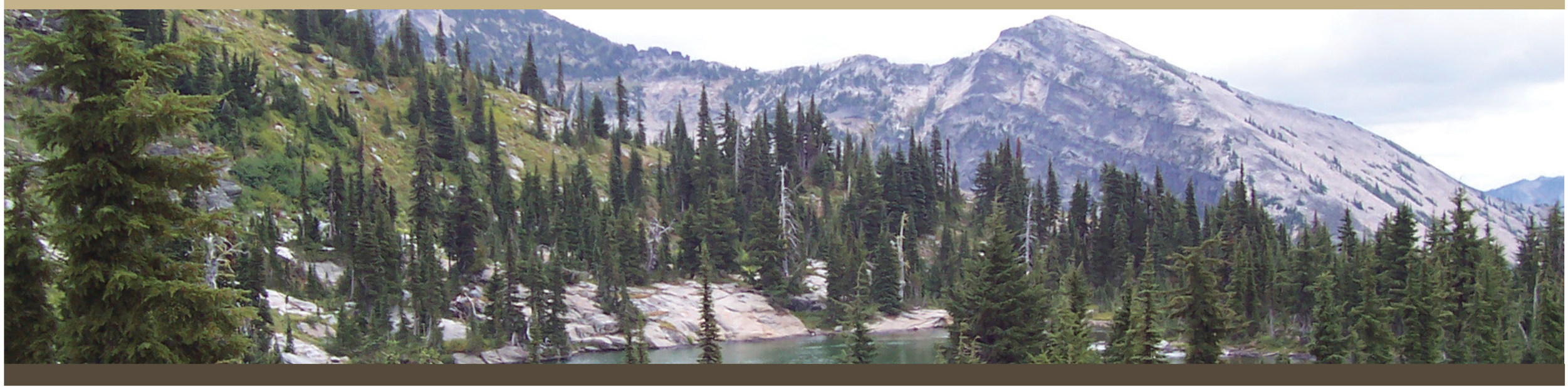
Supplemental Environmental Impact Statement (SEIS) for the Rock Creek Project



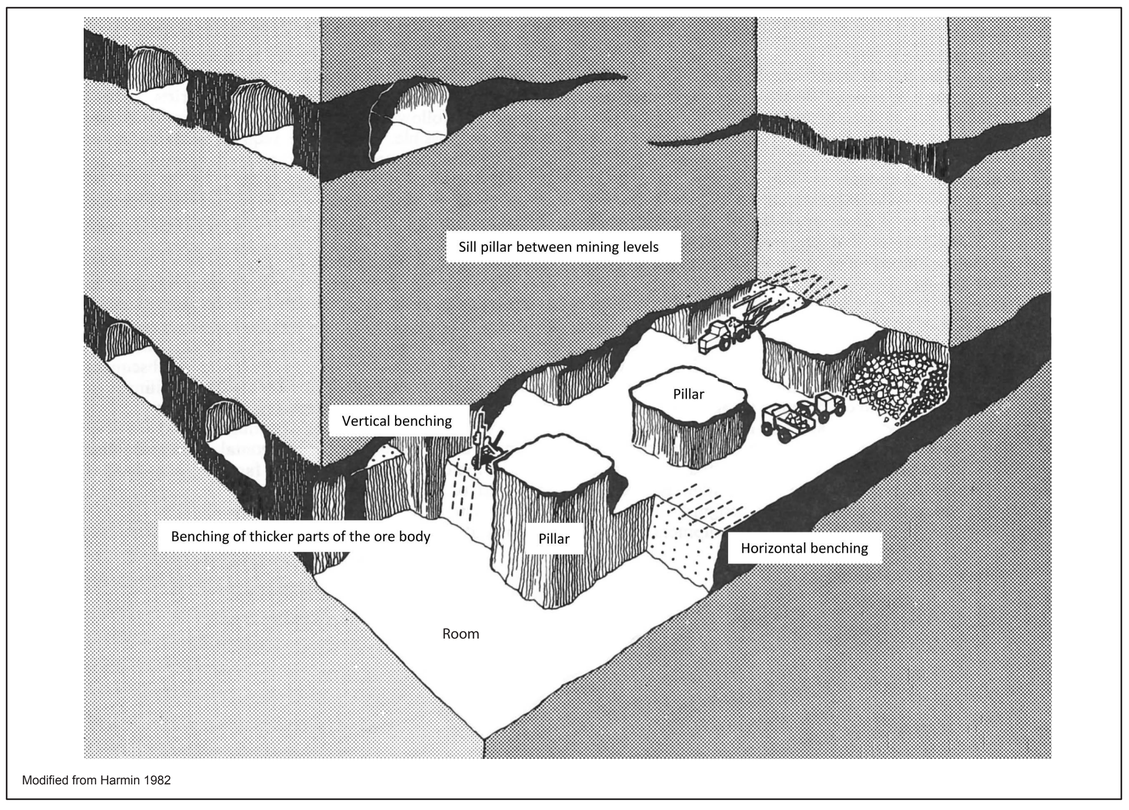
Subsidence

What is subsidence?

- Subsidence is the sudden sinking or gradual downward settling of the earth's surface.
- Subsidence is a concern because the underground mine would be beneath the CMW.

Analysis of Subsidence Risk

- Previously unknown evidence of subsidence related to failure of underground support pillars was observed above the Troy Mine
- Call and Nicholas prepared a report in 2014 for RCR describing the causes of the Troy Mine subsidence events in the context of Rock Creek Project plans.
- An independent, third-party review of the 2014 Call and Nicholas report and evaluation of causes of Troy Mine subsidence was conducted.
- Conclusion: Subsidence observed over the Troy Mine was a result of inadequately-sized pillars
- Based on the findings from Troy Mine subsidence, Rock Creek Alternative V mitigation measures were clarified and expanded
- Risk of subsidence was reviewed and analyzed as part of the Failure Modes and Effects Analysis (FMEA), which determined that with implementation of prescribed mitigations the likelihood of subsidence would be low.



Example of Room-and-Pillar Mining on Two Levels with a Sill Pillar Between Levels

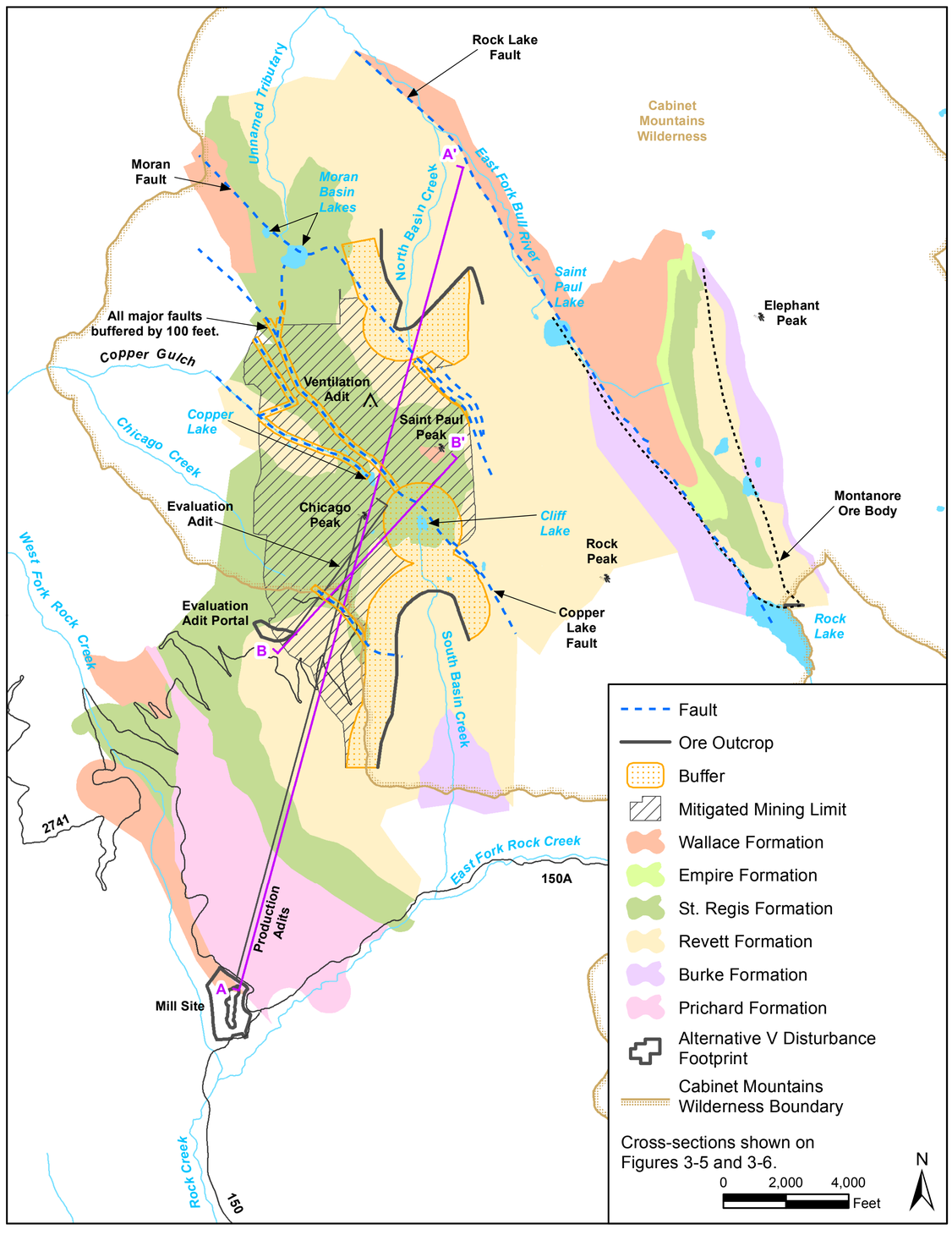
Key Mitigation and Monitoring

RCR would:

- Leave stable support pillars. Use a minimum 0.8 pillar width to height ratio as a preliminary numeric criterion to be finalized during later design (subject to KNF and DEQ approval).
- Not mine areas where overburden thickness is less than 450 feet without further study and KNF and DEQ approval
- Maintain a 100-foot buffer on either side of the Moran and Copper Lake Faults and other faults encountered, and maintain a 1,000-foot buffer around Cliff Lake and the ore outcrops. Any reduction in buffer size would require justification by RCR and prior approval by KNF and DEQ.
- Minimize size and number of drives through faults and perform probe drilling in advance of development near major faults
- Develop Rock Mechanics Data Collection and Subsidence Monitoring Plans for each phase of mine development.
- Prior to Phase I, submit an updated mine plan that would reference the Troy Mine experience in its proposal for future pillar designs and highlight how the new designs account for and differ from failed designs at the Troy Mine.
- Prior to Phase II, complete detailed mapping of surficial geology and evaluation adit geology to confirm major geologic structures and to identify geologic discontinuities.
- Prior to Phase II, submit for KNF and DEQ approval a detailed mine plan, using the data collected during Phase I, that minimizes the risk of subsidence.

Design, oversight, inspection, and reporting requirements include:

- Formation of a Technical Advisory Group including experts in underground mine design and rock mechanics to provide design review oversight.
- RCR may be required to fund an independent third-party technical advisor, whose duties would include providing QA/QC for the Agencies



Bedrock Geology and Associated Lakes, Streams, and Faults

Paste Tailings Facility

Tailings Facility Stability

- The Failure Modes Effects Analysis included the review of foundation failure, earthquake-induced failure, and complications from increased paste moisture either from underdrain plugging, paste production problems, or from snow or rain infiltration.
- The FMEA concluded that the Alternative V paste tailings facility would be stable under normal operating conditions, as well as when subjected to the design earthquake provided underdrains were included in the design to maintain a low phreatic surface within the paste.
- New seismic data for the region were used to revise the seismic stability assessment.
- Compensating factors identified in the FMEA are either to be included as Alternative V design features or would be incorporated into final design after review by the Paste Tailings Technical Advisory Group.

United States Department of Agriculture

Forest Service – Northern Region
Kootenai National Forest