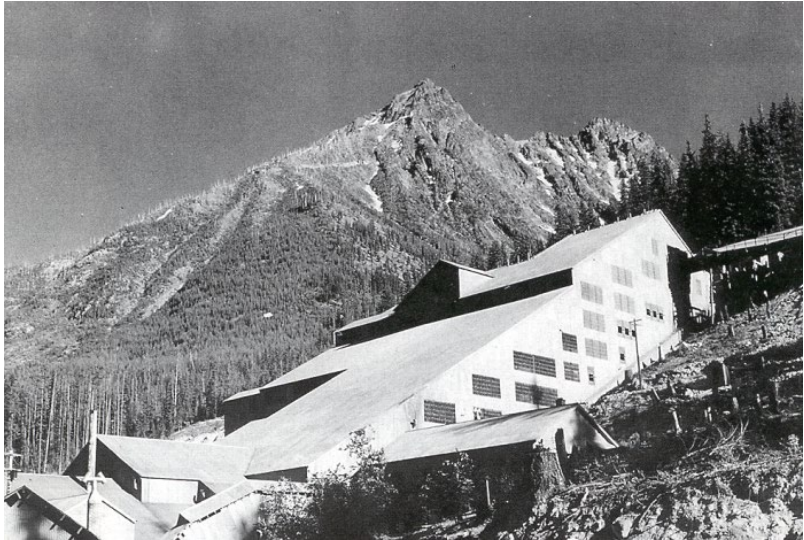
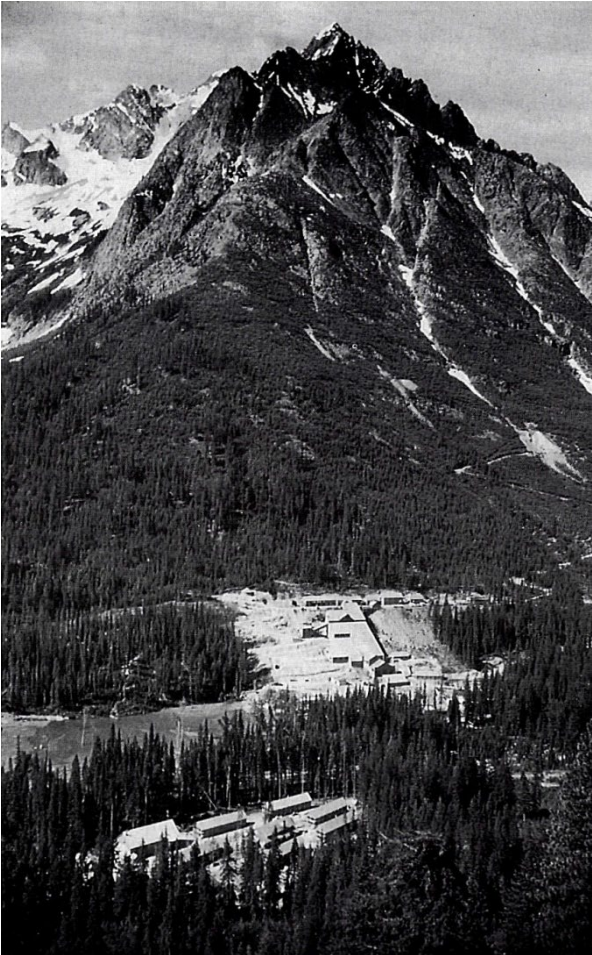


Holden Mine

2018 Five Year Review

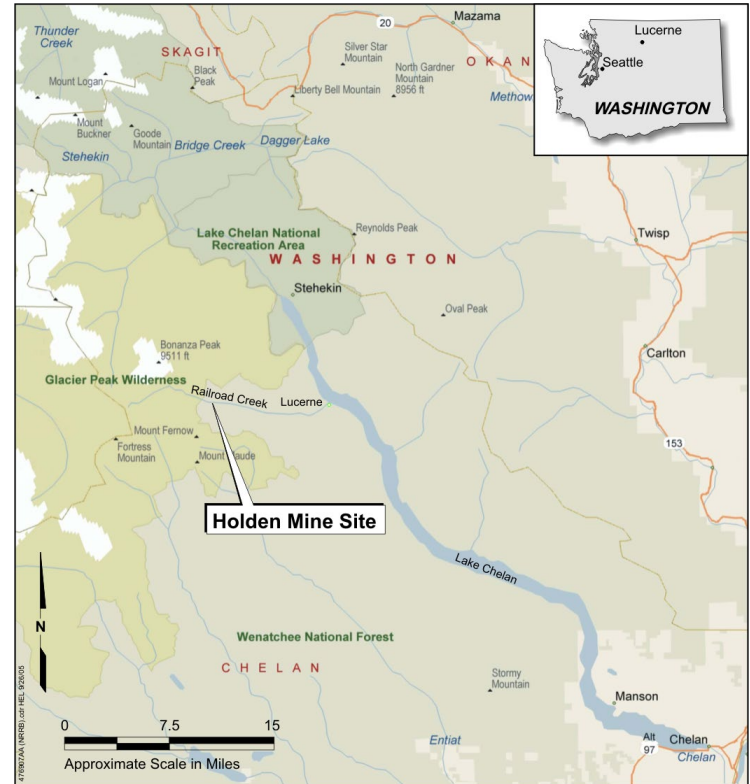
Mario Isaias-Vera, Remedial Project Manager

USDA Forest Service



Recreation Hall Dining Hall Dormitories Staff Houses © PI

Railroad Creek Valley, North Cascades, WA



Holden Mine Site

The Site includes an area of approximately 125 acres impacted by direct releases of hazardous substances



Hazardous Waste Products, a Legacy of Mining Operations



Contamination of Railroad Creek and its Vicinity



Why the Remediation? Restore the Environment & Protect Natural Resources



Roughly 8.5 million tons of tailings were produced as a byproduct of the milling operations. Most of which were deposited in three large impoundments



Hazardous substances have impacted aquatic life in Railroad Creek, and plants and wildlife in the Railroad Creek Valley.

The Record of Decision (ROD) provides for a comprehensive cleanup of the Site.

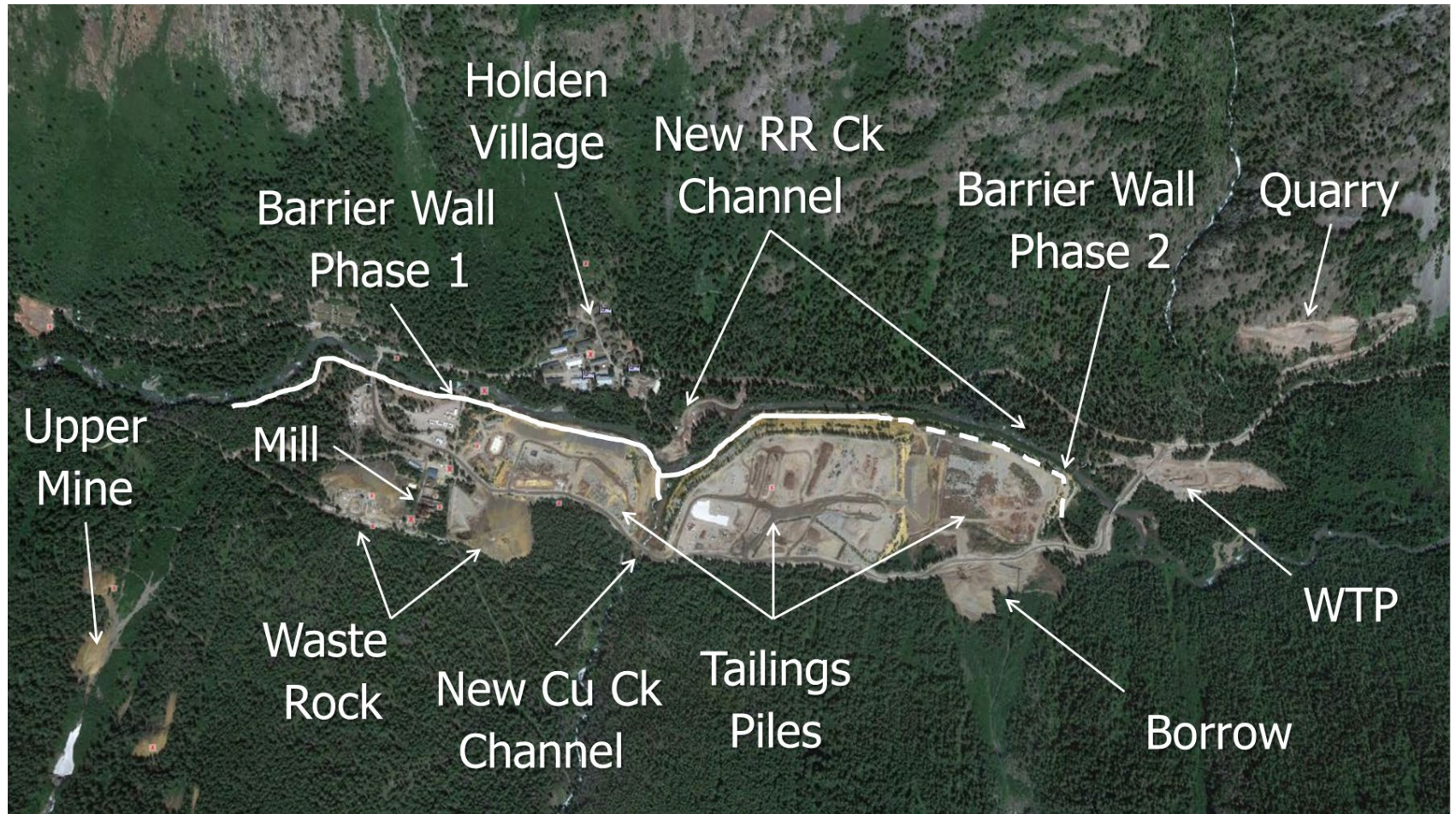
The selected remedy includes implementation of the following major components:

- Containment, collection, and treatment of impacted groundwater;
- Consolidation and capping of tailings, waste rock, and impacted soil;
- *In situ* remediation of some areas of impacted soil;
- Surface water and sediment cleanup actions (i.e., tailings stabilization and relocation of a portion of Railroad Creek); and
- Institutional controls.

The Remedial Action Objectives as defined in the ROD for the Remedial Design/Remedial Action are:

- Protection of Aquatic Life
- Mitigation of Sediments
- Protection of Groundwater
- Prevent Migration of Chemicals (or constituents) of concern (COCs) that exceed Cleanup Levels
- Protection of Human health
- Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Holden Mine - Areas



Logistic Operations

Labor, equipment, fuel, materials, supplies, and food are transported through Lake Chelan to Lucerne; an approximately 40 mile trip.



Daily Morning Safety & Briefing Meetings Conducted at the Site



Holden Village across from Holden Mine

Notice Railroad Creek between Holden Village and the tailing piles



View of the Waste Rock Piles, Tailing Piles 1, and Staging Areas



View of Tailing Piles Regraded

Railroad Creek between tailing piles and Holden Village.

Tailing piles 1 and 2 separated by Copper Creek.



Surveying Crews



Clearing and Grubbing Operations



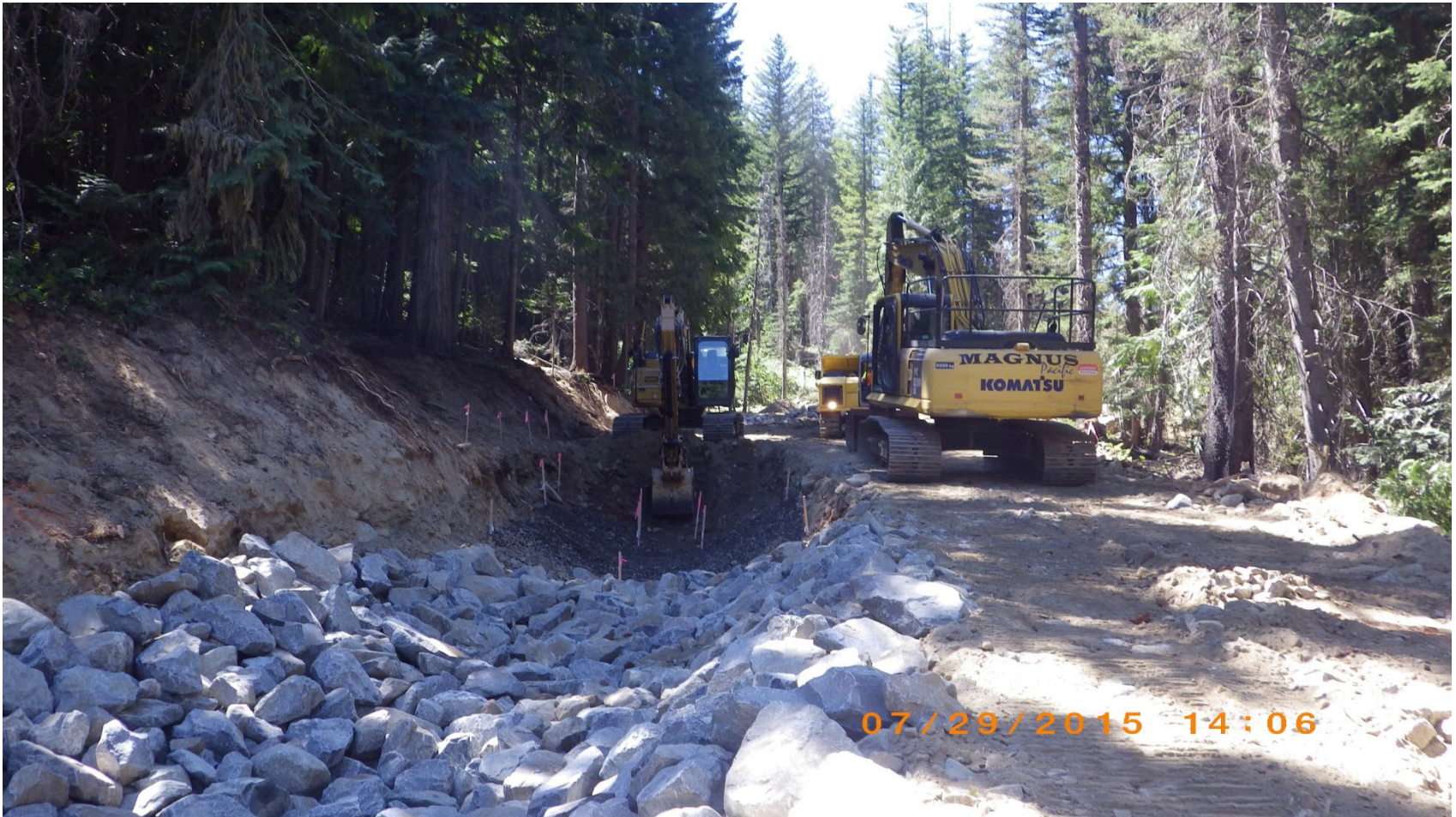
Demolition of Structures

Including removal of asbestos containing materials



Interceptor Channels

IC Channels divert clean water from tailing piles.
Clean water is directed to Railroad Creek.



Grading Operations of Tailing Piles



Jet Grouting Operations



Waste Rock Piles Regraded and Covered with Soil



Construction of Barrier Wall



Construction of the Underground Water Collection System



Quarry Site and Screening Operations at the Borrow Source



Concrete Batch Plant



Work in Copper Creek and Railroad Creek



Soil Erosion Control



Realignment of Railroad Creek



Work inside the Main Portal Mine

Bulkheads and underground utilities were developed to control water flow and pressure from the mine. Tunnel walls were stabilized to improve safety.



Holden Mine – Main Portal



Photos show before (above) and after (right) portal closure and access upgrade



Wolverine Fire

The Wolverine Fire caused severe damages to the only access road and to its vicinity.



Revegetation



We are already seeing results!



Water Treatment Plant

The WTP treats contaminated groundwater prior to being discharged back to Railroad Creek.



Improvement in Water Quality and Micro-invertebrate and Fish Populations



Recreational Opportunities



Monitoring of Aquatic Life and Water Quality in Railroad Creek

