplume](http://www.env.nm.gov/kabfuelplume)

## **Contact the Air Force:**

Kathryn Lynnes	Senior Advisor	(505) 846-8707	<a href="mailto:kathryn.lynnes@us.af.mil">kathryn.lynnes@us.af.mil</a>
AFCEC Public Affairs		(866) 725-7617	<a href="mailto:afcec.pa@us.af.mil">afcec.pa@us.af.mil</a>
Kirtland AFB Public Affairs		(505) 846-5991	<a href="mailto:377ABW.PA@us.af.mil">377ABW.PA@us.af.mil</a>

**Air Force Bulk Fuels Facility website:** [www.kirtlandjetfuelremediation.com](http://www.kirtlandjetfuelremediation.com)

**Kirtland AFB website:** [www.kirtland.af.mil](http://www.kirtland.af.mil) in the Environmental Issues section for Public Records

# THANK YOU!

## Field Trips



## Well installation in neighborhoods



## Source Area Cleanup



## GWTS



# Questions?

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Photo Credit: Rebecca Cline

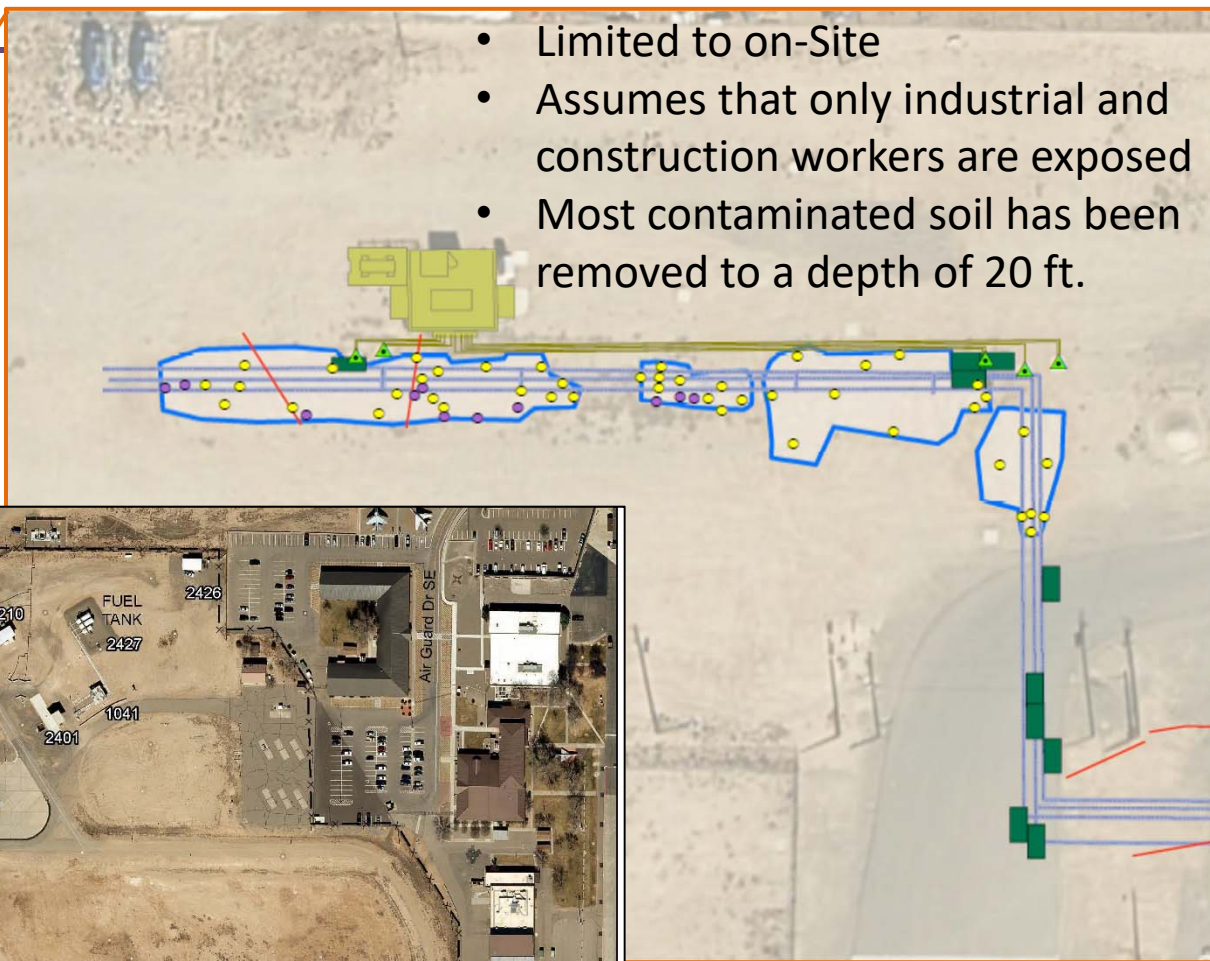
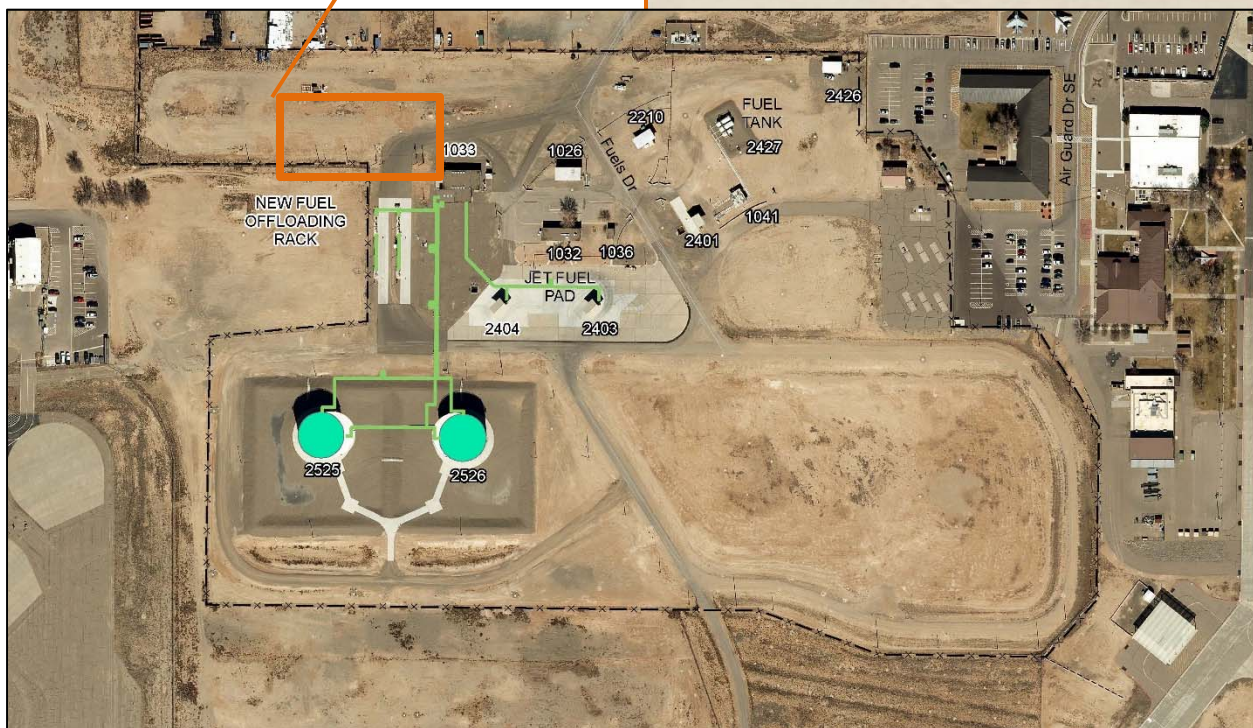
# Extra Slides

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# Soil CSM

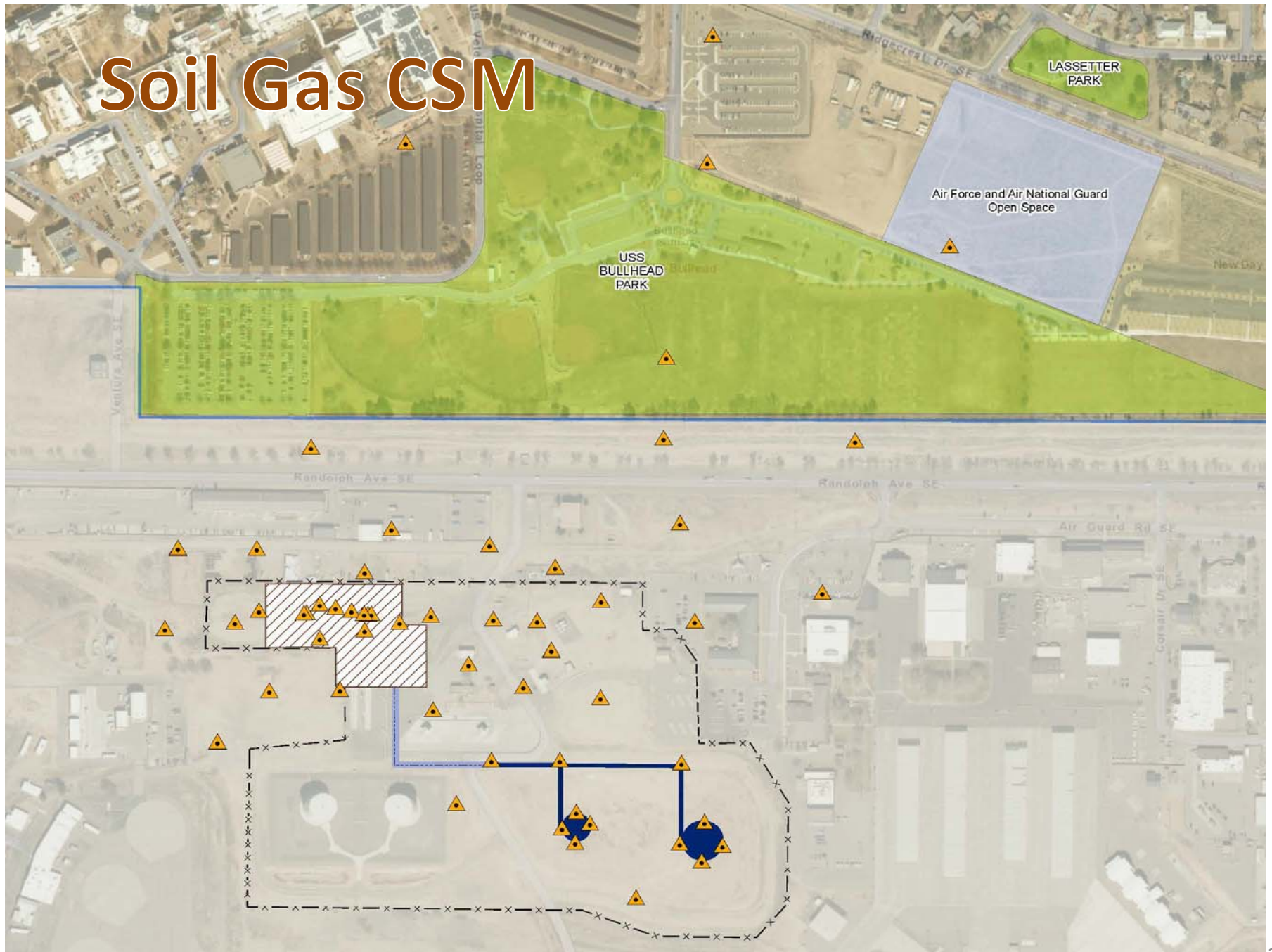
Bulk Fuels Facility



- Limited to on-Site
- Assumes that only industrial and construction workers are exposed
- Most contaminated soil has been removed to a depth of 20 ft.

Former Fuel Offloading Rack

# Soil Gas CSM

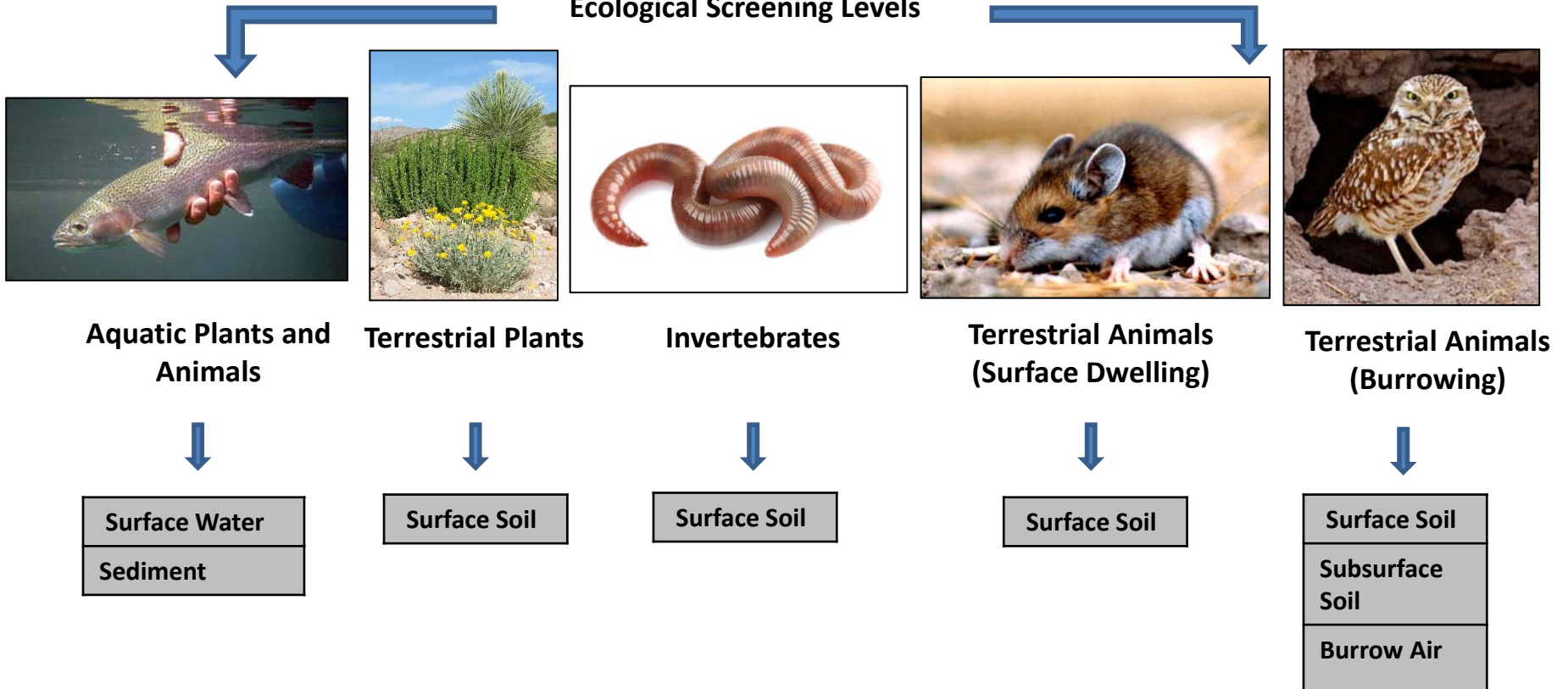




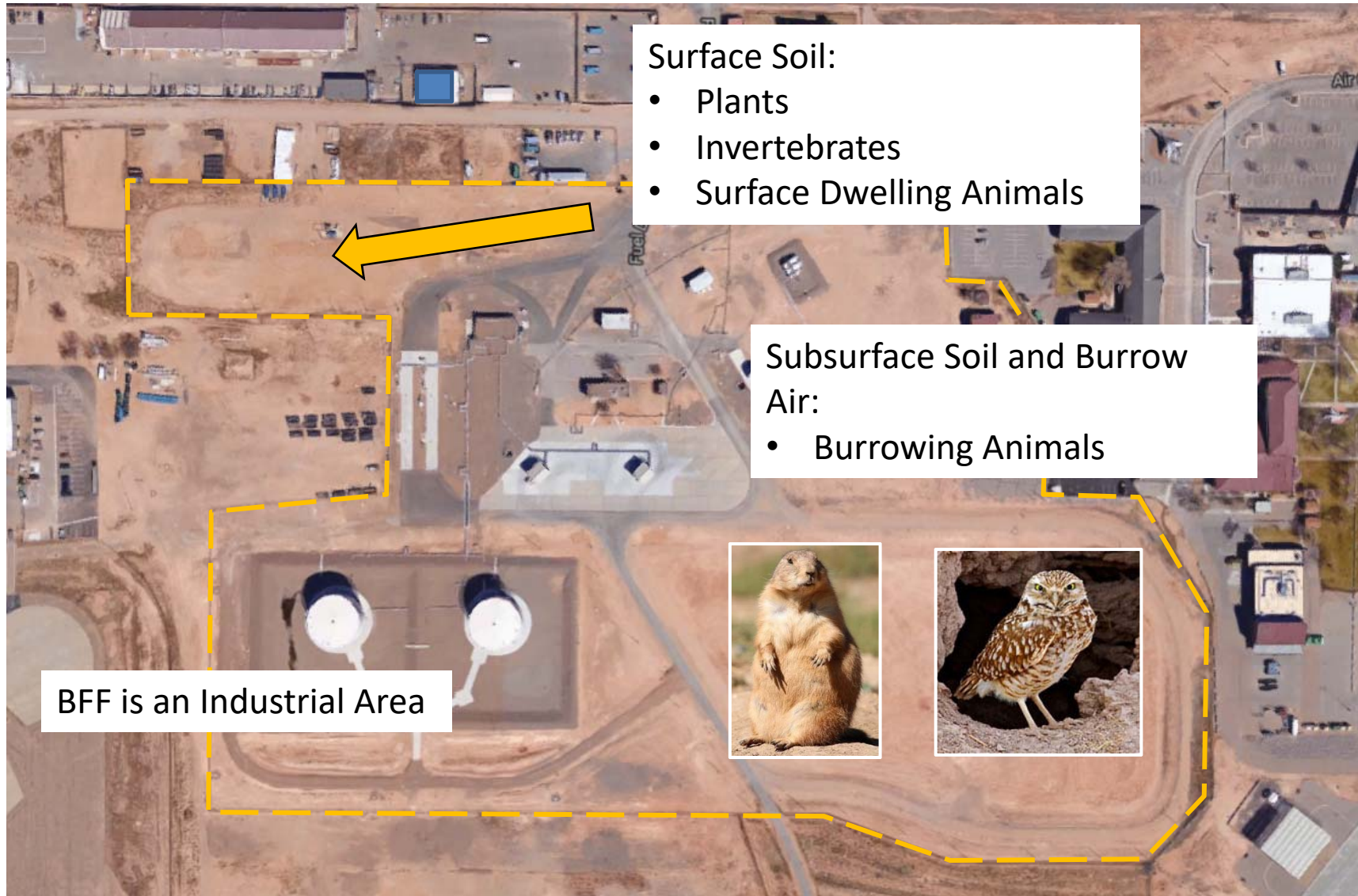
# Ecological Risk Assessment



## NMED Risk Assessment Guidance/ Ecological Screening Levels



# ERA: Receptors and Complete Exposure Pathways



Surface Soil:

- Plants
- Invertebrates
- Surface Dwelling Animals

Subsurface Soil and Burrow Air:

- Burrowing Animals

BFF is an Industrial Area



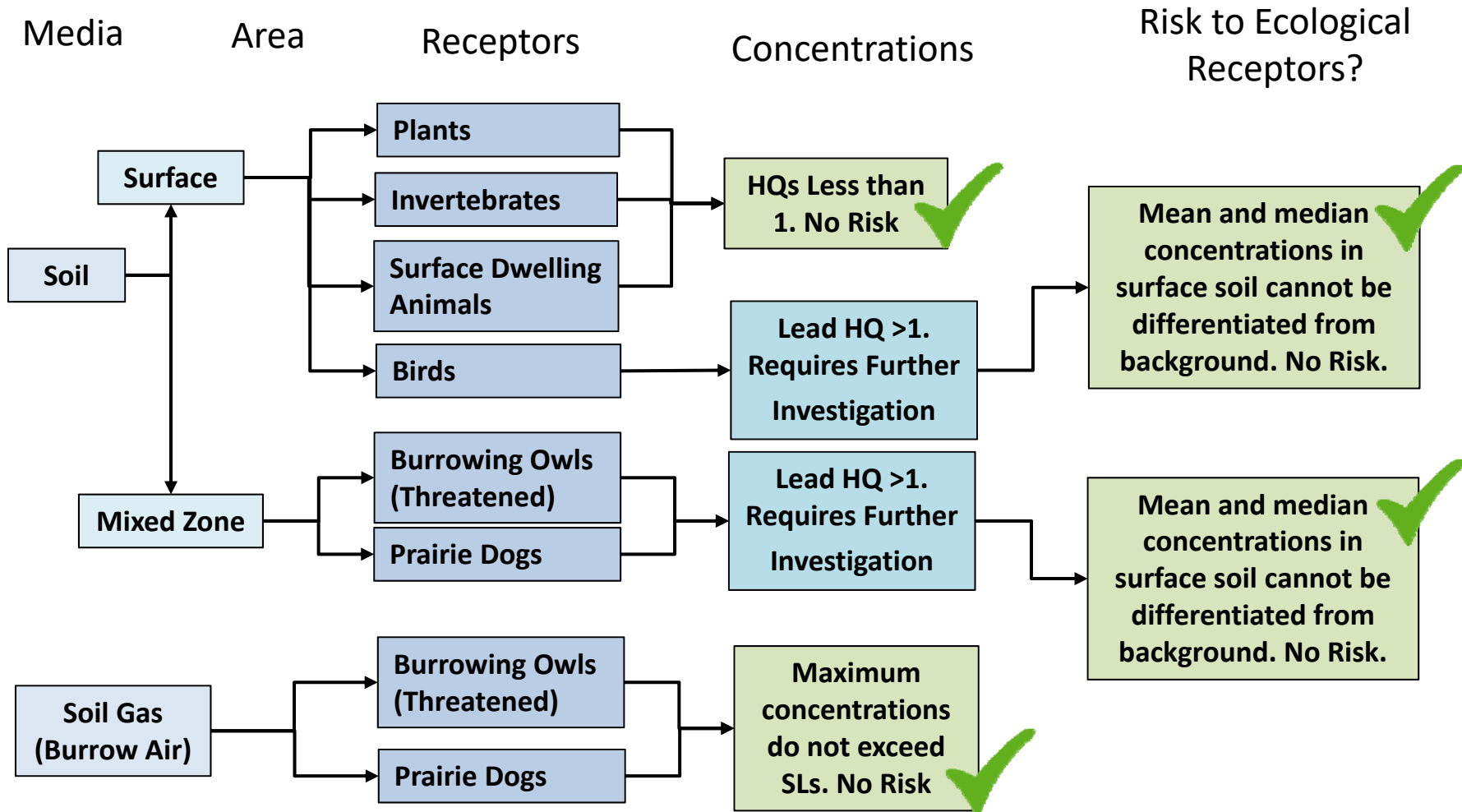
# ERA Risk Calculations

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- Do maximum concentrations of Site related chemicals exceed ESLs for identified receptors?
- Evaluates concentrations to determine HQ
  - $HQ < 1$ : most likely receptor is not at risk
  - $HQ > 1$ : additional investigation necessary



# ERA Results



# Overview of Risk Assessment Process

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- NMED's Risk Assessment guidance follows the same process as EPA, including:
  1. Describing exposure scenarios for residential, commercial/industrial, and construction land uses
  2. Identifying exposure pathways for each of these land uses
  3. Identifying conservative exposure assumptions designed to "over-estimate" exposure
  4. Identifying "target risk and hazard levels"
  5. Developing conservative screening levels

# Exposure Questions

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- How do people come into contact with contaminants?
  - Who may be exposed?
  - Residents? Workers? Recreational Users?
- Where were chemicals detected?
  - Soil? Groundwater?
- How are people exposed (pathways)?
  - Ingestion? Inhalation? Skin contact?
- How much is someone exposed?
  - For example, how much water do they drink per day?
  - And what is the frequency and duration? Lifetime? Short-term?

# Factors Used in Developing Screening Levels

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- Toxicity Assessment
  - Use data from animal and human studies
  - Considers:
    - Type of harmful effect associated with chemical exposure
    - Could it cause cancer?
    - Could it cause non-cancer effects (e.g., nasal irritation)
  - Relationship between amount of exposure and harmful effects
    - What concentration causes a harmful effect?
    - How much exposure is needed before a harmful effect is seen?
  - Uncertainties (e.g., evidence of chemical's effect)

# Screening Levels

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- Screening levels (SLs) are developed for each type of:
  - Media (e.g. soil, soil vapor and groundwater) and
  - Land use/exposure scenario (i.e.: residential, commercial/industrial and construction worker)
- At sites where contaminant concentrations fall below SLs, no further action or study is generally needed
- If a contaminant exceeds a SL it doesn't automatically mean that cleanup is required or –  
*”define ‘unacceptable’ levels of contamination”*

# Residential Soil SLs

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- Residential SLs are the most conservative SL because they are based on:
  - Both child and adult receptors
  - The assumption that a person is at their home 24 hours a day, 350 days per year for 26-years
- Assumes resident is exposed to soil (to depths of zero to 10 feet bgs) during home maintenance activities, yard work and landscaping, and outdoor play activities
- Three exposure pathways – direct ingestion, contact with skin, and breathing volatiles and fugitive dusts



# Commercial/Industrial Soil SLs

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- Unlike residential soil SLs commercial/industrial SLs are based solely on adult receptors
- Assumes that a long-term employee is exposed to soil through maintenance or grounds keeping during the course of a work day
- Assumes that the worker is exposed to surface and shallow subsurface soils (0-1 foot bgs) during moderate digging

# Construction Worker Soil SLs

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- Based solely on adult receptors
- Assumes that a worker is exposed to contaminated soil during the work day for the duration of a single on-site construction project
- Assumes that a worker exposed to contaminants in the top 10 ft of soil by incidental soil ingestion, contact with skin, and breathing contaminated outdoor air

# Vapor Intrusion Screening Levels

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- Volatile compounds may move upward from soil and/or groundwater as soil gas through pore spaces in soil above the water table through building foundations (or slabs) into indoor air
- NMED developed vapor intrusion screening levels (VISLs) to estimate potential risks and/or hazards from exposure to volatile compounds in buildings – they are not meant to be used as action standards or cleanup levels
- Only evaluated if buildings are present or may be built in the future

# KAFB Risk Assessment Overview

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Using Site data and the Conceptual Site Model the following steps were completed:

1. Receptors Identified
2. Pathways were evaluated to determine if they were complete or incomplete
3. Site chemical concentrations were compared to NMED target risk levels
  - Cancer risk - Above and beyond probability of general population due to other sources, such as sun exposure
  - Non-cancer risk – designed to protect even sensitive groups

# HHRA Risk Calculations

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- Maximum concentrations of Site related chemicals were evaluated for complete exposure pathways
- Sums are compared to NMED risk levels
  - Evaluated cancer risk
  - Evaluated noncancer risk