



Case Study: Kemess South Mine Reclamation and Closure (Development of a Risk-Based Remediation Plan)

NORTHERN LATITUDES MINE RECLAMATION WORKSHOP

Presented by:

Liza Flemming, P.Geo /P.Geol (BC, AB, NWT/NT)

Project Manager

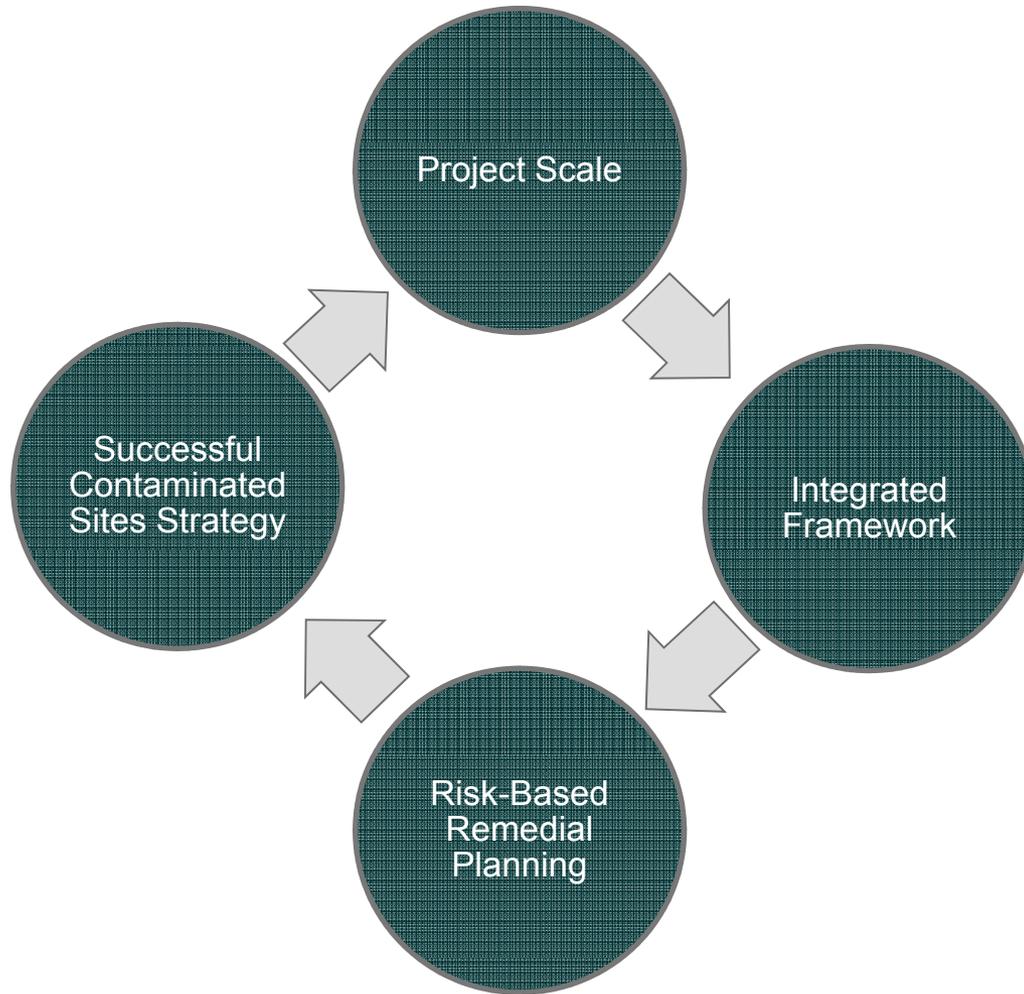


Agenda

1. Project Overview and Site Description
2. Site Screening and Investigation Process
3. Risk Assessment and Remedial Action Plan
4. Outcomes and Project Summary



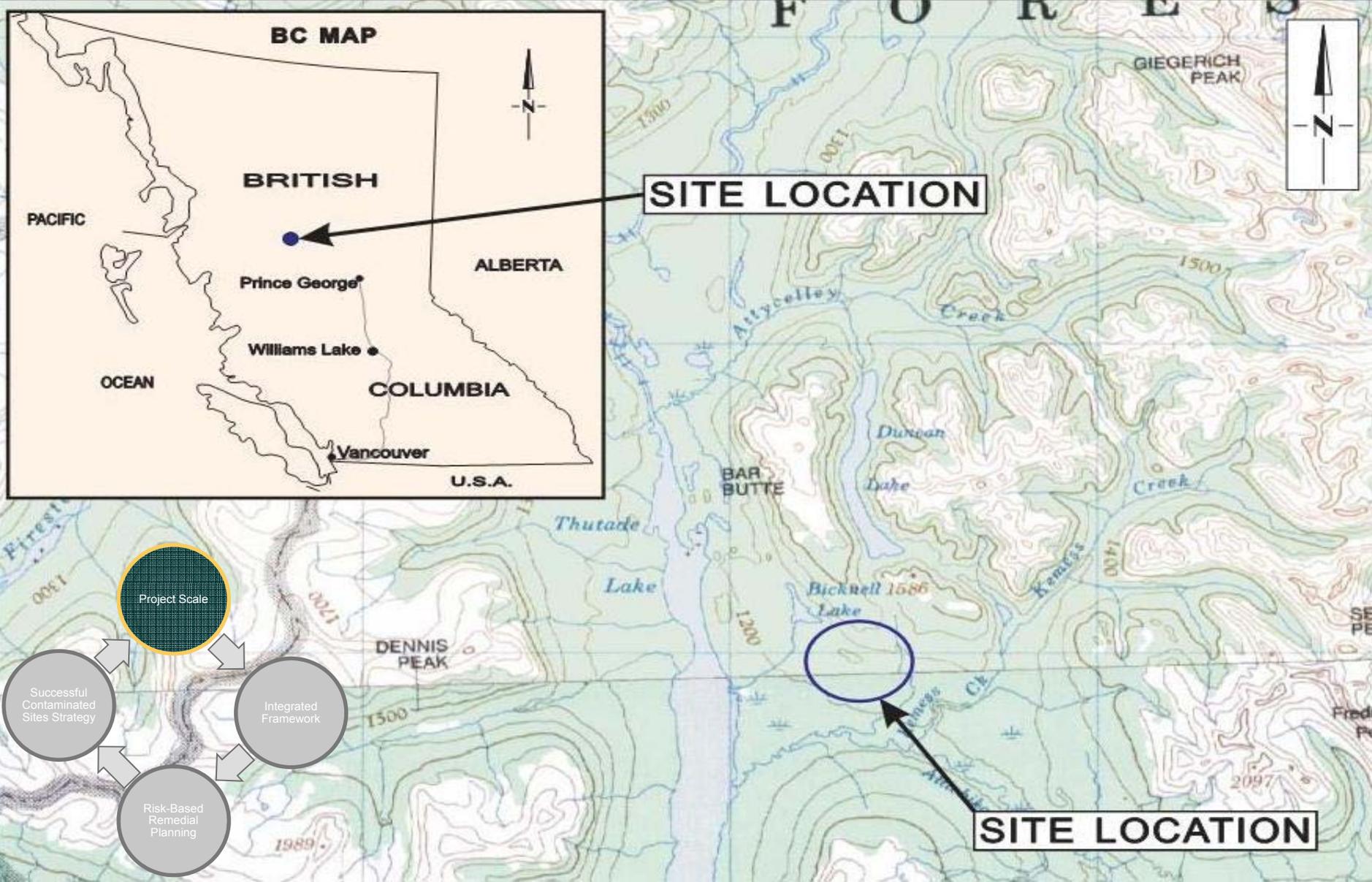
Case Study – Essential Components



- **Project Scale**
 - Both the site itself and our overall scope
- **Integrated Framework**
 - Complex regulatory requirements and multi-phase approach
- **Risk-Based Remedial Plan**
 - Focused, site-specific
- **Successful Site Closure Strategy**



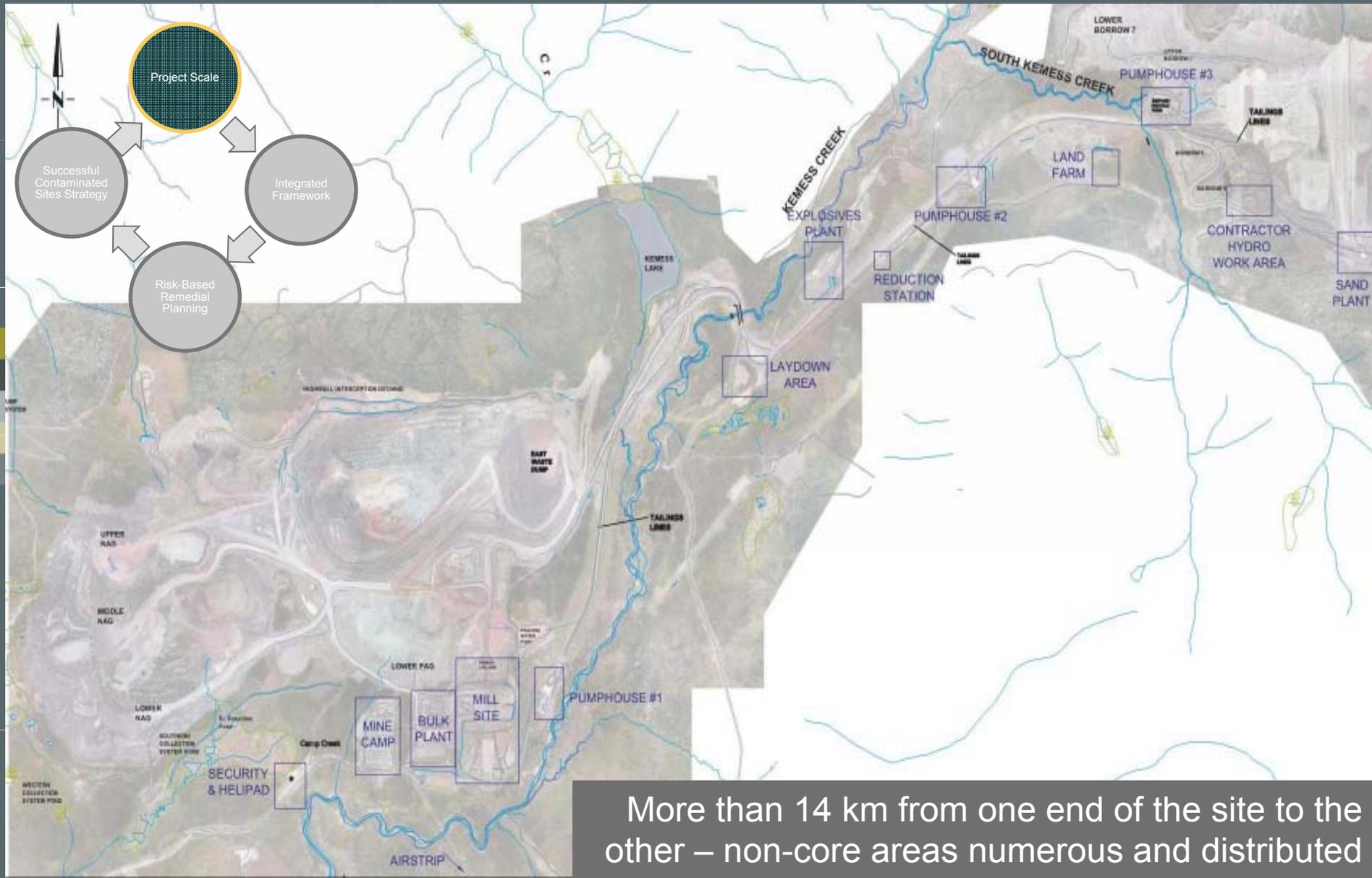
Site Location – near Mackenzie, BC



Site Setting – Core and Non-Core



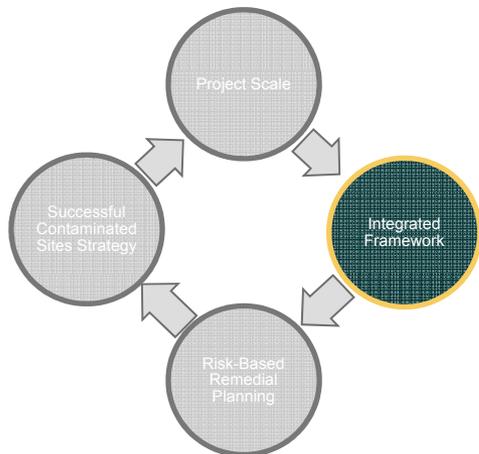
Site Layout – Non-Core Areas



More than 14 km from one end of the site to the other – non-core areas numerous and distributed

The Mine Site – Regulatory Drivers

- BC Requirements – Mine Sites
 - Past - Ministry of Energy, Mines, and Petroleum Resources (MEMPR)
 - Now – MEMPR Environmental Management Act – Ministry of Environment (MOE) and MEMPR
 - Complete closure plan – core **AND** non-core areas

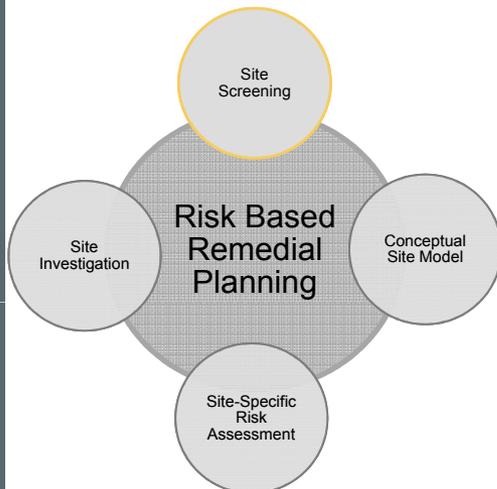


Remedial Plan – Risk-Based Approach



Site Screening

- Identify areas of environmental concern and associated contaminants of concern – screen all possible sources



Jet Fuel Storage



Site
Screening

Site
Investigation

**Risk Based
Remedial
Planning**

Conceptual
Site Model

Site-Specific
Risk
Assessment

Warehouse Laydown and Storage Area



Site
Screening

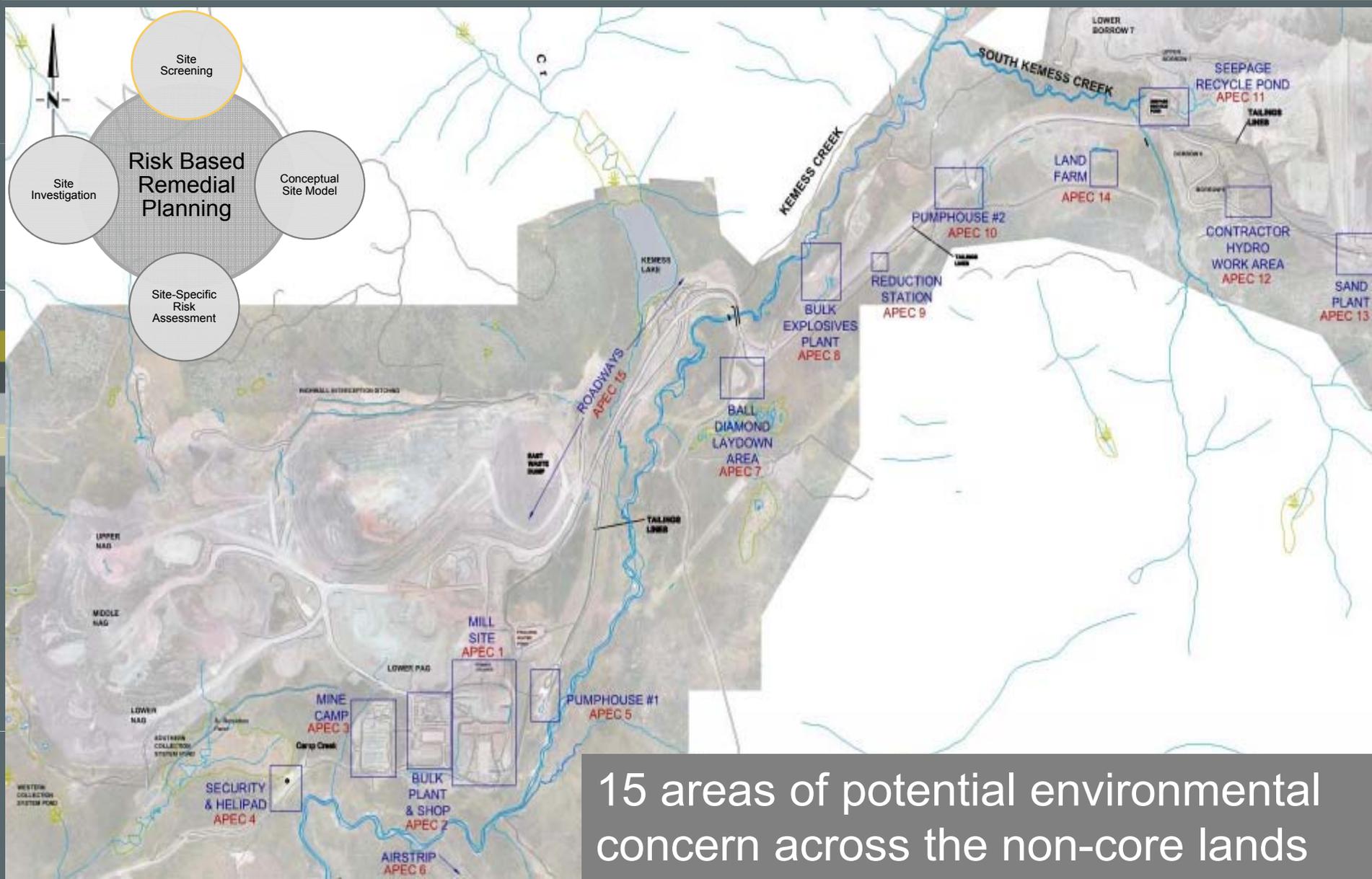
Site
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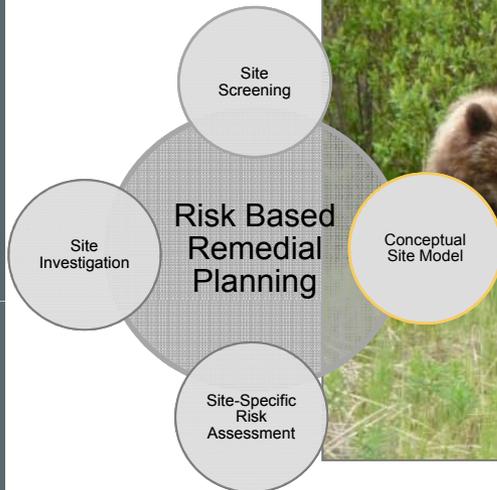
Potential Source Areas



15 areas of potential environmental concern across the non-core lands

Conceptual Site Model

- Identify potential receptors and exposure pathways—focus the investigation program



Aquatic Receiving Environment

Kemess Creek adjacent to pumphouse

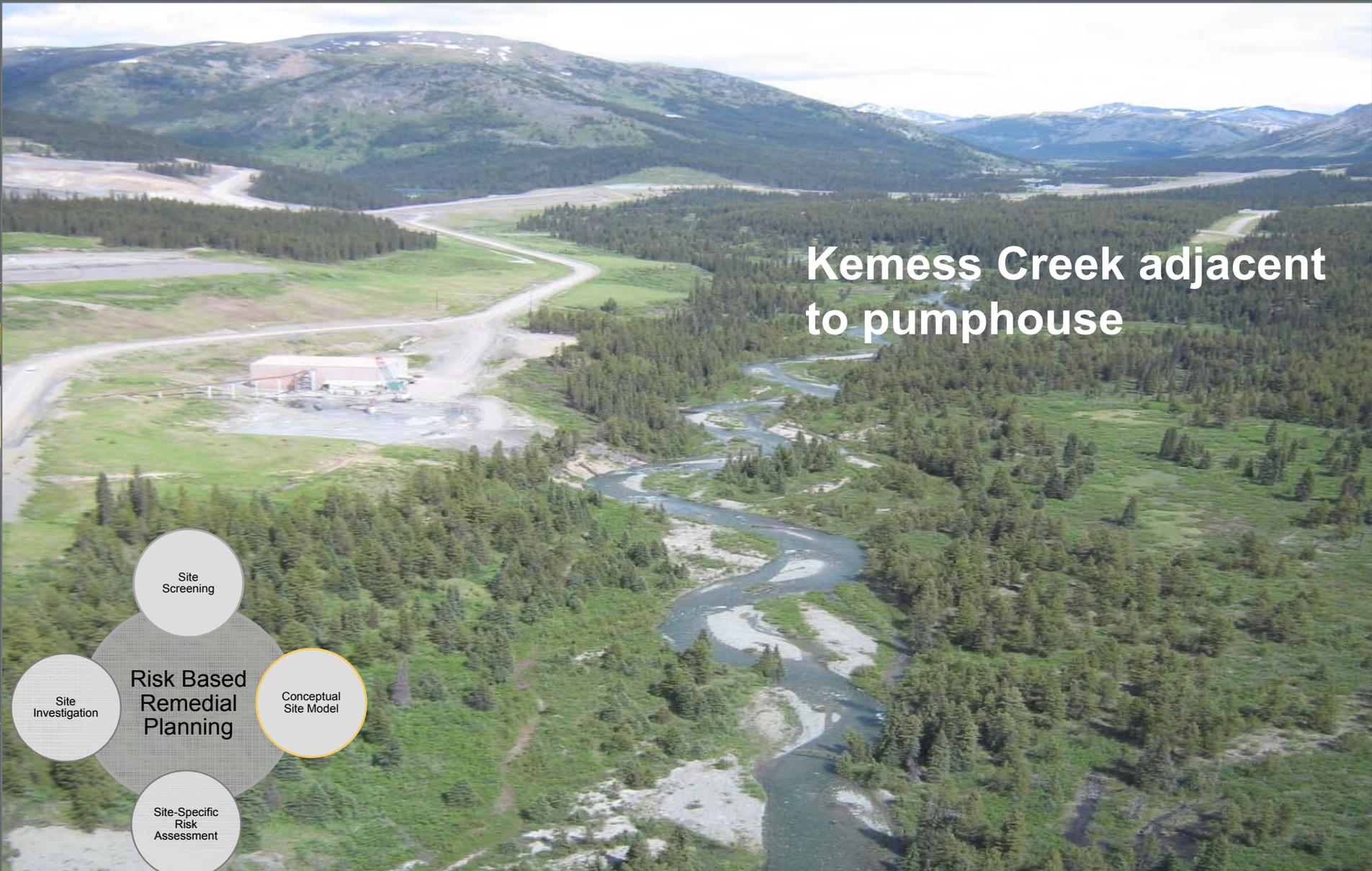
Site
Screening

Site
Investigation

**Risk Based
Remedial
Planning**

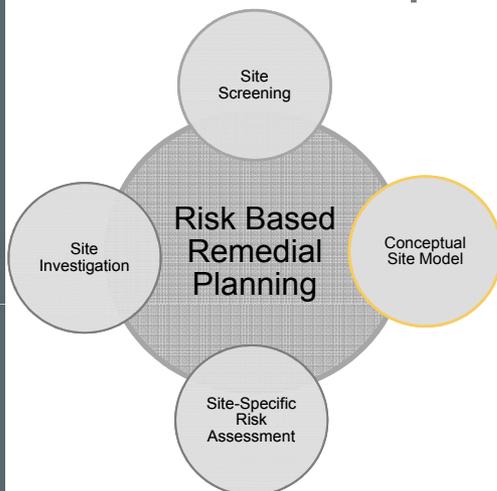
Conceptual
Site Model

Site-Specific
Risk
Assessment

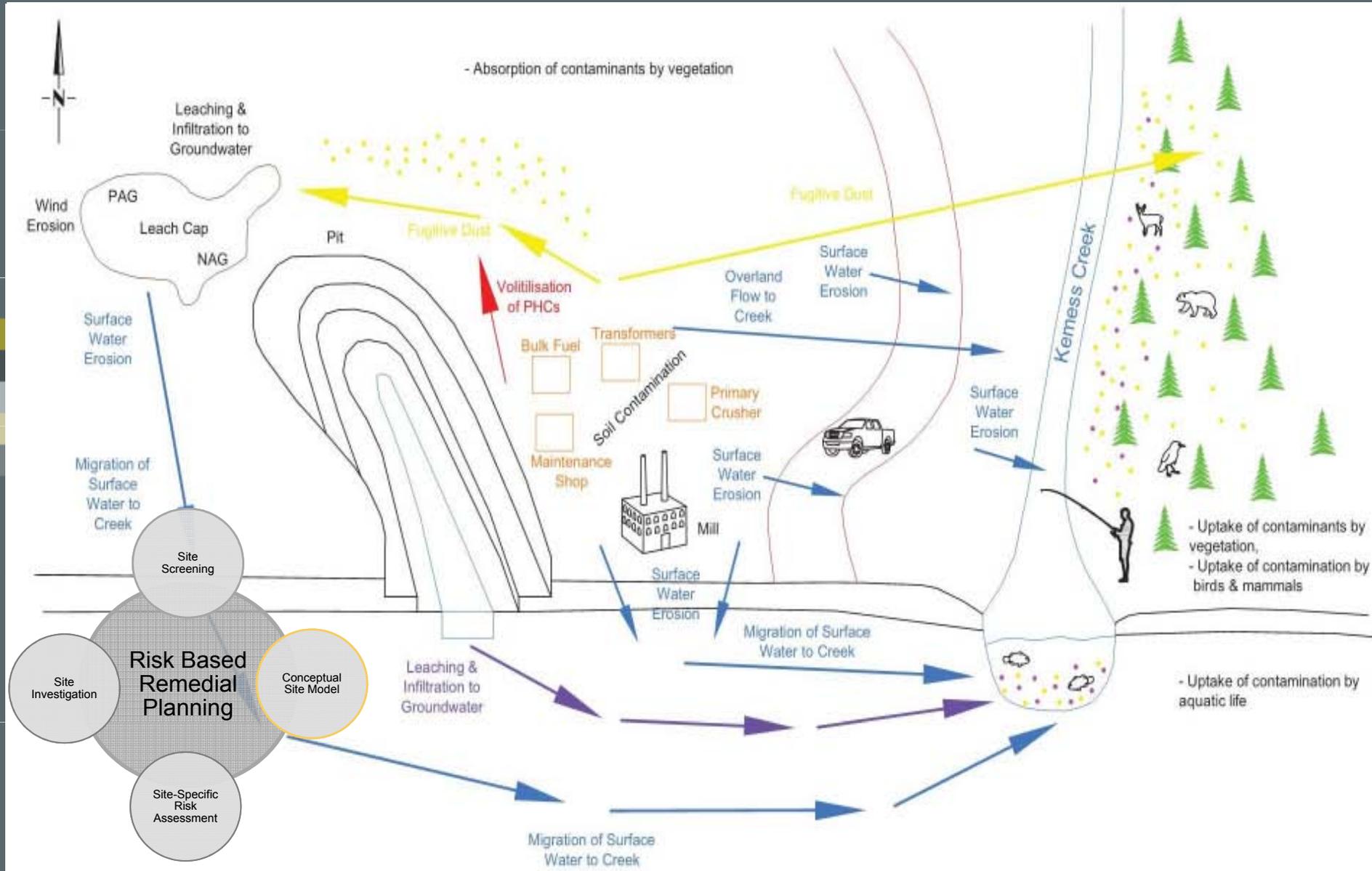


Source, Pathways & Receptors

- Integrate potential contaminant sources, pathways, and receptors
 - Sources from Site Screening
 - Release Mechanisms
 - Transport Pathways
 - Exposure Routes
 - Receptors

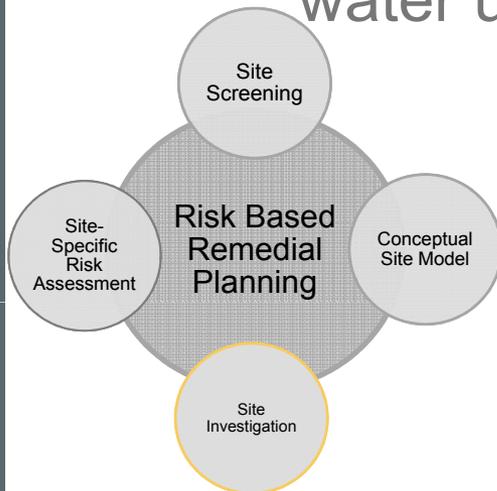


Summary of Results



Site Investigation Objectives

- Characterize potential sources and migration potential – key elements of Risk Assessment
- Three major sources and pathways:
 1. Surface soil – soil ingestion and eco
 2. Sub-soil – soil ingestion, eco, and shallow groundwater
 3. Deep groundwater – eco, aquatic, and drinking water users



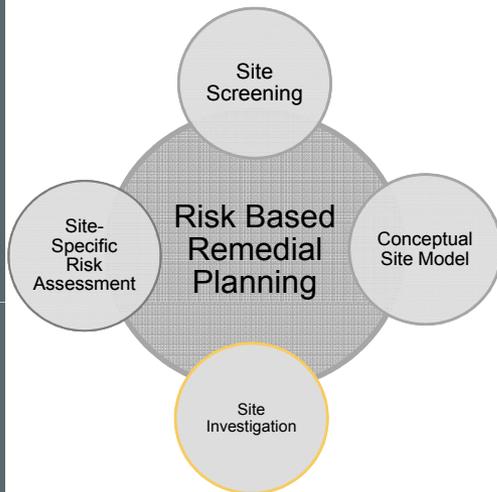
Phase 1 - Surface Soil



Phase 2 – Test Pits (Sub-Soil)

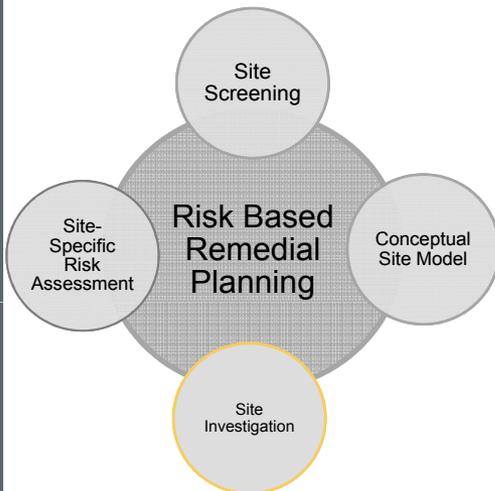


Note the staining in shallow soil



Phase 3 - Groundwater

- Wells at worst-case locations – directly down-gradient of sources and/or adjacent to receptors
- Characterize flow, aquifer and identify contaminant migration potential



Phase 3 - Groundwater



Site
Screening

Site-
Specific
Risk
Assessment

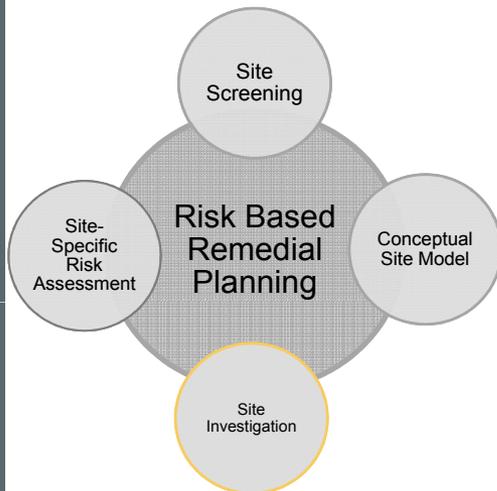
Risk Based
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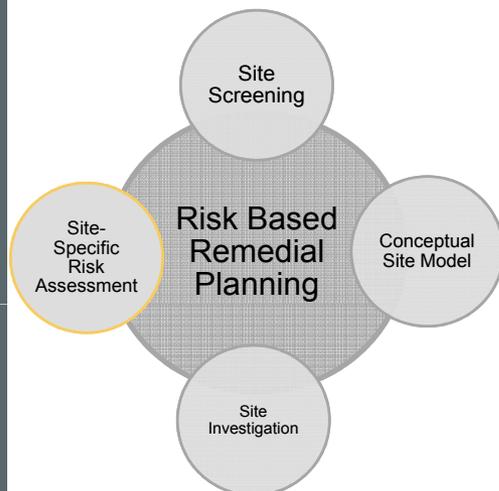
Summary of Investigation Results

- 15 areas of potential environmental concern reduced to 10 actual areas of environmental concern
- Completed in short time (2 months)
- Limited resources required
- Met the objectives – data from targeted sources



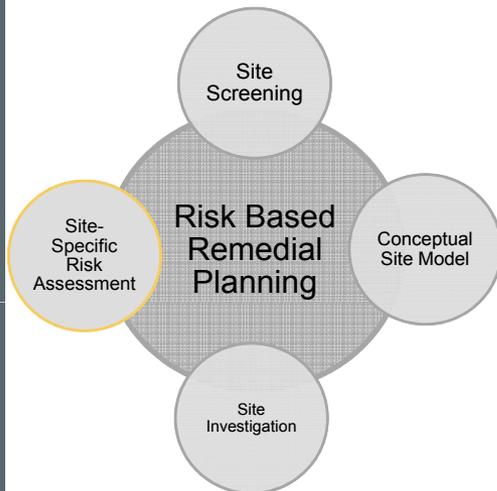
Risk Assessment Strategy

- Identification of risk – incorporate Conceptual Site Model and investigation results
- Evaluate potential for adverse effects to human and ecological receptors – ten areas of concern
- Focus on future exposure during post-decommissioning activities

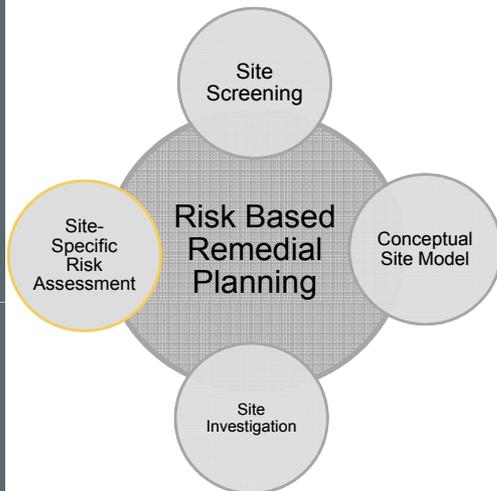


Human Receptors

- Future human users of the site – main driver for Risk Assessment and Remedial Plan
 - Environmental sources - more sensitive receptors

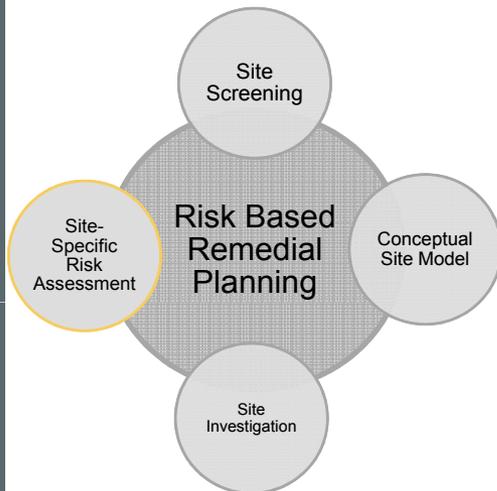


Ecological Receptors

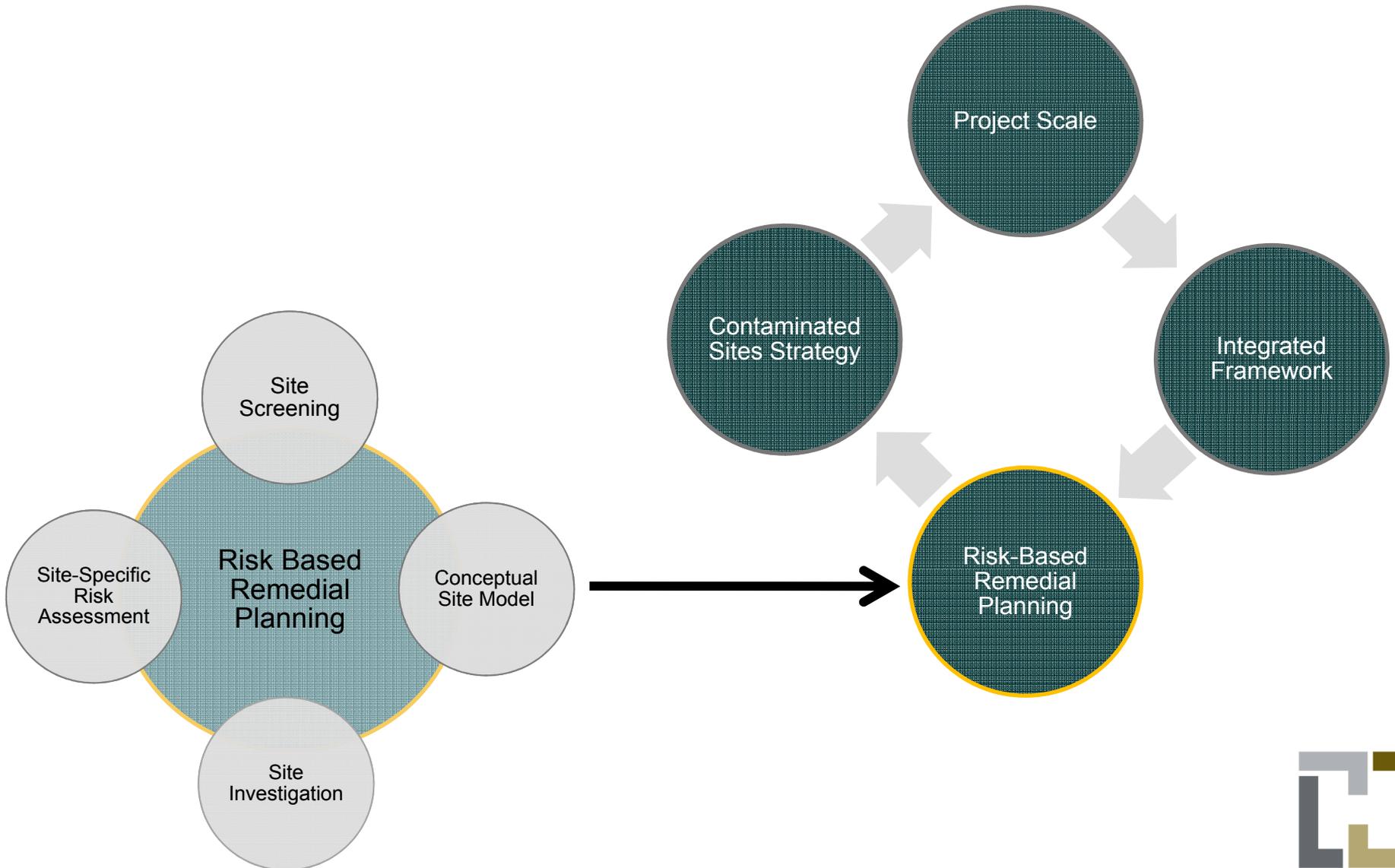


Summary of Potential Risk

- Ten areas of environmental concern reduced to four with unacceptable risk
 - Unacceptable risk to ecological receptors in soil for metals; shallow impacts
 - Acceptable risk to human health
- Mine site contamination was not considered extensive

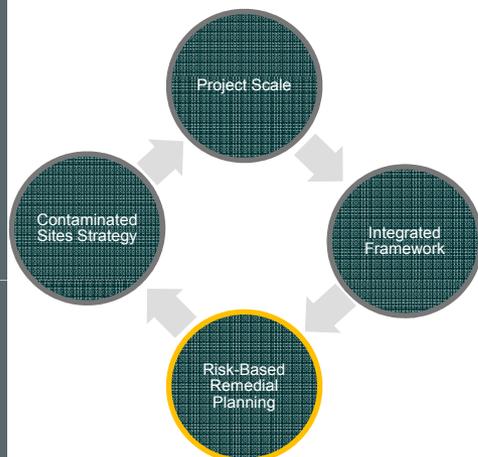


Risk-Based Approach – Remedial Plan



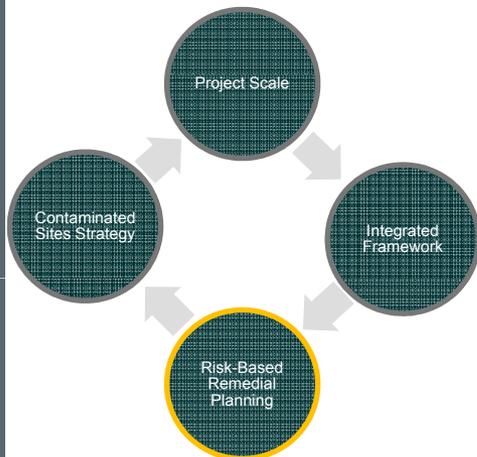
Risk Based Remedial Plan

- Final step of the integrated strategy to address the non-core areas
- Targeted remedial strategies for each of the four areas of environmental concern with potential risk
- Based on future land use at the site



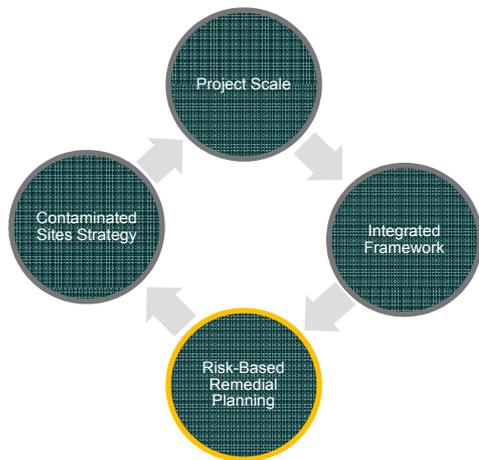
Remediation Strategy

- Soil contamination – shallow excavations
 - onsite disposal
- Further investigation
 - Stained soil, surface impacts, inaccessible buildings



Remediation Strategy

- Recommendations only at those areas with unacceptable risk to receptors
- Remediation methods tailored to site conditions and available resources
- Designed to meet MOE requirements for Non-Core areas



Successes of Our Approach

- Short time frame
 - Site Screening to RAP in 8 months
- Reduced cost to complete entire program
 - Four major tasks – significantly less than full-scale remediation
- Site-specific remedial options
- Risk-based RAP successfully integrated into Mine Closure Plan for core and non-core areas
 - Innovative alternative to “traditional” reclamation

Successful
Contaminated
Sites Strategy



Questions? Thank You!

Liza Flemming P.Geo /P.Geol (BC, AB, NWT/NT)
Project Manager/Geologist

Hemmera

P: 604.669.0424 (120)

E: lflemming@hemmera.com



www.hemmera.com

Vancouver | Burnaby | Victoria | Calgary

