

Making Risk-Based Decisions on the North Slope of Alaska:

Application of Lessons Learned at Locations with Unique Environmental and Cultural Conditions

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FINAL

Risk Evaluation Report: Alaska North Slope Radar Installation Sites

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Risk Evaluations at North Slope Alaska Air Force Installations
Reporting to Headquarters Pacific Air Forces





Location of North Slope Radar Installation Sites

The Problem

- Standard methodologies resulted in client and regulators getting “stuck” on important risk-related issues.
- Outside-the-box thinking necessary due to unique environmental, ecological, and cultural conditions, but was not happening.

➤ **Site management decisions languished.**

Keys to Success

- Establishment of working group (including representatives from Alaska DEC, U.S. EPA, Air Force, and consultants).
- Site visits by working group.
- Documentation of site visit findings using customized checklists and photographs.
- Consultation with the local population, including Alaska native communities.
- Development of consensus methodologies, including detailed conceptual site models for North Slope sites.
- Derivation of risk-based levels using consensus methodologies.
- Prominent use of hazard evaluation.

Working Group



Site Visits





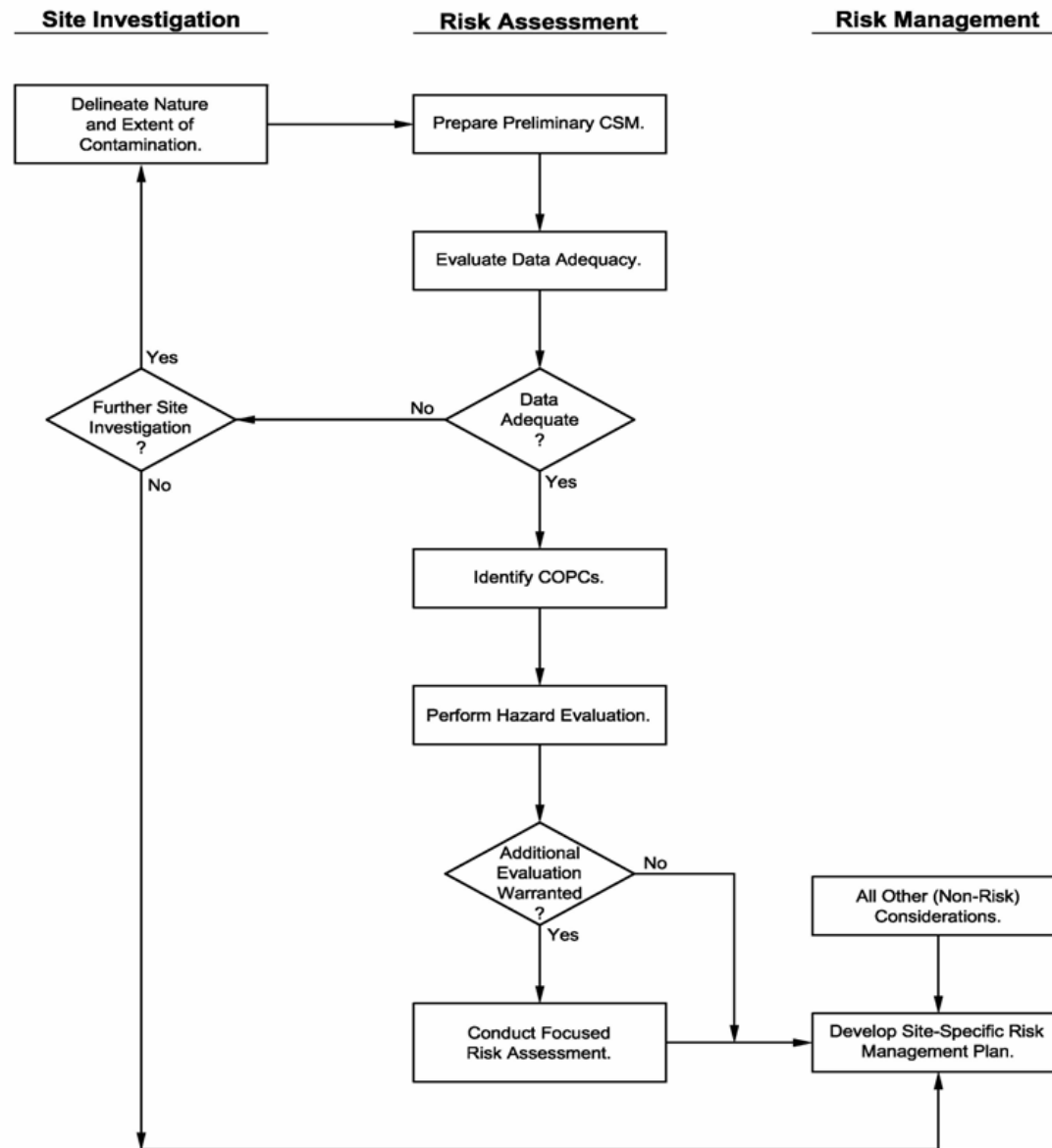








Consensus Methodologies



General Steps in the Risk Evaluation Process

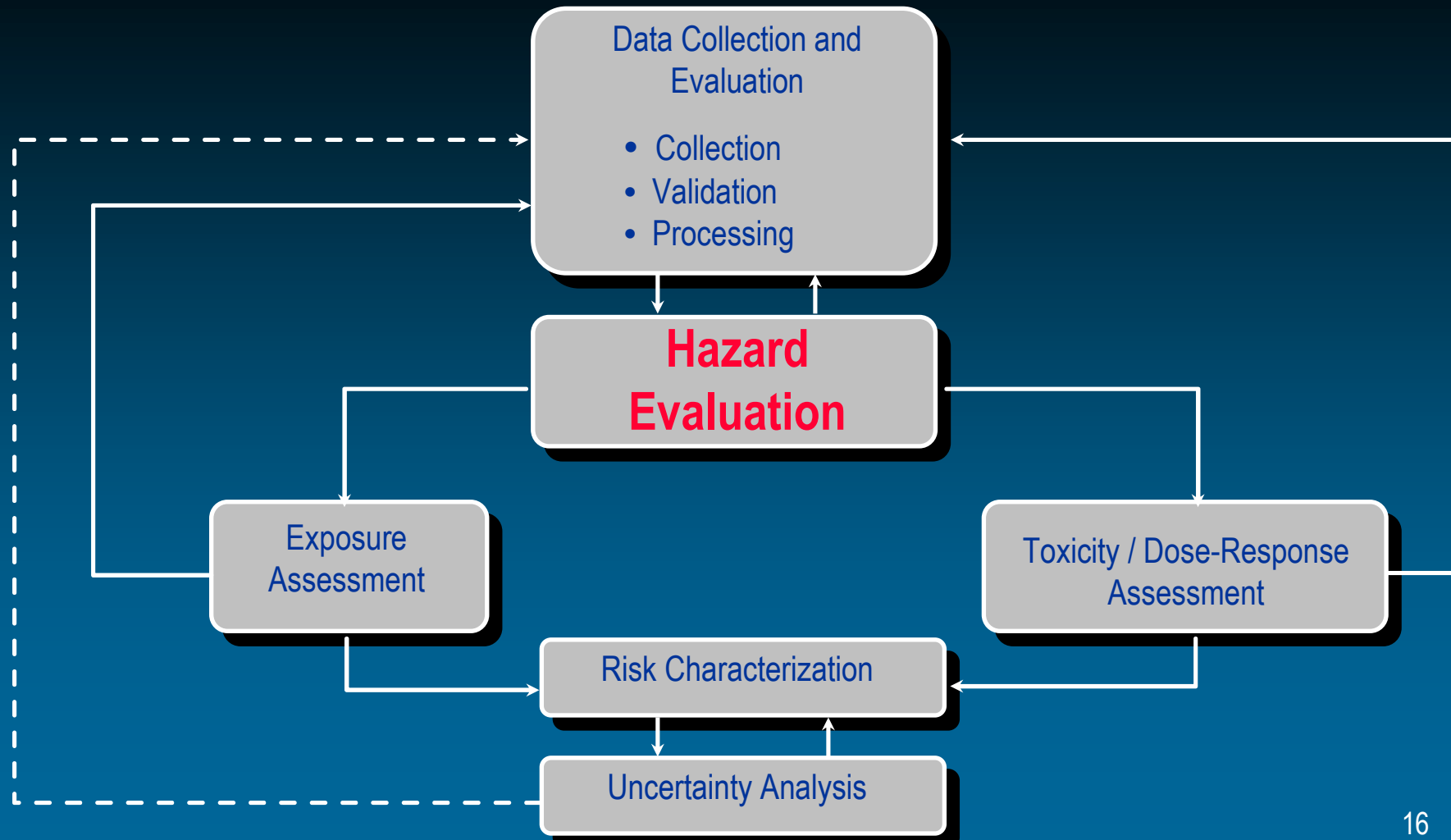
North Slope Risk-Based Levels (RBLs)

- RBLs calculated for target contaminants and ecological and human receptors and exposure pathways of concern specific to the arctic region.
- Served as one tool in the weight-of-evidence hazard evaluation process.
- Provided short-cut for identification of sites that clearly do not pose an unacceptable risk.

Example Human Health RBLs

HHRBL	Receptor	Sampled Medium	Exposure Medium	Exposure Route
SHS_{ing}	Subsistence Harvester	Soil	Soil	Ingestion
$SHSW_{der}$	Subsistence Harvester	Surface Water	Surface Water	Dermal
$SHDW_{ing}$	Subsistence Harvester	Surface Water	Drinking Water	Ingestion
$SCS-WF/V_{ing}$	Subsistence Consumer	Soil	Wild Food/ Vegetation	Ingestion

Hazard Evaluation



Hazard Evaluation

- A hazard evaluation involves making reasonable judgments about whether a potential hazard exists and the relative threat associated with each (weight-of-evidence approach).
- A thorough examination of the potential hazards as an initial step in the risk evaluation can help achieve consensus on the specific hazards that warrant further evaluation.

Often Overlooked or Underutilized

- Unfortunately, an initial hazard evaluation is a step in the risk assessment process that is often overlooked.
- This step is often limited to screening contaminant concentrations against risk-based levels or other decision criteria to identify chemicals of potential concern.

Tools for Conducting a Hazard Evaluation

- Site-visit checklists
 - Conceptual site models (CSMs)
 - Risk-based levels (RBLs)
- **Weigh the evidence to achieve consensus on the specific hazards that warrant further evaluation.**

The Hazard Evaluation Process

Essential elements include:

1. Systematic and comprehensive review of available information on identified actual or potential hazards.
2. Sorting the hazards into categories such as “high concern”, “moderate concern”, “low concern”, and “unknown concern”.
3. Identifying associated uncertainties.

Value of the Hazard Evaluation

- Starts out with a comprehensive list of potential hazards.
 - Sifts down to the hazards of most concern that warrant further evaluation in the risk assessment.
 - Poses the specific questions that the risk assessment should answer.
- **Focuses the risk assessment on hazards that legitimately may pose a threat to human and/or ecological receptors.**

Outcome of the Hazard Evaluation

Used to make decisions on the path forward for each site.

Example outcomes might be:

- No further action
- Additional site investigation to reduce uncertainties
- Additional evaluation in a risk assessment
- Remedial action

➤ **If additional risk assessment is warranted, the hazard evaluation identifies the specific question(s) that should be answered.**

Questions Identified by Hazard Evaluation

The hazard evaluation may pose a question for the risk assessment to answer that involves something other than calculation of risk. For example, if the concern is potential harm to caribou in an arctic environment, the essential question may be:

- **“Is there sufficient mass of contaminant to result in significant exposure?”**, or
- **“What percentage of the caribou’s diet can be supplied by potentially impacted vegetation in the area of contamination?”**

Example Application: Hazard Evaluation

Garage Site at Radar Installation on the
North Slope of Alaska







Tools for the Hazard Evaluation

- Site Visit
- Checklist
- Ecological and Human Health Conceptual Site Models
- Risk-Based Levels Specific to the North Slope

Weight-of-Evidence Evaluation

For each receptor and exposure pathway of concern:

- Rates exposure potential
- Rates likelihood of adverse effects if pathway is complete
- Identifies key uncertainties
- Documents if further evaluation is warranted
- Poses the question(s) that should be answered if further evaluation is pursued

Example: Hazard Evaluation Summary Table for Subsistence Harvester

Exposure Pathways of Potential Concern	Exposure Potential	Likelihood of Adverse Effects if Pathway is Complete
Incidental ingestion of, dermal contact with sediment	None: No biota present in impacted tundra pond that are or may be harvested. Exposure while harvesting aquatic biota is unlikely to occur.	Low: No exceedances of HHRBLs for this receptor and pathway of exposure.

Example: Hazard Evaluation Summary Table for Subsistence Harvester (Cont.)

Key Uncertainties	Further Risk Evaluation Warranted?	Question(s) that Should be Answered?
Due to limited number of samples, there is uncertainty in the magnitude and extent of PAH and metals concentrations in sediment.	No. Uncertainties are acceptable given low exposure potential.	None

Example: Hazard Evaluation Summary Table for Resident

Exposure Pathways of Potential Concern	Exposure Potential	Likelihood of Adverse Effects if Pathway is Complete
Incidental ingestion of, dermal contact with soil	Low: Owner does not intend to transfer site. If transferred, site is not well suited for constructing residence.	Moderate: Detected results for arsenic, lead, and PCBs exceed relevant HHRBLs, but magnitude of exceedances is low.

Example: Hazard Evaluation Summary Table for Resident (Cont.)

Key Uncertainties	Further Risk Evaluation Warranted?	Question(s) that Should be Answered?
Size of area of elevated lead and PCB contamination. Extent of contamination is presumed to be limited.	Yes. Assessment of residential scenario provides owner and ADEC with information useful for evaluating site management options, including need for land use controls.	If owner transfers garage site for unrestricted land use, and a residence is constructed, what is the reasonable maximum cumulative risk posed by site-related COPCs in soil?

Conclusions of the Hazard Evaluation

- Further evaluation of incidental ingestion of and dermal contact with soil by a resident is warranted in a focused risk assessment.
- Further evaluation of all other receptor/pathway combinations is not warranted because there is low to no exposure potential and low likelihood of adverse effects even if exposure does occur.

Other Applications of the Hazard Evaluation Process

The hazard evaluation process:

- Provides format and content focus for interactions with native and local populations (e.g., in the context of citizens advisory groups).
- Supports effective risk communication (e.g., in public meetings or other public forums).
- Can be customized to support and enhance EIS/EA permitting activities.

What We Gained

Through the North Slope work, we gained:

- Trust of regulators.
- Knowledge of cultural and environmental issues in the arctic.
- A risk assessment process that works and has been approved by ADEC.

➤ **The process can be replicated in Alaska, particularly in the arctic region, and also in other areas of the world with unique environmental conditions.**