

Ross-Adams Mine Site

**Engineering Evaluation/Cost Analysis
(EE/CA)**

**Open House
April 28, 2015**

Presentation Outline

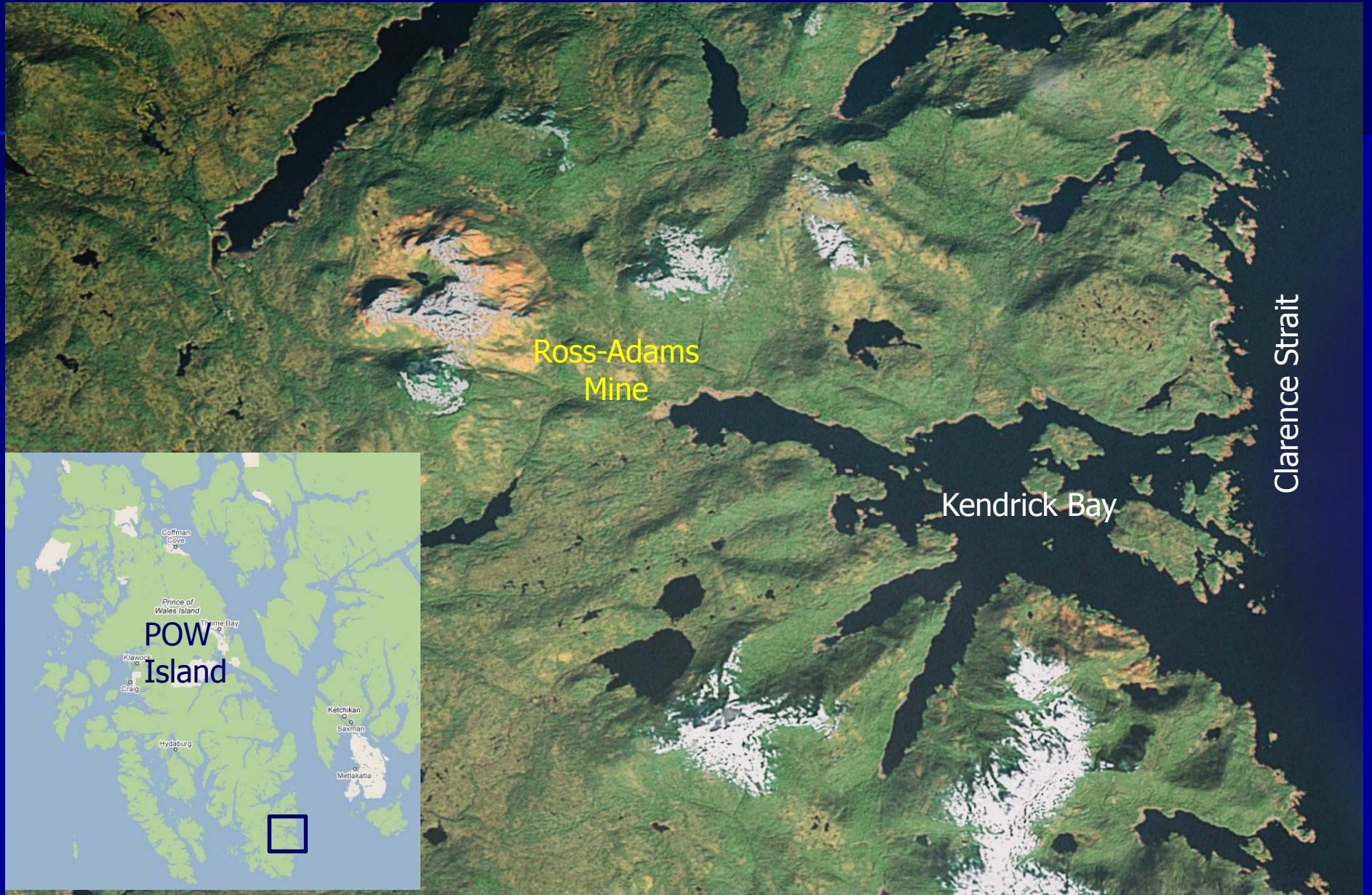
- Process
- Site Overview
- Site Features
- EE/CA and Risk Assessment Process
- EE/CA and Risk Assessment Results
- Community Participation

Process

Dawn/Newmont entered into an Administrative Settlement Agreement and Order on Consent (ASAOC) with the USDA Forest Service to perform an EE/CA for the Site

- Major Tasks
 - Planning Documents – completed 2009
 - Expanded Site Investigation – completed 2009
 - Site Characterization Report – finalized 2010
 - Human Health and Ecological Risk Assessments
 - Engineering Evaluation / Cost Analysis (EE/CA)
- Objectives
 - Identify and analyze removal alternatives appropriate for the Site features and environmental conditions
 - Recommend a remedy for the Site that is protective of human health and the environment
 - Work with the agencies and community in selecting a remedy for the Site

Site Location



Ross-Adams Mine History

Open Pit - 1957

Underground Mining – 3 Levels

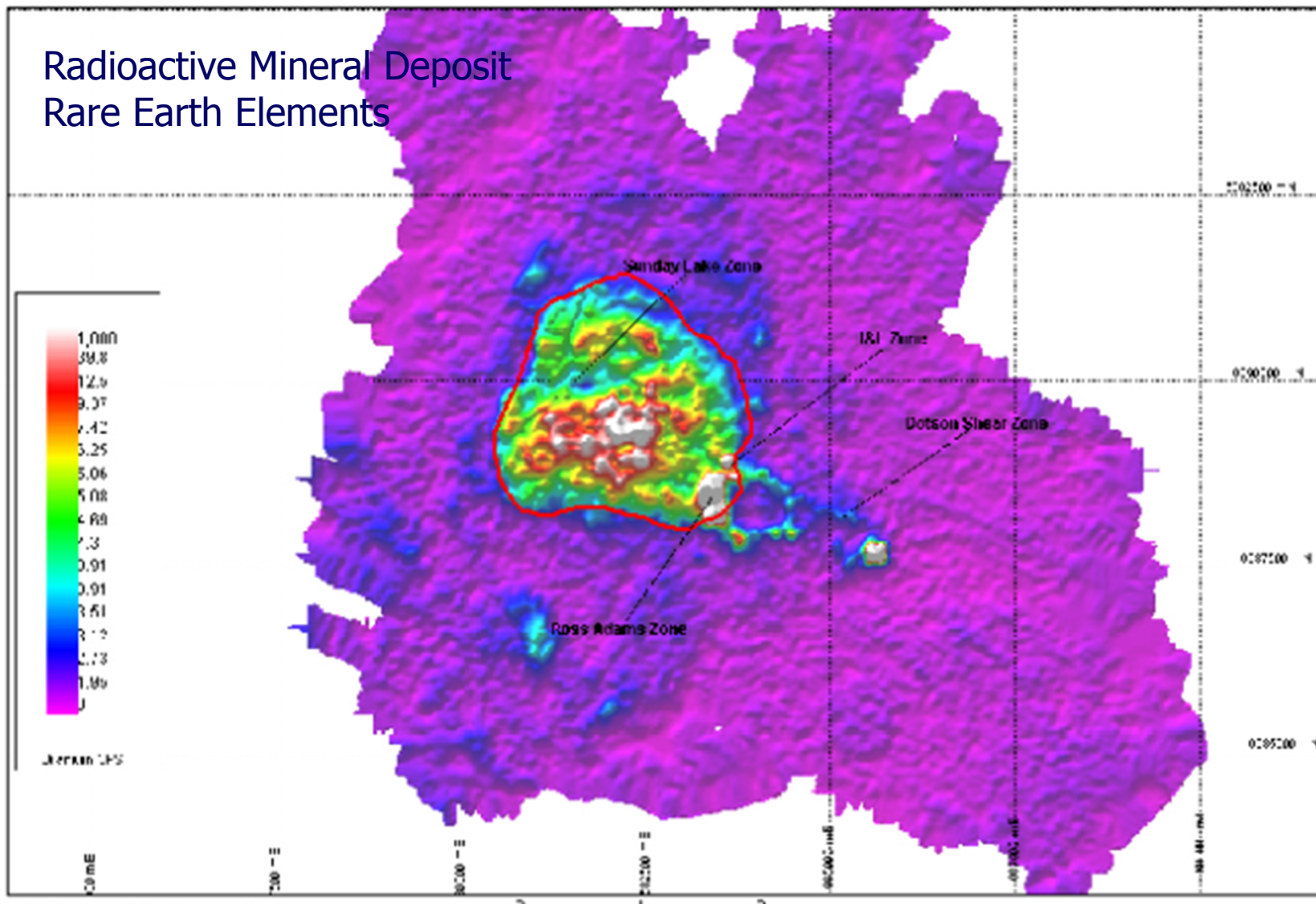
No on-site ore processing

Mineral exploration continues

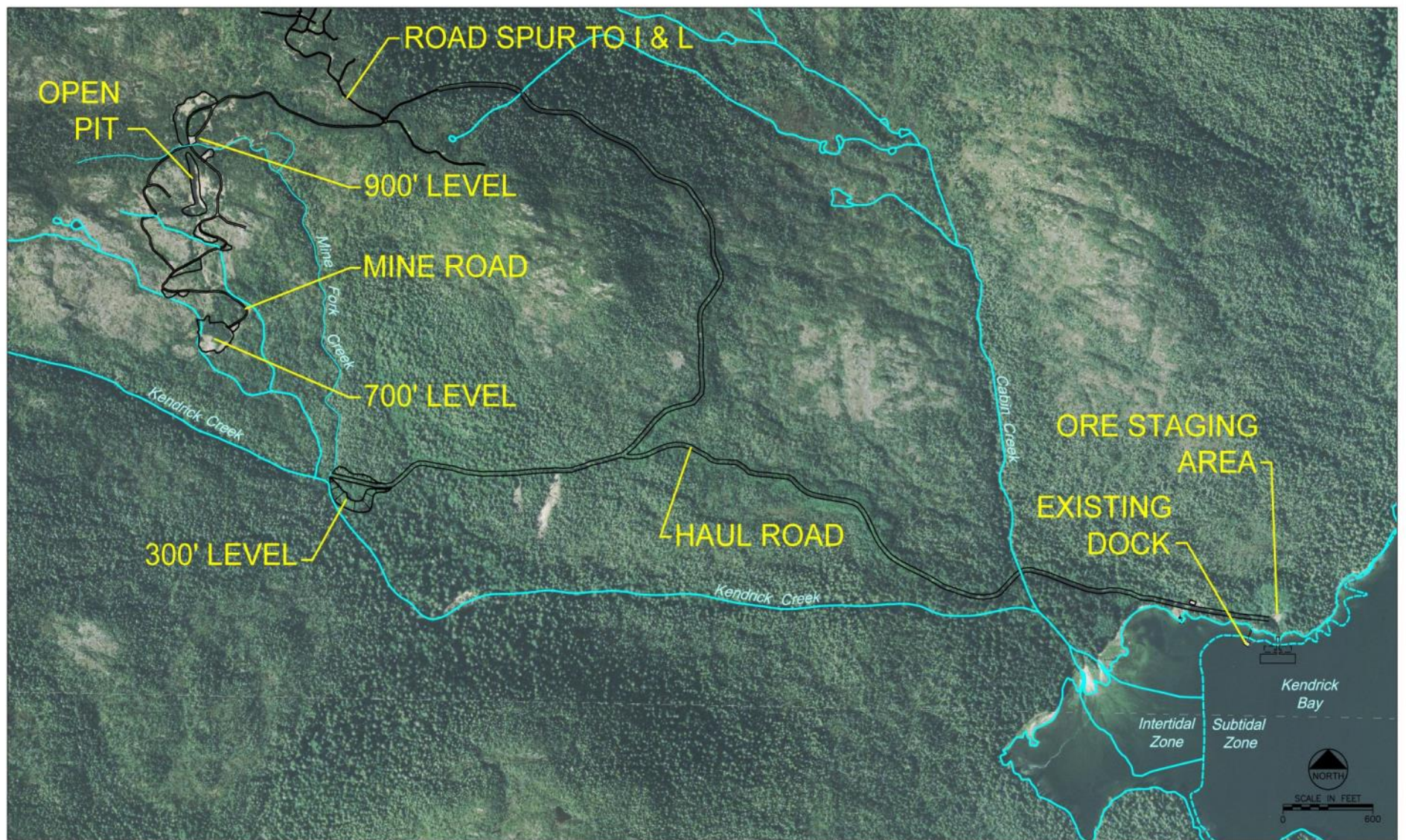


Bokan Mtn. Mineralization

Radioactive Mineral Deposit
Rare Earth Elements



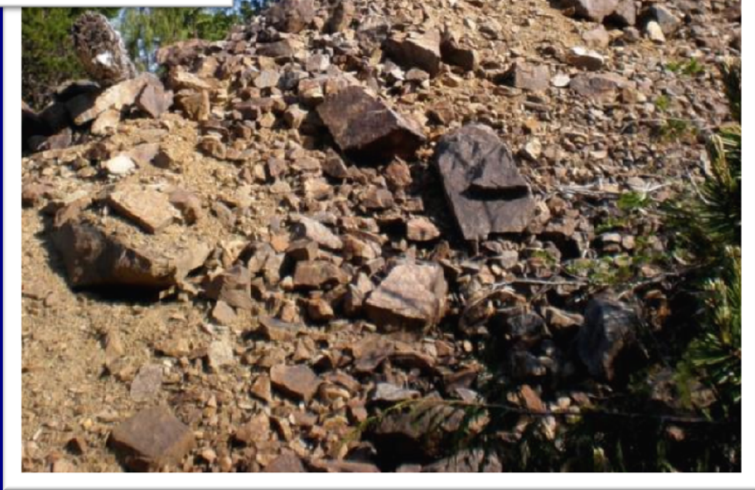
Site Features



Open Pit



Mine Rock Piles



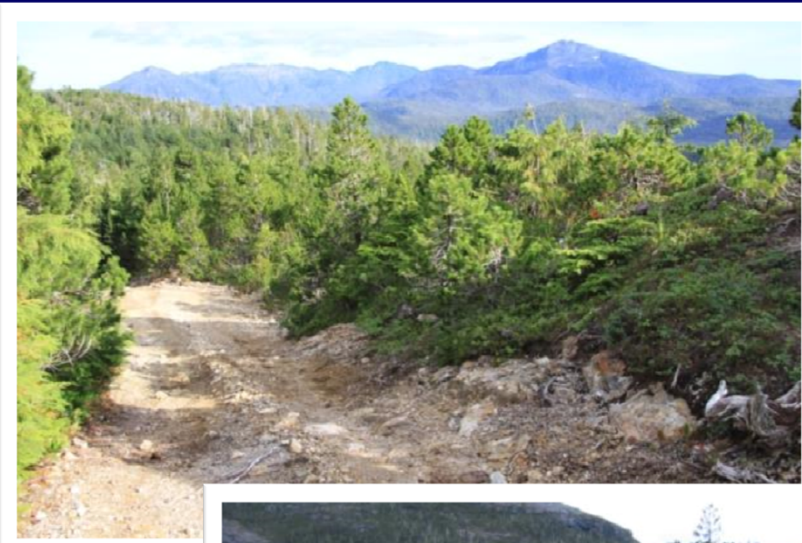
Mine Portals



300-Foot Level Portal Drainage



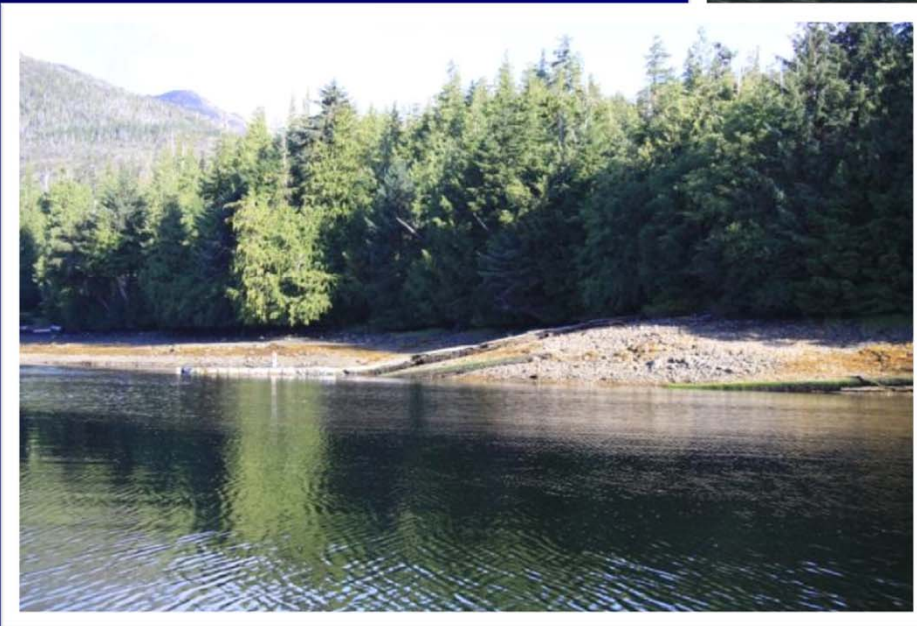
Haul Road, Mine Road, I&L Spur Road



Ore Staging Area



Former Loadout Ramps





EE/CA



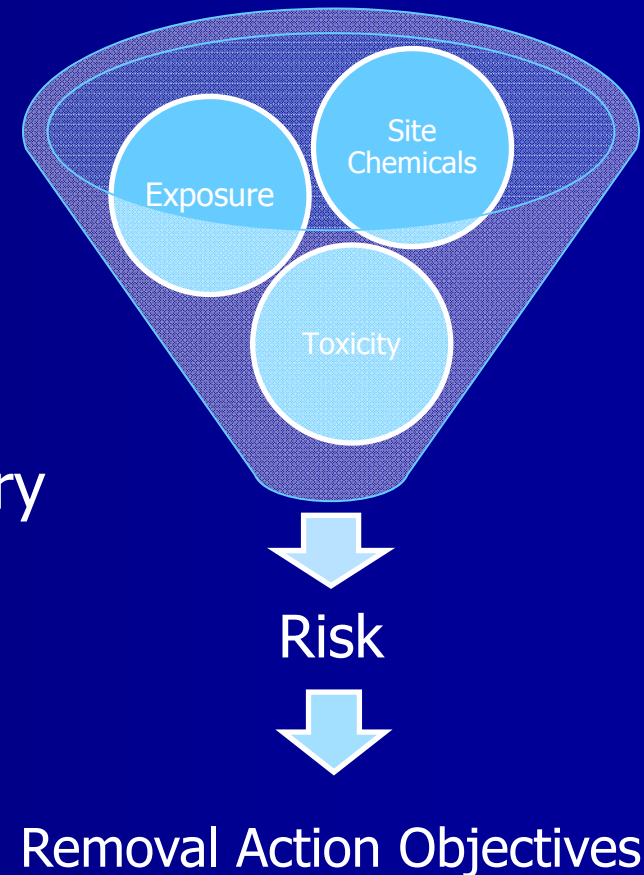
EE/CA Report Components

- Site Characterization Report (SCR)
- Human Health Risk Assessment (HHRA)
- Screening-Level Ecological Risk Assessment (SLERA)
- Removal Action Objectives and Goals (RAOs)
- Applicable or Relevant and Appropriate Requirements (ARARs)
- Response Action Technologies
- Removal Action Alternatives and Analysis
- Recommended Removal Action

Risk Assessment

Link Site Characterization to Removal Action

- Risk = Exposure & Toxicity
- Separate approaches
 - Human Health Risk Assessment
 - Ecological Risk Assessment
- Compare site risk to regulatory levels of concern
- Risk results - Key role in evaluating potential clean up approaches



Human Health Risk Assessment – Chemicals of Potential Concern

- Trace metals - Arsenic, uranium, manganese
- Naturally occurring radionuclides - Uranium, thorium, radium, lead, polonium
- Decay products of radionuclides
 - Radon - Colorless, odorless, tasteless gas from uranium or thorium
 - Gamma Radiation – Electromagnetic emissions from natural radioisotope decay
 - Gross alpha and Gross beta - Particle emissions from natural radioisotope decay

Human Health Risk Assessment – Contaminated Media & Exposure Routes

- Soil & Rock – Ingestion, dermal contact, gamma radiation
- Sediment – Ingestion, dermal contact, gamma radiation
- Air particulates and radon gas - Inhalation
- Surface water - Ingestion
- Local plants, wildlife, seafood – Ingestion
- *Consider mineralized, unmineralized and background levels*

Human Health Risk Assessment – Exposure Scenarios

- Occupational Visitors
 - Mineral exploration worker
 - Forest Service worker
- Child and Adult Recreational Visitors
- Subsistence Hunter-Gatherers
 - Annual harvest and consumption rates for Prince of Wales
 - Deer, local berries - Upland habitat at the site
 - Seaweed, sea cucumbers, flounder - West Arm of Kendrick Bay
- *Consider mineralized, unmineralized and background levels*

Human Health Risk Assessment - Results

- Compared risks to regulatory levels of concern
- *No danger from metals or for subsistence consumption*
 - Trace metals (As, U, Mn) – Low risk *all* media and exposure scenarios
 - Subsistence consumption – Low risk *all* upland, marine food
- *Materials from uranium mine have radiometric risk above levels of concern*
 - Mineral Exploration Worker – Radon in air, gamma exposure
 - Forest Service Worker – Radon in air, gamma exposure
 - Site Visitors – Radon in air, gamma exposure, combined radionuclides in soil and water

Human Health Risk Assessment - Results (cont.)

- Radionuclides by all routes of exposure
 - Minor contribution to risk for site visitors
- Vast majority of risk due to:
 - External exposure to direct gamma radiation from mine rock
 - Inhalation of radon decay products from mine rock, mine openings
 - Radon (90 to 95% of the radiation risk)
- Background risks – Radon, gamma exposure exceed levels of concern in natural radiometric areas
- Removal Action Objectives - Reduce risk to background levels of radon, gamma radiation



Ecological Risk Assessment – Terrestrial, Freshwater, Marine Habitats

- Similar to human health, but many receptors
- Problem formulation – Initial assessment
 - Chemicals of potential ecological concern
 - Sensitive communities and wildlife species
- Characterize chemical exposure and effects
- Estimate risk to ecological communities and individual wildlife species
- Inform cleanup approaches

Ecological Risk Assessment – Problem Formulation

- Chemicals of potential ecological concern
 - Over 20 metals
 - Two radionuclides (Ra-226, Ra-228)
- Communities of many species
 - Terrestrial soil – Plants & invertebrates
 - Stream water – Fish and invertebrates
 - Stream sediment – Invertebrates
 - Marine sediment – Invertebrates
- Individual indicator species
 - Terrestrial – Dark-eyed junco, American robin, masked shrew, long-tailed vole, belted kingfisher
 - Marine – Belted kingfisher, mew gull, sea otter, harbor seal

Ecological Risk Assessment – Exposure and Effects

- Terrestrial & Aquatic Communities
 - Exposure – Concentrations in soil, water, sediment
 - Effects – Toxicity reference values for concentrations in soil, water, sediment
- Wildlife indicator species
 - Exposure – Estimated dose via ingestion, drinking water, dermal contact
 - Effects – Toxicity reference values for known doses
- Level of concern – Exposure > Toxicity Reference Value
- Perspective important – Uncertainties, many assumptions, background levels

Ecological Risk Assessment – Risk Characterization – Trace Metals

- Risk levels below levels of concern in freshwater, marine habitat
 - All community receptors
 - All indicator wildlife species
- Risk exceeds levels of concern
 - Six metals - Cobalt, manganese, cadmium, lead, uranium and zinc
 - Terrestrial plants, soil invertebrates, terrestrial wildlife
 - Risk levels often in the low range
 - Dominated by few samples in localized areas, generally within the mine-rock affected areas
- Background Important – Site-risk no different than background-risk for uranium, manganese

Ecological Risk Assessment – Risk Characterization – Radionuclides (Ra-226, Ra-228)

- Risk exceeds levels of concern for some receptors
- Terrestrial plants
 - Highest at the upper elevations, mineralized area
 - Lower risk at lower elevations, non-mineralized area
- Stream-dependent riparian wildlife
 - Risks localized to few stream locations
 - Primarily surface water exposure

Ecological Risk Assessment – Ecological Preliminary Remediation Goals (PRGs)

- Soils in the non-mineralized area
- Four trace metal-receptor pairs:
 - Cadmium – Small mammals (masked shrew)
 - Cobalt – Plants
 - Lead – Birds (American robin)
 - Zinc – Plants, soil invertebrates.
- PRGs not developed for radionuclides (Ra-226, Ra-228)
 - Activity levels correlated with gamma emissions
 - Background gamma levels are cleanup goal for non-mineralized areas.

Removal Action Objectives

- Reduce human health risk from potential exposure to direct gamma radiation and inhalation of radon
- Reduce risk for recreational users from exposure to potential ingestion of soil and surface water
- Reduce risk or eliminate exposure pathways for terrestrial plants, terrestrial invertebrates, terrestrial wildlife from exposure to identified metals and radionuclides
- Reduce risk or eliminate exposure pathways for riparian animals from exposure to radium in surface water
- Reduce or eliminate safety hazards
- Minimize disturbance to existing undisturbed areas and minimize reliance on long-term active maintenance

Mine Rock Removal Action Alternatives

- Common Elements for All Alternatives
- Alternative M-1 – No Action
- Alternative M-2 – In-Place Stabilization with Stormwater and Institutional Controls
- Alternative M-3 – In-Place Covering of Mine Rock Piles
- Alternative M-4 – Excavation, Consolidation and Cover at Mine Affected Areas
- Alternative M-5 – Excavation, Consolidation and Cover at Open Pit Repository

Mine Portal Removal Action Alternatives

- Common Elements for All Alternatives
- Alternative P-1 – No Action
- Alternative P-2 – Close Upper Mine Openings with 300-Foot Level Portal Gate
- Alternative P-3 – Close Upper Mine Openings with 300-Foot Level Portal Rock Backfill Closure
- Alternative P-4 – Close Upper Mine Openings and 300-Foot Level Portal Concrete Bulkhead

Recommended Removal Action

Alternative M-5 – Excavation, Consolidation and Cover at Open Pit Repository

Alternative P-4 – Close Upper Mine Openings and 300-Foot Level Portal Concrete Bulkhead

- Most protective of human health and environment
- Achieves RAOs and ARARs
- Returns all mine rock to naturally mineralized area
- Returns area below 900-Foot Level to pre-mining conditions
- Provides permanent containment of mine materials
- Reduces inflow of water into the underground mine
- Reduces radon emanation and exposure to water drainage from the 300-Foot Level portal

Next Steps for EE/CA

- Public review/comments – May 1-30, 2015
- USFS response to public comments
- USFS selects removal action, in collaboration with State and EPA, after considering public comment
- USFS issues formal decision
- Removal action process

Public Review/Comment

Submit comments by May 30, 2015 to:

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Site documents are available at:

www.Ross-Adams-EECA.com



Questions?

