

Kennecott Mill Town Cultural Landscape Report

「PART II」

TREATMENT

CULTURAL LANDSCAPE CHARACTER AREAS

Based on an evaluation of landscape characteristics, the Kennecott mill town and associated mine sites exhibit several key patterns, relationships, and individual features that contribute to the historical significance of the National Historic Landmark District (NHL). On the largest scale, the entire NHL is viewed as a single cultural landscape, with four elements or “systems” that historically defined the physical character of the landscape. The four systems are the:

- Mill town, where ore was processed and transported and where the community supporting the operation lived
- Mine sites on the ridge where the ore was extracted
- Tram system, linking the mine sites with the town below
- Transportation (regional) systems, focusing on the railroad and road systems that moved goods and supplies in and out of the mill town to the valley and ports beyond

In addition to these primary cultural landscape systems, the natural landforms, topography, and hydrology historically defined the configuration, scale, and environmental context within which these elements developed. More than a collection of individual structures, features, or artifacts, it is the relationship among these cultural and natural resources that provides the foundation for holistic management of the cultural landscape.

Although this document deals specifically with resources in the Kennecott mill town, any management action affecting the mill town will affect resources in other areas of the NHL. While some of these effects are addressed in the recommendations, a more thorough assessment of the potential impacts on areas outside the mill town should be undertaken prior to any management action.

MANAGEMENT PHILOSOPHY AND PRIMARY TREATMENT

Cultural landscape resources and values within the Kennecott mill town provide a range of options for management and interpretation that are generally compatible with current use and long-term preservation of the site. Although the mill town contains resources from all periods of historical development, no effort will be made to "freeze" the landscape to a specific date, or "recreate" a landscape that no longer exists. What makes the cultural landscape of Kennecott so extraordinary is the degree to which the remaining patterns, relationships, and features reflect the historic character and physical layout of the site over a long period of development and subsequent abandonment.

The goal for management of the cultural landscape is to stabilize, preserve, and interpret the key patterns, relationships, and remaining structures and features that historically define the character of the historic district. In some cases, individual features may have such a high degree of historical significance that rehabilitation or restoration is warranted, but in most cases the primary treatment for the cultural landscape is stabilization and interpretation.

CRITERIA FOR DELINEATING MANAGEMENT ZONES:

- Preserve areas in the mill town that contain a significant concentration of cultural resources that possess a high degree of physical integrity and context.
 - Retain the historic land use patterns as a framework for locating new facilities.
 - Protect areas in the mill town with resources and landscape characteristics that are historically important, but have no integrity due to loss of fabric or physical context.
 - Identify and provide buffers for private holdings that are not addressed in the recommendations.
-

In developing a plan for the long-term management of the site, the National Park Service (NPS) will work closely with all landowners to ensure access to and protection of private property. The strategy and options for protecting private property, preserving cultural resources, and integrating public use of the site will be determined through the planning process and public involvement.

MANAGEMENT ZONES

Based on the evaluation of significant cultural landscape resources, the mill town has been divided into six management zones (figure 102). These zones are defined by the physical location, concentration, and integrity of significant historic resources as documented in this report. The purpose of management zones is to consolidate findings from the *Analysis and Evaluation* and establish management priorities for treatment of the cultural landscape.

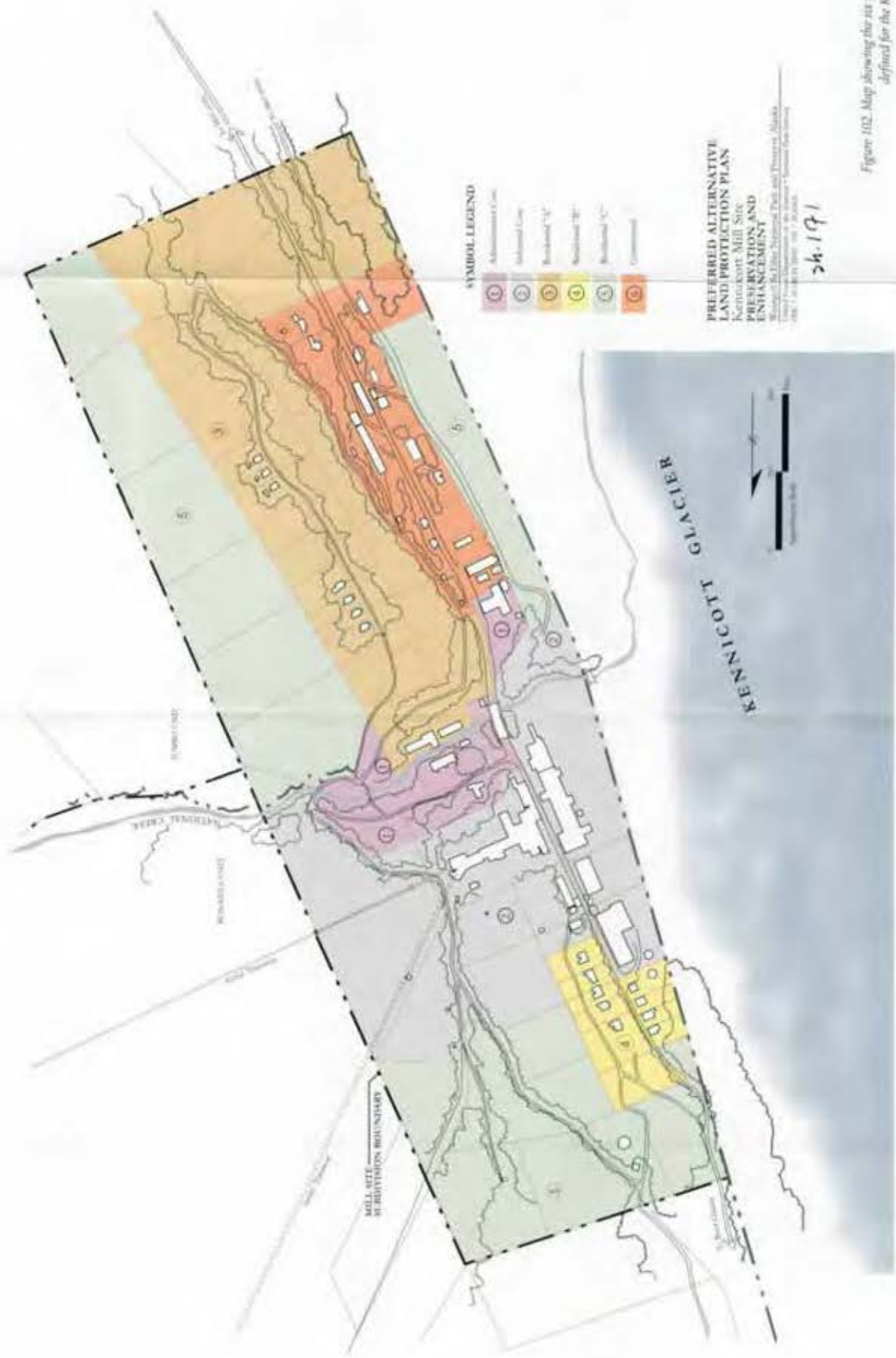


Figure 102. Map showing the six management zones defined for the Kenicott mill town

ON MICROFILM

TREATMENT PLAN

The treatment plan for the Kennecott mill town outlines a series of actions the NPS plans to implement over the next several years (figure 103). The plan is based on an evaluation of cultural landscape resources and management goals and objectives defined by Wrangell-St. Elias National Park and Preserve in partnership with the Kennecott community. Through a series of public meetings focussing on the future of Kennecott, four alternative plans were developed. From these four plans, a preferred alternative was selected, consolidating ideas and concepts from all of the proposals.¹ The *Interim Operations Plan* (IOP) outlines several actions to be undertaken by the NPS. Key actions include:

- Rehabilitate and adaptively use the company store for administration and as a visitor contact point.
- Rehabilitate the railroad trestle.
- Organize the mill town into land use areas or zones that reflect historic land use patterns while accommodating contemporary land use patterns and needs.
- Selectively thin vegetation around historic structures to reduce the risk of fire and reestablish historic views and vistas.
- Develop interpretative media and establish trails to enhance visitor understanding of the site.

The treatment plan provides a preliminary framework for management of Kennecott. The initial emphasis of the plan is on stabilization of critical resources, and as such there is considerable flexibility for accommodating treatments based on emergency needs and funding allocations. More detailed treatments for the mill town are described in the written recommendations. The purpose of the written recommendations is to guide the stabilization and preservation of significant cultural landscape resources and to the degree possible, retain the evocative character of an abandoned historic mill town. The recommendations are therefore aimed at retaining the historic character, activities, and key structures that defined the town between 1900–1938, while also allowing appropriate adaptive reuse of structures and interpretation of the site. Recommendations are organized into six categories: buildings and structures, circulation systems, archeological resources, vegetation, views and viewshed, and small-scale features.

It is important to note that while many privately owned structures and properties are a critical part of the mill town and larger historic district, these resources are not specifically addressed in this document. However, many of the recommendations that follow provide guidance to individual property owners interested in treatment for their historic properties.

TREATMENT RECOMMENDATIONS

BUILDINGS AND STRUCTURES

The 13 primary structures and all secondary structures owned by the NPS are considered contributing structures and should be stabilized and preserved. Priority for treatment is based on the *Evaluation of Historic Structures* (see Appendix I). The treatment goal is to prevent further deterioration and ensure future management options by taking all actions required to protect the site and buildings. Table 17 shows the current priorities for building stabilization.

Table 17: Priorities for Building Stabilization

Priority ²	Building No.	Description
1	2 and 3	Concentration Mill and Tram Terminus
2	15, North section	Leaching and Flotation Plant
3	9	Power Plant
4	36	Machine Shop
5	20	Store and Warehouse
6	1	Manager's Office
7	5	Bunkhouse (National Creek)
8	19	West Bunkhouse
9	23	Schoolhouse
10	8	Assay Office
11	15, South section	Leaching and Flotation Plant
12	18	Recreation Hall
13	34	Depot
14	48	Refrigerator Plant



Figure 10.3 Map showing treatment plan for the Kermanshah still town

SPECIFIC RECOMMENDATIONS

- Conduct a condition assessment to identify both the immediate and long-term stabilization needs and initiate treatment to arrest irreversible damage (collapse).
- Based on condition assessments and available funding, implement a systematic program of stabilization. Required treatments will vary from building to building and may include weather-proofing roofs, walls, and foundations and repair to structural connections at floors, walls, and foundations to resolve lateral loads. All treatments shall be undertaken in a manner consistent with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.
- Identify buildings that meet the structural requirements for rehabilitation and make the modifications to allow for visitor, administrative, or operational use. All changes to buildings shall respect the historic character of the building and be completed in a manner consistent with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.
- Stabilize the National Creek railroad trestle (the primary circulation structure in the mill town) and replace failing structural members.
- Retain where possible the remnants of the historic tramlines, including wooden towers, tram decks, and ore bins. Most of these features are in their historic context and remain the primary physical and interpretative resources linking the mine sites on the ridge to the lower mill town.
- Retain and stabilize the pedestrian bridge located below the site of the crib dam. Consideration should be given to incorporating this bridge into an interpretative trail that routes visitors past the remains of the crib dam, and features associated with the water conveyance system that historically served the town.
- Mitigate all hazardous building materials identified in compliance with the NPS/ADEC Agreement.

ARCHITECTURAL CHARACTER

Most of the buildings in the Kennecott mill town are of wood-frame construction on post and sill foundations. Most buildings have gabled roofs, although several of the cottages have hipped roofs. Buildings associated with heavy industry are of post and beam construction on wood-post foundations.

The majority of the buildings and structures in Kennecott have horizontal siding. Some early residences have board and batten siding and several small sheds have metal siding and roofs. Windows range from one-over-one double-hung units in the domestic and administrative structures, to four-over-four and six-over-six double-hung windows in the industrial structures and older cottages. In some cases, double-hung windows were turned sideways to accommodate grade and architectural convenience. With few exceptions, the wood-frame structures were painted red with white sash. Small utilitarian structures, such as woodsheds, privies, chicken houses, cold frames, and boardwalks, were also made of wood or metal. (Also see "Structures" in the Analysis and Evaluation section.)

DESIGN CHARACTER: ROADS AND TRAILS

Characteristic of other mining sites, historic roads in the mill town were informal in character with only slight variations in design and material. Early wagon roads such as the road from McCarthy, the road from the mill north to the Bonanza and Erie mines, and the road along the south side of National Creek, winding up the slope to the crib dam, were relatively narrow dirt roads approximately 10 feet wide. These roads were somewhat defined by a roadbed cut into the slope or by treads delineating the route.

Shoulders and drainage swales were not commonly used along these roads, and the condition of each road varied seasonally. Documentation indicates that in some cases, over the years, tailings were used as a surface material on some of the more heavily used roads.

Secondary roads and access for service vehicles was even less formal, with undifferentiated routes based on functional need and building access. This resulted in few, if any "formalized" roads around the industrial complex. Instead, most of these access routes were no more than compacted soils, leaving large denuded areas around buildings.

Pedestrian routes include foot trails and boardwalks. Foot trails were narrow dirt trails, 18-24 inches in width. Wood cribbing was used when required for steps and grade changes. Boardwalks ranged in size, from 4-5 feet in width. Individual planks were approximately 4 inches wide.

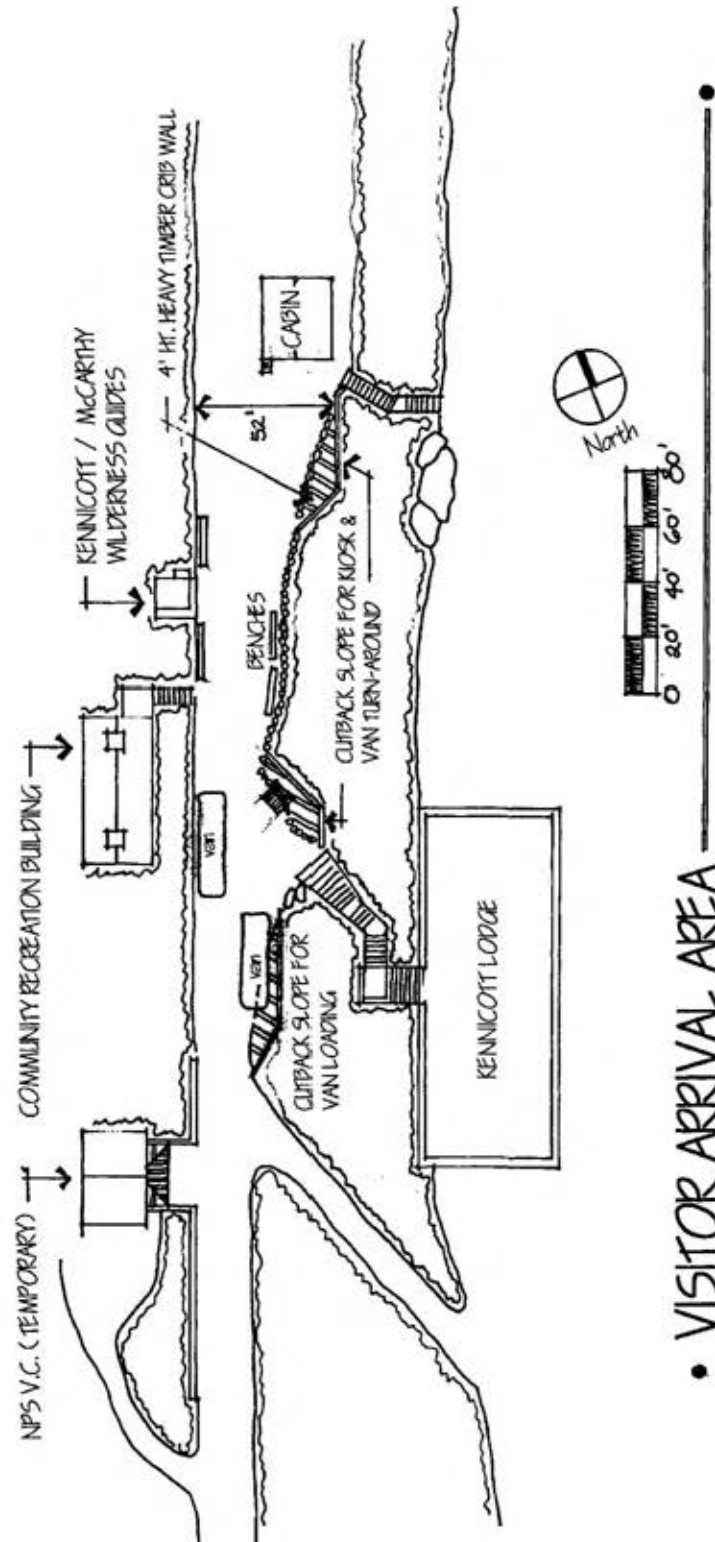
- Remove all building materials that post-date the historic period or present safety hazards to visitors.
- Discourage construction of new buildings within the historic district. If new structures are required, they should be carefully sited (location, design, mass, and scale in relation to surrounding structures and landscape features) and constructed using materials compatible with the architectural character of the mill town.

CIRCULATION SYSTEMS

The majority of existing circulation systems throughout the mill town reflect historic patterns, and these should be maintained whenever possible. Contributing circulation systems include the (abandoned) railroad corridor, Silk Stocking Road, the loop road on the north side of the site, portions of the original wagon road extending northeast toward the mine sites, and the primary pedestrian trail across the east edge of the mill town.

SPECIFIC RECOMMENDATIONS

- Many historic footpaths in the mill town are currently obscured by overgrown vegetation, or have been abandoned altogether. Where possible, reestablish these historic trails and either incorporate them into interpretative trails or integrate them into circulation systems throughout the site.
- In some areas, vegetation has encroached on historic roads and reduced the original width of the road. Currently these segments function as pedestrian trails or limited access routes for private vehicles. To the extent possible, these roads should be retained as functional roadways.
- The addition of new roads within the mill town should be discouraged. If new roads are required they should be informal in character (unpaved or gravel surface), and reflect a hierarchy from primary roads to access and service roads.



• VISITOR ARRIVAL AREA

- When new trails and pedestrian trails are required, every effort shall be made to conform to standards established by the Americans with Disabilities Act (ADA) and provide universal accessibility.

VEGETATION

Existing vegetation throughout the mill town is largely the result of growth since the historic period. In many cases, this change in plant cover compromises the physical integrity of key resources and impairs access (physical and visual) to the significant areas of the historic mill town. Consideration should be given *selective* thinning of vegetation in several areas within the town.

SPECIFIC RECOMMENDATIONS

- Remove vegetation encroaching around historic structures as necessary to assure long-term preservation of the structures.
- Limit the use of ornamental vegetation (annuals, perennials, shrubs and trees, planter boxes, and other materials for decorative purposes) to the residential cottages and the lodge. Use of nonnative ornamentals in other areas of the mill town is inappropriate.
- Prepare a Vegetation Management Plan for the Kennecott mill town and adjacent areas as appropriate. All treatments proposed in the plan should be consistent with the management objective of preserving the cultural landscape and historic scene in the mill town between 1900–1938.
- For interpretative purposes, reestablish the vegetable gardens that were part of the historic landscape, including the large plot on the north side of National Creek and several of the smaller plots associated with Silk Stocking Row.

GUIDELINES FOR TREATMENT OF VEGETATION

- Retain vegetation that provides privacy (screening) to and from private residences.
 - Remove vegetation as a way to expand or direct circulation within the town and to protect or expose significant archaeological resources.
 - Thin tree canopy and understory materials in a manner that provides or enhances historic viewsheds (from specific view points to key resources).
 - Selectively remove vegetation around historic structures to reduce the risk of fire and pests.
 - Remove vegetation as required and feasible to retain or redefine the tramline cable corridors from the tram deck to the mine sites on bonanza ridge.
-

LAND USE

To preserve the spatial integrity of the cultural landscape, historic land use patterns established in the early development of Kennecott should be retained and used as the framework for new activities and functions within the mill town. In all cases, adaptive use on public lands will comply with appropriate uses as specified (see "Treatment Plan").

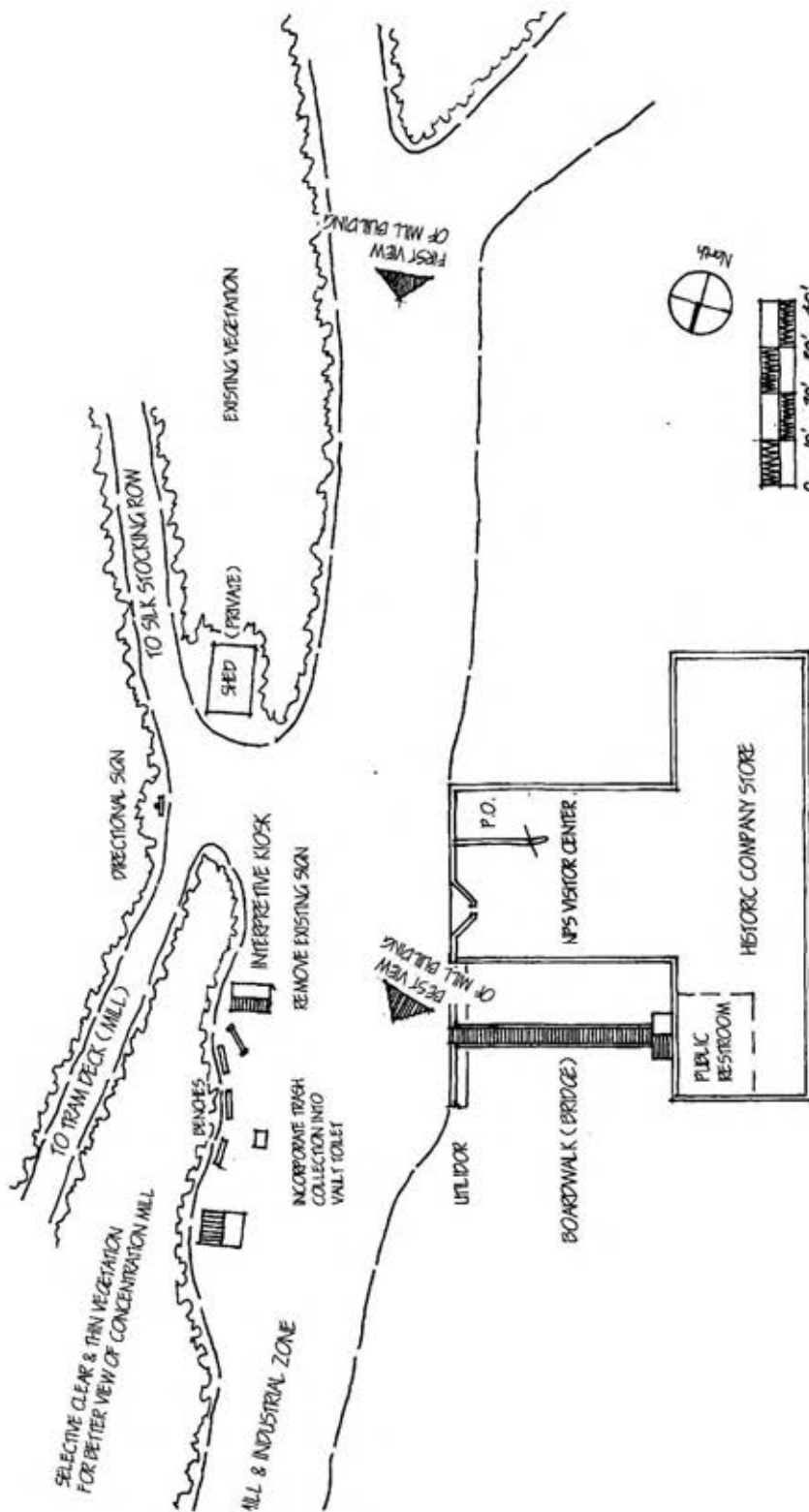
These land use patterns are summarized in Table 18, Management Zones and Land Use.

Table 18: Management Zones and Land Use

Zone	Historic Land Use	Appropriate Adaptive Land Uses
Zone 1: Administrative Core	Office Manager's Residence Depot (Station) Hospital Staff housing	NPS Operations Administrative offices Interpretation Visitor Center
Zone 2: Industrial Core	Concentration Mill Tram Deck Power Plant Leaching Plant Machine Shop Tailings Flumes Support structures Warehouses	Interpretation Exhibits Storage Equipment Repair Workshops Utility Infrastructure Maintenance facilities
Zone 3: Residential B	North end Cottages	Private Residences ¹ Interpretation
Zone 4: Residential A	Silk Stocking Row Old Lodge Barracks Access Roads	Private Residences ⁴ Interpretation Lodging (temporary) Tent Cabins
Zone 5: Commercial	Store Post Office Resident Services Meat house Community Facilities Housing Tent Cabins	Concessions/Commercial (outfitters, bike rentals, guide services, gift shop, book store) Offices Community Center
Zone 6: Limited Development	Vegetated hillsides Cleared hillsides Historic dumps	Natural resource protection Interpretation

VEGETATION MANAGEMENT PLAN

- Designates vegetation management zones for the mill town
- Assesses the condition of existing plant communities and associations
- Identifies management issues for each zone
- Proposes treatments (maintenance, alteration, and limited restoration)
 - Nonnative vegetation (existing)
 - Hazard trees
 - National Creek riparian corridor
 - Alpine communities
- Prepares a list of appropriate plant materials for each zone within the mill town. (For screening views or structures, supplemental plantings around new facilities, and restoration as a result of ground disturbance or rehabilitation of historic structures and roads.)



• COMPANY STORE SITE PLAN

SPECIFIC RECOMMENDATIONS

- Areas to the west and beyond the extent of the historic structural development (including tailings and dumpsites) should remain undeveloped and managed primarily for natural resource values.
- The cemetery located south of the town site is historically significant and should be preserved as part of a cyclic maintenance preservation program.

ARCHEOLOGICAL RESOURCES

SPECIFIC RECOMMENDATIONS

- Consideration should be given to the role and use of artifacts, features, and structural ruins that post-date the period of significance (with a priority rating of 5). While many of these features are not managed as cultural resources, they may still provide historical information, and in their setting add to the industrial character of the mill town.
- Mitigate potential safety hazards for visitors by protecting structural ruins, remnant structural foundations (dam, bridges, and flumes), and isolated archeological features and artifacts throughout the site. Suitable mitigation techniques include moderate clearing of vegetation to increase visibility, rerouting "formal" circulation routes to bypass or provide only distant views of the features, signage, or restricted access (such as a guided tour only).
- Small-scale features and remnants in the vicinity of National Creek, such as the clothesline, boardwalk, and well should be stabilized and if appropriate, reestablished as interpretative tools for understanding the domestic character of this area.

PRIORITIES FOR PRESERVATION OF ARCHEOLOGICAL RESOURCES (TABLE 19)

Priority 1 Features associated with the operation of Kennecott during the historic period (1900–1938) that remain in historical and physical context.

Priority 2 Features associated with the operation of Kennecott during the historic period but have lost their original context.

Priority 3 Structural ruins from the historic period, in situ.

Priority 4 Features from multiple periods requiring additional investigation.

Priority 5 Features that post-date the period of significance (not managed as cultural resources).

Artifacts, features, and structural remains dating from the Kennecott era (1900–1938), as documented in the *Analysis and Evaluation* (priority ratings 1, 2, and 3), are contributing resources and should be preserved in context and stabilized as part of a Collection Management Plan.

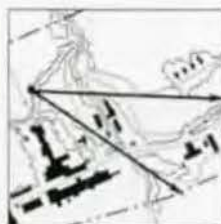
VIEWS AND VIEWSHEDS

Throughout the historic period views were characteristically unobstructed as most of the vegetation was removed to provide raw materials for construction, reduce the fire hazard, or create space for siting structures. Over the years, vegetation has not been actively managed and encroaching trees and shrubs obstruct many historic views. While wholesale removal of existing vegetation would re-establish all of the historic viewsheds, the primary treatment should remain rehabilitation. In this regard, management should target management of *selected* views and viewsheds that enhance the interpretative environment of the cultural landscape, while maintaining appropriate privacy for individual property owners.

SPECIFIC RECOMMENDATIONS

- Selectively thin or remove vegetation to preserve or reestablish historic views in the mill town.⁵
- Work with property owners to maintain privacy (screen views) between public spaces and private residences.
- Selectively remove encroaching vegetation from historic trails, structures, and roads. Retain the natural visual character of shoulder areas around circulation routes and structures by thinning rather than brushing out vegetation.
- Use views and vistas as interpretative tools to enhance the visitor experience. This can be accomplished by: removing vegetation to open foreground and middle-ground views from interpretative trails; framing views to specific features; creating a visual sequence of experiences along a trail or road that reveals a view; or, by providing unique and discrete views from the interior of the structures to the larger landscape setting.
- Concentrate visitor services and activities in areas that provide vistas to natural and cultural resources of the mill town and surrounding areas.

PHOTO KEY: PRIMARY VIEWS TO PRESERVE OR REESTABLISH



- View from the trail between National Creek and the tram deck southwest to the National Creek area, and toward the south end of town.



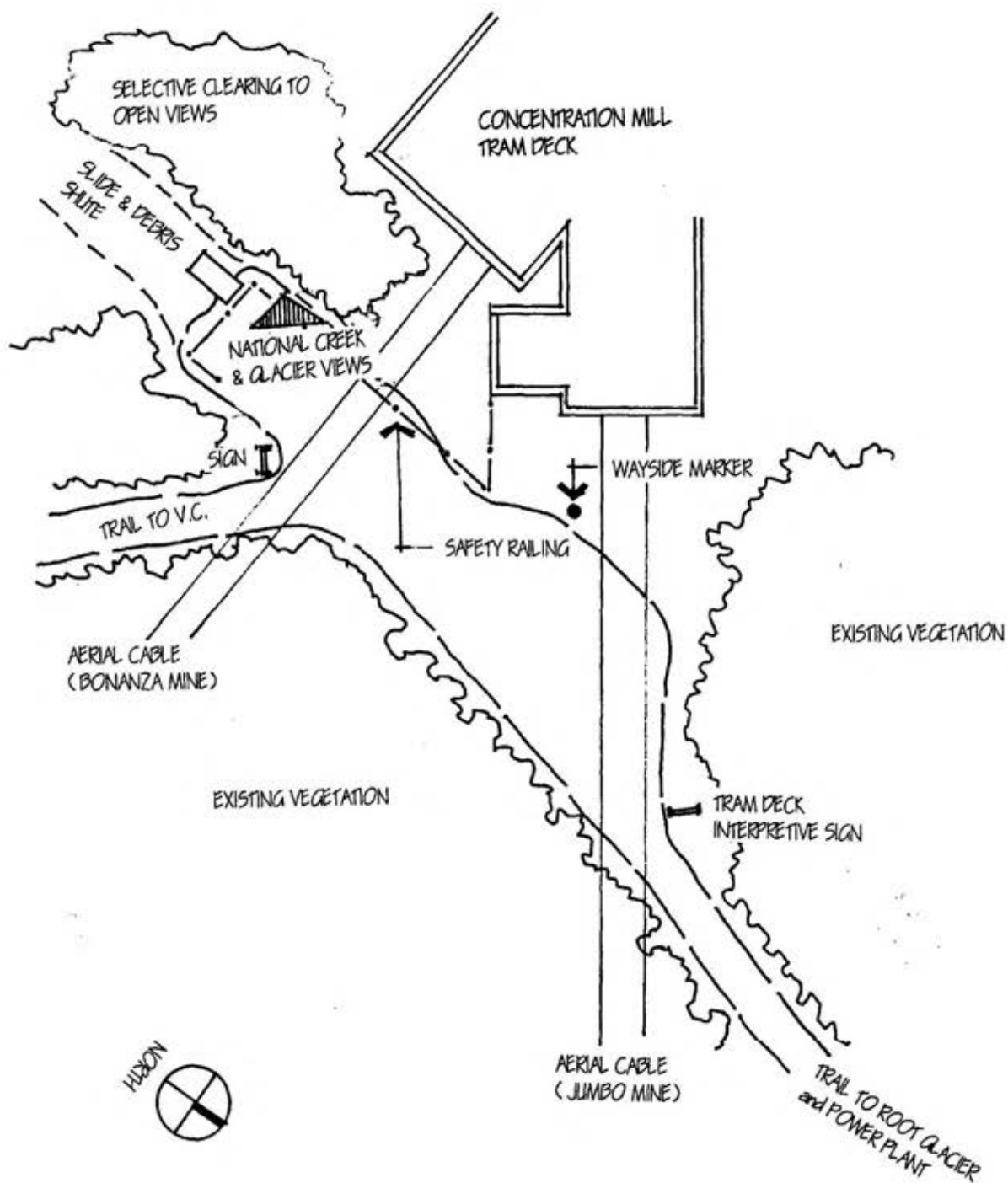
- View looking north along the railroad trestle to key structures in the mill town.



- Views from the north end of the town, looking south to the cottages, power plant, leaching plant, and concentration mill.



- Views through the National Creek area from the pedestrian crossing above the barracks.



• AERIAL TRAM DECK SITE PLAN ——— •

NOT TO SCALE

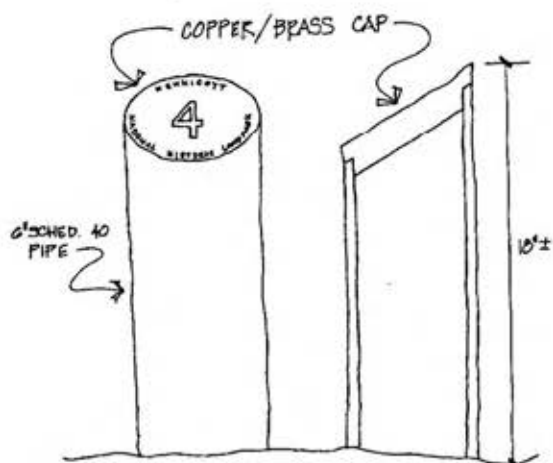
SMALL-SCALE FEATURES

Small-scale features in the mill town historically included a variety of functional and ornamental elements, most of which no longer remain. In many cases, these features—such as benches, plank bridges, steps and handrails, etc. were fashioned at the site using available materials. In some cases, furniture that was brought to the site for use in specific structures may have found its way to a porch, or the front of the store. Other small-scale features were constructed based on need using materials that could be salvaged. For example, metal pipe was used for the handrail along the trail and steps from Silk Stocking Row to the company store. In other areas (around the managers office), a wood handrail was used. Altogether small-scale features reflected the working industrial character of the town.

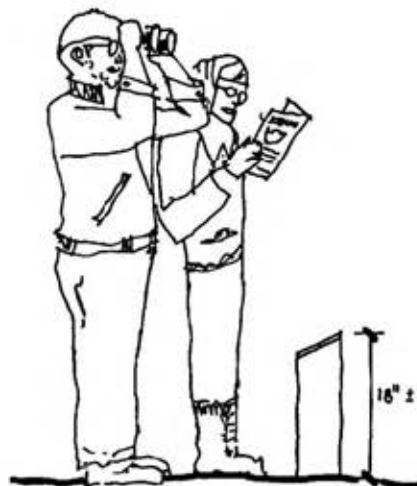
In order to allow the NPS flexibility in the preservation or establishment of new small-scale features the following design guidelines are proposed.

SPECIFIC RECOMMENDATIONS

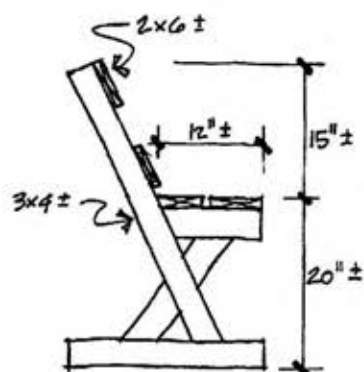
- All small-scale features, including light fixtures, benches, garbage cans, and interpretative displays, should be visually compatible with the historic character of Kennecott, and should meet all applicable codes and regulations. Complementary design rather than replication is the preferred treatment when rehabilitating or replacing historic site features.
- To enhance the interpretive environment, consideration should be given to reestablishing nonextant, small-scale structures and features. These features include functional and ornamental elements (such as benches and clothes-lines), utilities (light standards, utilidors, and water systems) and mining features (such as flumes). Reestablishment or reconstruction of small-scale features should be based on historical documentation.
- Whenever possible, reestablishment of nonextant features should be based on either:
 - Individual features as they comprise a system (utilidors or water systems)
 - Aggregate features defining a land use area such as the administrative area around National Creek (picket fences, boardwalk, handrails, clothes-lines, gardens, etc.)



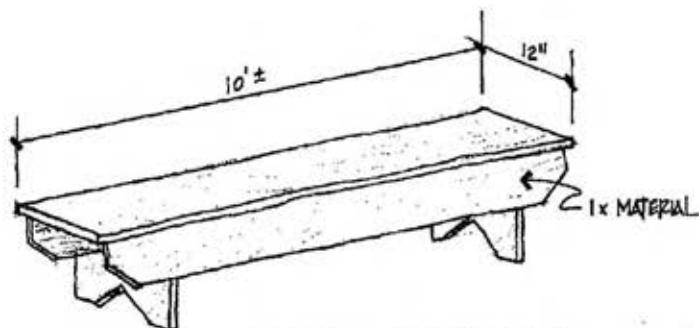
INTERPRETIVE GUIDE MARKER



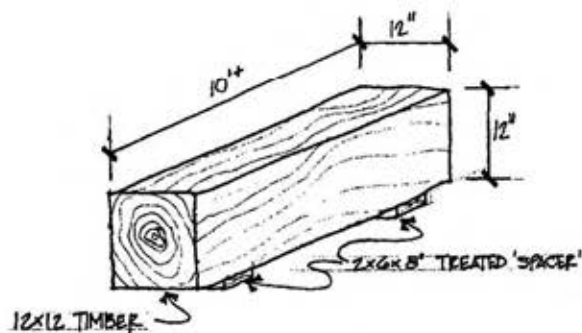
GUIDE MARKER



HISTORIC PERIOD BENCH



HISTORIC PERIOD BENCH



TIMBER BENCH

Materials

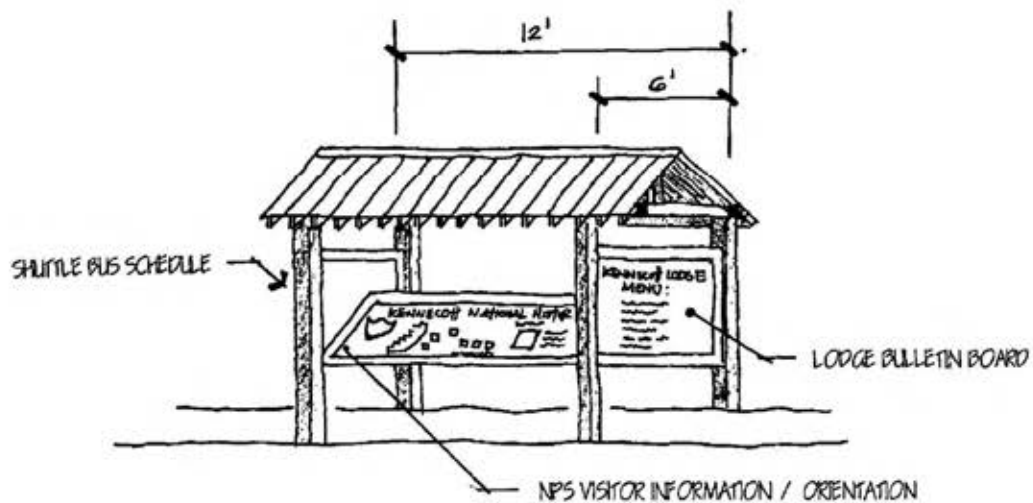
- The use of metal as a material for signs, seating, and fencing in the industrial core is appropriate. If paint is required, apply a nonreflective matte surface paint whenever possible to reduce the visual impact of an element in the landscape.
- Retain the use of metal for handrails in the industrial core when needed for safety or interpretive trails.
- Maintain the gravel and dirt surfacing of roads and trails whenever possible. Accessible trails should be paved using compacted granite, soil cement, or chip seal.

Utilities

- Conduct additional archeological investigations and site work to identify, document, and assess the condition and viability of abandoned utilities through the mill town. Where appropriate, reestablish a portion of this system for interpretive purposes.
- Develop a lighting plan for the mill town that addresses both function and safety. Functional issues include the scale, color, and design of the fixture in the context of the mill town. Safety issues include modern techniques for illuminating the ground to meet both safety and security needs. All lighting concepts for the town site must also preserve the natural qualities of the environment.

Site Furniture

- Assure that all garbage cans meet applicable health, safety, accessibility, and wildlife standards. Material and surface treatments should be visually compatible with the historic character of Kennecott. If treatment with rust inhibitor primer is required to reduce maintenance or meet standard, finish with compatible matte paint color.



KIOSK / VISITOR ARRIVAL
NOT TO SCALE



KIOSK / COVERED

- Locate benches in areas designated for visitors (trailheads, kiosks, interpretive contact points, tour areas, hotel, etc.). Benches should be simple in design, without back structure, and constructed of wood.

Signs

- Individual signs and informational markers were not used in Kennecott during the historic period. Because of this, the addition of new signs within the NHL is considered an intrusion on the historic character of the site, and should be kept to a minimum. When signs are required, they should be materially compatible with other built structures (wood, concrete, and metal) in the district, and be located in an unobtrusive manner. Design guidelines for new signs in the NHL are organized into three categories:
- Orientation (or directional) Signs and Safety Information
- Interpretive Information
- (Commercial) Business Signs

Orientation Signs and Safety Information

- All visitor orientation or directional signs (to specific features and facilities) should be clustered and concentrated in high visitor contact locales.
- Large kiosks are appropriate when used adjacent to historic structures or associated with designated visitor staging areas (trailheads, visitor "center", shuttle turnaround, etc.).
- Safety signs should be consistent in material, form, and style. Variations in size and siting will be required based on specific site needs and issues. Safety signs will be used to identify permanent and restricted access areas, and delineate temporary closures for areas under construction or limited seasonal use.

Building Signs:

Use 3" painted white letters (Verdana Style) on red background, attach directly to structure.

POWERHOUSE

Approximate sign size @ 8" x 38"

CONCENTRATION MILL

TRAM DECK

Directional Signs:

Use 2" painted white letters on red background, attach with 2 – 4x4 posts

← **ROOT GLACIER TRAIL**
TRAM DECK and
VISITOR CENTER →

Warning & Safety Signs:

Use standard metal commercially available signs. Attach directly to structures.

Interpretative Information Signs

- Develop an interpretative sign plan for the NHL. The plan should be consistent with the overall sign plan for the district and the proposals outlined in the interpretive plan for the NHL to be developed by the NPS.
- Interpretative signs include waysides, markers highlighting individual site components, and trail indicators. In all cases, the introduction of new interpretative signs should be based on overall interpretative plan and management goals and objectives for visitor experience at Kennecott.
- Design emphasize should be given to the use of specific materials, siting, and color of interpretative signs to assure visual compatibility between signs and other landscape features.
- Interpretative signs should not be attached directly to any historic structure mining equipment (remaining on the site), vegetation, or archeological feature.

Commercial Signs

- A limit of one sign per commercial building is recommended. The sign should fit flush and not protrude from the structure.
- The scale and size of the sign should not exceed the façade of the structure, and should be visually compatible with the structure. The use of bright colors, neon, or lettering styles not identified in the sign plan for the district, is not appropriate.

ENDNOTES

INTRODUCTION

¹Kennicott and Kennecott are the correct names of two different but closely associated places. Kennicott with an "i" refers to the Kennicott Glacier and River named in 1899 by the U.S. Geological Survey in honor of Robert Kennicott, a pioneer Alaska explorer. Kennecott with an "e" refers to the mining company that took its name from the Kennicott Glacier but for some unknown reason misspelled the name. The error occurred early in the history of the mines, perhaps as early as 1901. Regardless, the Kennecott Mines Company was in operation in 1906. In 1908, a U.S. Post Office was established at Kennecott. In recent years, upon the transfer of the surface estate to the Great Kennicott Land Company, the two spellings have been used casually and interchangeably. This has caused some unnecessary confusion. Broadly speaking, references to Kennicott with an "i" stress the natural history of the area while Kennecott with an "e" addresses the human history of the area. The National Park Service adheres to this convention, which follows from the official designation of the area as the Kennecott Mines National Historic Landmark. See Donald J. Orth, *Dictionary of Alaska Place Names*, US Geological Survey Professional Paper 567 (Washington: USGPO, 1967), p. 510.

²Information is excerpted from the Kennecott Pre-Acquisition Environmental Site Assessment, pgs. 25–30, and the Site History section of this document.

³*The Kennecott Interim Management Plan and Environmental Assessment* will be used as an amendment to the park's General Management Plan.

⁴See Appendix H for a summary of the development of the mines on Bonanza Ridge. Also note that the Mother Lode Mine on the east side of Bonanza Ridge was historically an important ore body associated with the operations at Kennecott. Because it is privately owned, the Mother Lode Mine is not addressed in this report.

SITE HISTORY

¹Early archeological sites in the Copper River Basin are limited in number, but the working of copper is indicated through the recovery of by-products. Refer Donald Clark, "Prehistory of the Western Subarctic" in *Handbook of the North American Indians: Volume 6, Subarctic* (Washington: Smithsonian Institution, 1981), 124. It is likely that native copper was initially found as placer deposits.

²Frederica De Laguna and Catharine McClellan, "Ahtna," in *Handbook of the North American Indians*, 651–2 (see n. 1).

³William R. Hunt, *Mountain Wilderness: Historic Resource Study for Wrangell-St. Elias National Park and Preserve* (Alaska: National Park Service, 1991), 41.

⁴Lt. Henry Allen, *Report of an Expedition to the Copper, Tanana, and Koyukuk Rivers in 1885* (Washington: GPO, 1887), 132, 158.

⁵Morgan Sherwood, *Exploration of Alaska, 1865–1900* (New Haven: Yale Univ. Press, 1965), 162–3.

⁶William R. Hunt, *North of 53: The Wild Days of the Alaska-Yukon Mining Frontier 1870–1914* (New York: Macmillan Publ. Co., 1974), 63–8.

⁷Elizabeth A. Tower, *Ghosts of Kennecott: The Story of Stephen Birch* (Privately published, 1990), 12; Hunt, *Mountain Wilderness*, 41 (see n. 3). While the copper deposits revealed to the McClellan Party was probably not Chief Nikolai's real source the find encouraged further exploration.

⁸Oscar Rohn considered the limestone-greenstone contact a likely source for copper deposits in his 1899 expedition and likely passed on his findings to the McClellan group. Oscar Rohn, "A Reconnaissance of the Chitina River and the Skolai Mountains, Alaska," *US Geol. Survey Twenty-First Annual Report, 1899–1900*, part 3, 489. Ocha Potter, staker of the Mother Lode claims disproved Rohn's theory in 1906 by showing the Kennecott deposits ran across rather than parallel to the contact zone. Ocha Potter, *Sixty Years* (unpublished manuscript on file at NPS Alaska office, 1939), 50–1, 65–7.

⁹The use of power of attorney enabled prospectors to stake more than the two discovery claims legally allowed per prospector. Before 1912, prospectors could stake claims in the names of other people without their knowledge or consent. The discoverer would then purchase the claim for a token amount.

¹⁰Frank Schrader and Arthur Spencer, "Geology and Mineral Resources of a Portion of the Copper River District, Alaska," *U.S. Geol. Survey Bulletin Special Publication* (1901).

¹¹*Ibid.*, 86.

¹²William C. Douglass, *A History of the Kennecott Mines, Kennecott, Alaska* (Manuscript, 1964, on file at NPS Alaska Office, Anchorage), 5.

¹³Tower, *Ghosts of Kennecott*, 17 (see n. 7).

¹⁴*Ibid.*, 17.

¹⁵Lone Janson, *Copper Spike*, eighth printing (Privately published, 1975), 10.

¹⁶Tower, *Ghosts of Kennecott*, 22 (see n. 7).

¹⁷McClellan explained in a 1903 interview that the company (Alaska Copper and Coal) "did not care to put out the money necessary for improvement [of the property] while the title was in controversy." *The Post Intelligencer*, Nov. 29 1903, quoted in Tower, *Ghosts of Kennecott*, 24–6 (see n. 7). A secondary effect of the trial was the proliferation of different accounts pertaining to the Bonanza discovery and transfer of claims. Five such versions are discussed in Robert A. Stearns, "Alaska's Kennecott Copper and the Kennecott Copper Corporation," in *The Alaska Journal* (1975), 130–9.

¹⁸Melody Webb Graumann, *Big Business in Alaska: The Kennecott Mines, 1898–1938* (Occasional Paper No. 1, Cooperative Park Studies Unit, Fairbanks: Univ. of Alaska, 1977), 7. The richness of this deposit is even more anomalous given that mining engineers in the 1900s classed five percent copper as high grade ore.

¹⁹Ibid., 6.

²⁰Valdez was the first choice for a port. Cordova was eventually selected. A third possible terminus for the CR&NW was Katalla where a breakwater was constructed and some track laid. The railway abandoned the prospect after the facilities were destroyed by a storm in 1907." Janson, *Copper Spike*, pp. 51–54.

²¹John K. Winkler, a biographer of J. P. Morgan, noted the rise of American industrial promoters in an "unprecedented boom period between 1898 and 1901." According to Winkler, the industrial promoter "would invade a given industry, buy up a string of competing plants at inflated prices, combine them under a high-sounding name, and offer stock to the public." *Morgan the Magnificent: The Life of J. Pierpont Morgan, 1837–1913* (New York: Garden City Publishing Co., Inc., 1930), 200. Carnegie, Guggenheim, and Morgan were among the well-known financial houses that supported industry through long-term loans and syndicates.

²²Large-scale backing of industry was by no means foreign to any of the Alaska Syndicate backers. J. P. Morgan, for instance played an important role in the development of railways and the steel industry. In 1901, Morgan purchased US Steel from Andrew Carnegie for \$25 million and capitalized the US Steel Corporation at \$1.4 billion dollars. The Guggenheims (who already operated the Guggenheim Exploration Company) preferred to invest in the development of mines rather than in their working. Herbert L. Salterlee, *J. Pierpont Morgan: An Intimate Portrait* (New York: The MacMillan Company, 1939); Thomas R. Navin, *Copper Mining and Management* (Tucson: Univ. of Arizona Press, 1978), 255.

²³Horace J. Stevens, *The Copper Handbook*, vol. 9 (Houghton, Michigan: Horace J. Stevens, 1909), 840.

²⁴Tower, *Ghosts of Kennecott*, 39 (see n. 7).

²⁵Graumann, *Big Business in Alaska*. (see n. 18).

²⁶Ibid., 16.

²⁷Anon., *Outline of Geology and Mining Methods of Kennecott Mines*, Kennecott Copper Corporation, Alaska, (Kennecott Copper Corporation internal report, c. 1924), 6–7.

²⁸A 1937 Bureau of Mines publication on aerial tramways noted “their operation is practically unaffected by snow or other weather conditions. Construction costs may vary greatly with topography, but operating costs are affected very little. Mountain ranges are crossed and ravines and streams are spanned without expensive grading or other preliminary work.” O. H. Metzger, “Aerial Tramways in the Metal-Mining Industry: Part 1,” in *Bureau of Mines Information Circular 6948* (September 1937), 5.

²⁹A review of the local topography appears in Alan M. Bateman and D. H. McLaughlin, “Geology of the Ore Deposits of Kennecott, Alaska,” in *Economic Geology*, vol. 15, no. 1 (1920), 4–5.

³⁰A list of favorable conditions appears in Robert Peele (ed.), *Mining Engineers' Handbook* (New York: John Wiley & Sons, 1918), 1706. Here, the author informs mill towns “should be [located] at the most advantageous point respecting: receiving of crude ore and delivering of products; power for operation; water supply; disposal of tailing; room for future growth; safety from floods and snow slides. Other things being suitable, mill should be just below mine opening.”

³¹Photographic documentation suggests these structures may have been constructed earlier (c. 1904). They were definitely in use by 1907.

³²In order to rid an area of insects, prospectors often resorted to vegetation removal. Prospectors in the Chugach Range 30 miles south of Kennecott, for instance, burned off much of the vegetation, including good quality timber stands. Refer Fred Moffit, “Geology of the Hanagita-Bremner Region, Alaska,” *U.S. Geol. Survey Bulletin 576* (1914), 13.

³³Graumann, *Big Business in Alaska*, 15 (see n. 18).

³⁴The double-reversible aerial tramway system adopted represented an “off-the-shelf” technology. The use of through-type towers, junction stations, and

breakovers closely followed established designs (these are shown in Peele, *Mining Engineers' Handbook*, 1555–98 (see n. 29)). A junction station joined two tramways into one (at Kennecott this was used for the Jumbo and Glacier line). Breakovers enabled the aerial tramway to curve over ridge crests. An angle station (on the Bonanza line) allowed the tramway to make a horizontal jog. Cables for the tramway were of locked coil construction. The cost of running the aerial tramways at Kennecott amounted to \$6.27 per hour. O. H. Metzger, "Aerial Tramways in the Metal-Mining Industry: Part 2," in *Bureau of Mines Information Circular 7095* (February 1940), 29. Tower, *Ghosts of Kennecott*, 67; Graumann, *Big Business in Alaska*, 17 (see n. 18).

³⁵Janson, *Copper Spike*, 76 (see n. 15).

³⁶The syndicate purchased the right-of-way through the canyon for one-quarter-million dollars. While the Copper River route would cost the company \$12 million extra to build, it did allow for a potential merger with coal fields to run the railway that the Valdez route did not. Janson, *Copper Spike*, 33–4 (see n. 15).

³⁷*Ibid.*, 112.

³⁸Among the Syndicate's possessions, The Alaska Steamship Company became the largest maritime transportation company in Alaska trade, and Northwestern fisheries, Alaska's second largest packing company. Graumann, *Big Business in Alaska*, 8 (see n. 18).

³⁹Herbert L. Salterlee, a biographer of J. P. Morgan, noted that Morgan viewed the railway up the Copper River as a great risk, but one that "held possibilities for the future." *J. Pierpont Morgan: An Intimate Portrait*, 448–9 (see n. 21); Martin Harrais, "Gold Lunatics," unpublished manuscript, Polar collections, Rasmusen Library, Univ. of Alaska Fairbanks, 212.

⁴⁰Janson, *Copper Spike* 140–4 (see n. 15).

⁴¹Tower, *Ghosts of Kennecott*, 57 (see n. 7).

⁴²Lewis A. Levensaler to William A. Dickey, letter 6 May 1910 (on file at WRST

office). As early as 1907, development at the Bonanza claim included a cabin outside the main adit. A sketch in F. Moffit and S. Capps, "Geology of the Nizina District, Alaska," *U.S. Geol. Survey Bulletin* 448 (1911), 87 depicts a cabin outside the Bonanza adits. The authors explain earlier that structural developments relied upon 1907 field recording. A map included in the pocket, dated 1911, appears more up to date, with the railroad and Bonanza mine tram terminus mapped in.

⁴³Lewis A. Levensaler to William A. Dickey, letter 6 May 1910 (on file at WRST office). A smaller power plant conceivably operated at the site prior to 1910.

⁴⁴William Cronon, "Kennecott Journey: The Paths Out of Town," in William Cronon, George Miles, and Jay Gitlin (eds.), *Under and Open Sky: Rethinking America's Western Past* (New York: W. W. Norton, 1992), 47.

⁴⁵Margaret Crawford's study of company towns in the American South similarly notes visibility as a main attribute of managerial residences. Margaret Crawford, "Earle S. Draper and the Company Town," in John S. Garner (ed.), *The Company Town* (New York, Oxford Univ. Press, 1992), 139-72 (especially figure 5.3, 149). Although managerial residences were often removed from the industrial area, this was not always the case. Indeed, there may well have been some attraction in the existence of industrial enterprise in an otherwise natural setting. See for instance an 1803 description of Dowlais Ironworks quoted in Bruce Thomas, "Merthyr Tydfil and Early Ironworks in South Wales," in *The Company Town*, 33 (see above).

⁴⁶Janson, *Copper Spike*, 146 (see n. 15); Douglass, *History of Kennecott Mines*, 6 (see n. 12).

⁴⁷Descriptions of the milling process including changes over time can be found in Horace M. Lawrence, "Ammonia Leaching of Copper Tailings at Kennecott, Alaska," *Engineering and Mining Journal* 104, 18 (November 3, 1917): 781-787, and in E. J. Duggan, "Flotation and Leaching at Kennecott," in *Engineering and Mining Journal* vol. 126, no. 26 (1928), 1009.

⁴⁸Graumann, *Big Business in Alaska*, Appendix C, (see n. 18).

⁴⁹Ibid., 18.

⁵⁰Tower, *Ghosts of Kennecott*, 57 (see n. 7).

⁵¹Janson, *Copper Spike*, 104 (see n. 15).

⁵²Ibid., 104. The substitution of a copper rather than traditional gold spike at the line terminus, while novel, was not unusual practice. This, for instance, occurred in 1899 at the completion of a railroad for the Mt. Lyell Company copper mine, Tasmania. Refer Geoffrey Blainey, *The Peaks of Lyell*, second edition (Australia: Melbourne Univ. Press, 1959), 115.

⁵³Graumann, *Big Business in Alaska*, 20-1 (see n. 18).

⁵⁴Ibid., 20.

⁵⁵Walter H. Weed, *Copper Handbook*, vol. 10 (Houghton, Michigan: Horace J. Stevens, 1913), 50.

⁵⁶Douglass, *History of Kennecott Mines*, 7 (see n. 12).

⁵⁷Fred Moffit, "The Metalliferous Deposits of the Chitina Valley," *U.S. Geol. Survey Bulletin 755-b* (1924), 64.

⁵⁸Graumann, *Big Business in Alaska*, 21 (see n. 18).

⁵⁹Ibid., 21.

⁶⁰Douglass, *History of Kennecott Mines*, 7 (see n. 12).

⁶¹Janson, *Copper Spike*, 148 (see n. 15).

⁶²Graumann, *Big Business in Alaska*, 22 (see n. 18).

⁶³This may have been caused by mill foundations being set into permafrost.

⁶⁴Graumann, *Big Business in Alaska*, 22 (see n. 18).

⁶⁵E. J. Duggan, "Ammonia Leaching at Kennecott," in *Transactions of the American Institute of Mining Engineers*, vol. 106 (1933), 548; Horace M. Lawrence, "Ammonia Leaching of Copper Tailings at Kennecott, Alaska," in *Engineering and Mining Journal*, vol. 104, no. 18 (November 3, 1917), 781-7.

⁶⁶E. J. Duggan, "Ammonia Leaching at Kennecott," 548 (see n. 63).

⁶⁷Thomas R. Navin, *Copper Mining and Management*, 262 (see n. 21).

⁶⁸Graumann, *Big Business in Alaska*, 26-8 (see n. 18).

⁶⁹Douglass, *History of Kennecott Mines*, 10 (see n. 12).

⁷⁰Kennecott officials consistently mentioned freight costs as a key factor in the development of the ammonia leaching facility. Refer Horace M. Lawrence, "Ammonia Leaching of Copper Tailings at Kennecott, Alaska," 782 (see n. 63); E. J. Duggan, "Flotation and Leaching at Kennecott," 1008 (see n. 45); E. J. Duggan, "Ammonia Leaching at Kennecott," 548 (see n. 63).

⁷¹Walter H. Weed, *Mines Handbook* (New York: Stevens Copper Handbook Co., 1920), 299-304.

⁷²E. J. Duggan, "Flotation and Leaching at Kennecott," 1009 (see n. 45).

⁷³Kennecott Copper Corporation. *Annual Report for 1936, Kennecott Copper Corporation, Alaska Mines* (Internal report, 1936), 12.

⁷⁴Graumann, *Big Business in Alaska*, 28 (see n. 18).

⁷⁵Douglass, *History of Kennecott Mines*, 10 (see n. 12).

⁷⁶HAER inventory, Sept. 1982, lots 86-9.

⁷⁷HAER inventory, Sept. 1982, lots 36-8.

⁷⁸Douglass, *School Days* (Douglass Collection, Univ. of Alaska Fairbanks), quoted in Hunt, *Mountain Wilderness*, 75–6 (see n. 3).

⁷⁹Hunt, *Mountain Wilderness*, 76 (see n. 3).

⁸⁰The small neighborhoods formed by staff accommodations likely buffered the appearance of industry at Kennecott and may also have helped discourage rowdiness amongst workers in the mill town.

⁸¹Graumann, *Big Business in Alaska*, 28–30 (see n. 18).

⁸²*Ibid.*, 30.

⁸³*Ibid.*, 30.

⁸⁴*Ibid.*, 32.

⁸⁵While through towers were one of the most sturdy tower designs available, they still required annual repairs and maintenance, particularly in steep and rugged terrain. At Kennecott, a number of through towers were not anchored to their footings, perhaps in order to improve the speed of repair [refer National Park Service, *Mining Compliance Site Inventory Form XMC 086* (on file at WRST office)].

⁸⁶Hunt, *Mountain Wilderness*, 73 (see n. 3); Douglass, *History of the Kennecott Mines*, 9 (see n. 12).

⁸⁷The Mother Lode Mine was discovered and staked in 1906 by Ocha Potter, a Michigan College of Mines graduate. Although Potter's prediction of the value of the ore body would later prove correct, he became disillusioned with the value of his prospect in 1913 and soon sold it to a speculator. Ocha Potter, *Sixty Years*, 65–7 (see n. 8).

⁸⁸Hunt, *Mountain Wilderness*, 85–8 (see n. 3); Douglass, *History of the Kennecott Mines*, 9 (see n. 12).

⁸⁹Graumann, *Big Business in Alaska*, 35 (see n. 18).

⁹⁰Anon., *Outline of Geology and Mining Methods*, 9 (see n. 26).

⁹¹Renovations entailed constructing an extra story on the 1910 bunkhouse and developing the attics of both bunkhouses, complete with dormer windows. Steven Peterson, Raymond Todd, and Richard Silva, *Historic Structures Report: Kennecott National Historic Landmark 1992 Emergency Stabilization Recommendations* (Alaska: National Park Service, 1992), 71, 112, 122.

⁹²Hunt, *Mountain Wilderness*, 75 (see n. 3).

⁹³Duggan, "Flotation and Leaching," 1009 (see n. 45).

⁹⁴*Ibid.*; Steven Peterson, Raymond Todd, and Richard Silva, *Historic Structures Report*, 9 (see n. 89).

⁹⁵The flotation technique used sodium sulphide, coal-tar creosote, sulphur, quicklime, and steam-distilled pine oil (listed in decreasing amounts required) as reagents to encourage the separation of ore. With the addition of water and forced air, this process created a rich froth of copper concentrates (32 to 35 percent copper), which could then be skimmed from the top of the flotation tanks. Duggan, "Flotation and Leaching," 1013 (see n. 45).

⁹⁶*Ibid.*; Graumann, *Big Business in Alaska*, 38 (see n. 18).

⁹⁷Duggan, "Flotation and Leaching," 1013 (see n. 45).

⁹⁸Tower, *Ghosts of Kennecott*, 74 (see n. 7).

⁹⁹Alan Bateman, consulting geologist for the Kennecott Mines, related Kennecott's mining operation to four stages: active exploration and development (1910–1915); vigorous mining and increasing ore reserves (1915–1922); exploitation of reserves with few new discoveries (1922–1930); clearing up and robbing of pillars (1930–1938). Refer Alan Bateman, *Residuary Life of the Kennecott Mines* (Kennecott Copper Corporation Company Internal Report, 1939), 3.

¹⁰⁰Graumann, *Big Business in Alaska*, 39 (see n. 18).

¹⁰¹The mill began as a tall narrow structure with defined levels. By the close of Kennecott operations, however, alterations had gradually transformed the mill structure into a delta form with numerous mezzanine floors.

¹⁰²Alan Bateman, "Internal Report 25 Sept. 1925," quoted in Bateman, *Residuary Life of the Kennecott Mines*, 5 (see n. 97).

¹⁰³*Ibid.*, 6.

¹⁰⁴Graumann, *Big Business in Alaska*, 43 (see n. 18).

¹⁰⁵Michael Lappen, *Whose Promised Land?: A History of the Conservation and Development Management Plans for the Wrangell and Saint Elias Mountains Region, Alaska 1938–1980* (Univ. of California MA thesis, 1984), 29.

¹⁰⁶Douglass, *History of the Kennecott Mines*, 11 (see n. 12).

¹⁰⁷Thomas R. Navin. *Copper Mining and Management*, 254–72 (see n. 21).

¹⁰⁸Salvage operations were indeed so well-arranged that the last shipment made the last train from Kennecott on November 10. Kennecott Copper Corporation, *Annual Report for 1938, Alaska Mines*. (Kennecott Copper Corporation Manuscript 1938), 31–5.

¹⁰⁹*Ibid.*; The equipment purchased by W.E. Dunkle was transferred to the Golden Zone Mine south of Mt. McKinley. National Park Service, *Kennicott Pre-Acquisition Environmental Site Assessment* (Alaska: National Park Service, 1996), 28.

¹¹⁰Kennecott Copper Corporation, *Annual Report for 1938* (see n. 106), 34; National Park Service., *Kennicott Pre-Acquisition*, 28 (see n. 107).

¹¹¹Kennecott Copper Corporation, *Annual Report for 1938* (see n. 106).

¹¹²Lappen, *Whose Promised Land?*, 39 (see n. 103).

¹¹³The tennis and handball courts, a storage facility opposite the West Bunkhouse, and two garages and one cottage south of the schoolhouse may also have been removed during this time.

¹¹⁴National Park Service, *Kennicott Pre-Acquisition*, 29 (see n. 107).

¹¹⁵A roughly made water-wheel west of the railway bridge over National Creek may relate to the Consolidated Wrangell period, indicating the use of alternate power sources.

¹¹⁶National Park Service, *Kennicott Pre-Acquisition*, 29 (see n. 107).

¹¹⁷John D. Coffman and Harry J. Liek, *Report on Proposed Alaska National Park* (National Park Service, 1938).

¹¹⁸Lappen, *Whose Promised Land?*, 43 (see n. 103).

¹¹⁹National Park Service, *Kennicott Pre-Acquisition*, 30 (see n. 107).

¹²⁰*Ibid.*, 22 (see n. 103).

¹²¹*Ibid.*, 33 (see n. 103).

¹²²*Ibid.*, 42 (see n. 103).

ANALYSIS AND EVALUATION

¹High-grade ores were crushed, bagged and shipped to the smelter as soon as the railway was completed in 1911. Lower grade ores were treated by gravity concentration typical of the day. Carbonate ores, which were not amenable to gravity concentration or conventional leaching techniques, were treated with a site-specific ammonia leaching process after 1916. Finally particles too small to respond to gravity concentration or be treated profitably by ammonia leaching were subjected to flotation after 1923.

²Glacier Mine operated seasonally, and supported a tent camp and two wooden structures.

³Excerpted from Kennecott Pre-Acquisition Environmental Site Assessment, National Park Service, December 1996. Pgs. 30–33.

⁴See Recommendations for preservation philosophy and management of health/safety issues.

⁵The notable exception is the log section of the manager's office.

⁶See Appendix B for a description of the evaluation criteria used to assess priorities for treatment.

⁷Over the years, there have been a variety of names and numbers associated with individual structures at Kennecott. As part of the CLR, the effort was made to cross-reference and verify the location and name of every building to determine the most appropriate system. As a result of this effort, the names for buildings and associated numbers used in the CLR are taken from the historical record, as documented in this report. Construction dates for building are taken from Graumann, 1987, and the Historic American Engineering Record (HAER) recording project, 1980. Additional building descriptions are from Wheaton, 1979, and from Peterson, et.al. 1992. Condition is from Peterson, et al., 1992, and field documentation, 1997 and 1998. Significance statements are taken from the National Register nomination, 1984 and HAER documentation, 1980. Building descriptions and significance statements are not given for structures in private ownership.

⁸Although integrated both structurally and functionally with the Concentration Mill, the Tram Terminus was built prior to the mill structure, and has a significant historical relationship to the tram system, as a staging area for receiving the ore from the mines. It is considered here as a discrete structure, related to both.

⁹The first power plant was constructed in phases between 1911 and 1924, before it was destroyed by fire. Documentation indicates that the second building

followed the general plan of the first plant with boilers in the north end, turbines on the south, and transformers in an extension to the west.

¹⁰This evaluation is based on architectural and historical records for individual structures conducted in 1996. Also see Appendix B.

TREATMENT RECOMMENDATIONS

¹For the complete text of the preferred alternative contained in the *Interim Operations Plan*, see Appendix A.

²Priorities for stabilization of historic structures is based on preliminary assessments conducted between 1996 and 1998. Priorities designated in this document are subject to change based on seasonal assessments, management needs, funding, and support.

³New construction and rehabilitation of existing structures shall be reviewed by the Architectural Control Committee in accordance with covenants and deed restrictions associated with individual properties.

⁴New construction and rehabilitation of existing structures shall be reviewed by the Architectural Control Committee in accordance with covenants and deed restrictions associated with individual properties.

⁵Historic views have been identified using the photographic record for Kennecott, and to lesser degree, oral histories. Although a scientific assessment of views has not been undertaken, it is well documented that vegetation throughout the mill town was virtually non-existent as a result of construction and operations at the site, (beginning in 1900 and continuing off and on until abandonment in 1938). As a result, the landscape was quite open, allowing foreground, middle-ground, and distant views. Because the majority of vegetation in the mill town has not been actively maintained, most of the historically open views have been lost.

BIBLIOGRAPHY

Allen, Henry. 1887. *Report of an Expedition to the Copper, Tanana, and Koyukuk Rivers in 1885*. Washington: U.S. Government Printing Office.

America North Inc. 1992. "Kennicott Mine Site Investigation Interim Report." 2 Vols. Anchorage, Alaska.

America North/EMCON, Inc. 1992. "Kennicott Mine Site Investigation Final Report." 2 Vols. Anchorage, Alaska.

_____. 1992. "Remediation Recommendations Report Kennicott Mine Site, Alaska." Anchorage, Alaska.

Anon. c. 1924. *Outline of Geology and Mining Methods of Kennecott Mines, Kennecott Copper Corporation, Alaska*, Kennecott Copper Corporation internal report.

Asbestos General, Inc. 1991. "Kennicott Asbestos Containing Materials Survey." Anchorage, Alaska.

Alan Bateman. 1939. "Residuary Life of the Kennecott Mines." Kennecott Copper Corporation. Internal Report.

Bateman, Alan M. and D. H. McLaughlin. 1920. "Geology of the Ore Deposits of Kennecott, Alaska," in *Economic Geology*, Vol. 15, no. 1.

Betts, Robert C. and Peter M. Bowers. 1994. "Archaeological Monitoring of 1993 Asbestos Abatement at Kennecott, Alaska." Revised edition 2 Vols. Northern Land Use Research, Inc., Fairbanks, Alaska.

Blainey, Geoffrey. 1959. *The Peaks of Lyell*, 2nd edition. Melbourne Univ. Press, Melbourne, Australia.

Alfred H. Brooks. 1914. "The Alaskan Mining Industry in 1913" in *Mineral Resources of Alaska; Report on Progress of Investigations in 1913*. U.S. Geological Survey Bulletin 592. U.S. Government Printing Office, Washington.

_____. 1915. "The Alaskan Mining Industry in 1914" in *Mineral Resources of Alaska; Report on Progress of Investigations in 1914*. U.S. Geological Survey Bulletin 622. U.S. Government Printing Office, Washington.

_____. 1923. "The Alaskan Mining Industry in 1921" in *Mineral Resources of Alaska; Report on Progress of Investigations in 1921*. U.S. Geological Survey Bulletin 739. U. S. Government Printing Office, Washington.

Cloues, Philip and James Wood. 1994. "Abandoned Mine Land Inspection Report, Kennecott Mine Complex, Wrangell-St. Elias National Park." Mining and Minerals Branch, Land Resources Division, National Park Service.

Coffman, John D. and Harry J. Like. 1938. *Report on Proposed Alaska National Park*. National Park Service.

Margaret Crawford. 1992. "Earle S. Draper and the Company Town," in John S. Garner (ed.), *The Company Town*. Oxford University Press, New York.

E. J. Duggan. 1928. "Flotation and Leaching at Kennecott," in *Engineering and Mining Journal*, Vol. 126, no. 26.

E. J. Duggan. 1933. "Ammonia Leaching at Kennecott," in *Transactions of the American Institute of Mining Engineers*, Vol. 106.

William C. Douglass. 1964. *A History of the Kennecott Mines, Kennecott, Alaska*. Manuscript on file Alaska Regional Office, National Park Service, Anchorage.

Eppinger, R.G., P.H. Briggs, D. Rosenkrans, and others. 1999 "Geochemical Data for Environmental Studies of Mineral Deposits at Nabesna, Kennecott, Orange Hill, Bond Creek, Bremner, and Gold Hill, Wrangell-St. Elias NP/P, Alaska." U.S. Geological Survey. Open File Report 99-XXX, manuscript in review.

Eppinger, R.G.; P.H. Briggs; D. Rosenkrans; and V. Ballestrazze. 1999. "Environmental geochemical studies of select mineral deposits in Wrangell-St. Elias NP/P, Alaska." U.S. Geological Survey Professional Paper No. XXX, manuscript in review.

Friends of Kennicott. 1994. "A Proposal for Ownership & Management of the Kennicott Property; Protecting the Cultural and Natural Heritage of Alaska's Wrangell-St. Elias National Park."

Friends of Kennicott. January 1997. "Kennecott Acquisition: Past Present and Future."

Gallant, A.L., E.F. Binnian, J.M. Omernik, and M.B. Shasby. 1995. "Ecoregions of Alaska." Professional paper 1567. U.S. Government Printing Office. Washington, D.C.

Graumann, Melody Webb. 1977. *Big Business in Alaska: The Kennecott Mines, 1898-1938*. Occasional Paper No. 1, Cooperative Park Studies Unit, Fairbanks: University of Alaska.

Harris, Martin, "Gold Lunatics," unpublished manuscript, Polar collections, Rasmusen Library, University of Alaska, Fairbanks.

Helm, June. (Vol. editor). 1981. *Handbook of the North American Indians*: Volume 6, Subarctic Smithsonian Institution, Washington.

Hunt, William R. 1991. *Mountain Wilderness: Historic Resource Study for Wrangell-St. Elias National Park and Preserve*, National Park Service, Alaska.

_____. 1974. *North of 53: The Wild Days of the Alaska-Yukon Mining Frontier 1870-1914*. Macmillan Publishing Company, New York.

Kay, Simon and Robert E. Miller. 1990. "Kennicott-A Hazardous Waste Audit." 2 Vols. School of Engineering, University of Alaska, Anchorage.

Kennecott Copper Corporation, 1938. *Annual Report for 1938, Alaska Mines*. (Kennecott Copper Corporation Manuscript.

_____. 1936. *Annual Report for 1936, Kennecott Copper Corporation, Alaska Mines*. Internal report.

_____. *Annual Report of the Kennecott Copper Corporation for the Year[s] ended December 31, 1917, 1918, 1920, 1924*.

_____. General company records. Copies on file National Park Service, Alaska Regional Office, Anchorage, Alaska.

Michael Lappen. 1984. *Whose Promised Land?: A History of the Conservation and Development Management Plans for the Wrangell and Saint Elias Mountains Region, Alaska 1938–1980*. Univ. of California MA thesis.

Horace M. Lawrence, 1917. "Ammonia Leaching of Copper Tailings at Kennecott, Alaska," in *Engineering and Mining Journal*, Vol. 104, no. 18.

Lone, Janson. 1975. *Copper Spike*, 8th printing. Privately published.

Loso, Michael G. 1998. "Kennecott Vegetation Documentation for the Kennecott Cultural Landscape Report." Prepared for the National Park Service. Park files, WRST.

Ludwig, Stefanie L. and Bruce A. Ream. 1995. "Archaeological Monitoring of 1994 Remediation Activities at Kennecott, Alaska." 2 Vols. Northern Land Use Research, Inc. Fairbanks, Alaska.

Martin, Richard and Robert Spude. 1987. Comp. "Response to Kennecott: A Preservation Proposal for the Secretary of the Interior." NPS, Alaska.

O. H. Metzger. September 1937. "Aerial Tramways in the Metal-Mining Industry: Part 1," in *Bureau of Mines Information Circular 6948*.

_____. February 1940. "Aerial Tramways in the Metal-Mining Industry: Part 2," in *Bureau of Mines Information Circular 7095*.

Miles, George and Jay Gitlin, eds. 1992. *Under and Open Sky: Rethinking America's Western Past*. W.W. Norton, New York.

Moffit, Fred H. 1910. "Mining in the Chitina District." In *Mineral Resources of Alaska; Report on Progress of Investigations in 1909*. U.S. Geological Survey Bulletin 442. U.S. Government Printing Office, Washington.

_____. 1913. "Mining in Chitina Valley." In *Mineral Resources of Alaska; Report on Progress of Investigations in 1912*. U.S. Geological Survey Bulletin 542. U.S. Government Printing Office, Washington.

_____. 1914. "Geology of the Hanagita-Bremner Region, Alaska," *U.S. Geological Survey Bulletin 576*.

_____. 1921. "Mining in Chitina Valley." In *Mineral Resources of Alaska; Report on Progress in Investigations in 1919*. USGS Bulletin 714. U.S. Government Printing Office, Washington.

_____. 1924. "The Metalliferous Deposits of the Chitina Valley," *U.S. Geological Survey Bulletin 755-b*.

_____. 1909. "Mining in the Kotsina-Chitina, Chistochina, and Valdez Creek Regions." In *Mineral Resources of Alaska; Report on Progress of Investigations in 1908*. U.S. Geological Survey Bulletin 379. U.S. Government Printing Office, Washington.

Moffit, Fred H. and Stephen R. Capps. 1911. *Geology and Mineral Resources of the Nizina District, Alaska*. USGS Bulletin 448. U.S. Government Printing Office, Washington.

_____. 1911. "Geology of the Nizina District, Alaska," *U.S. Geol. Survey Bulletin 448*.

Moffit, Fred H. and A. G. Maddren. 1908. "The Mineral Resources of the Kotsina and Chitina Valleys, Copper River Region" In *Mineral Resources of Alaska; Report on Progress of Investigations in 1907*. U.S. Geological Survey Bulletin 520. U.S. Government Printing Office, Washington.

National Park Service. January 1994. Wrangell-St. Elias National Park and Preserve. [Danny Rosaenkrans]. "1993 Kennecott Mine Openings and Tram Survey Report."

_____. July 16, 1993. Wrangell-St. Elias National Park and Preserve. "NPS Site Inventory Form, XMC-125."

_____. March 27, 1996. "Final Kennicott Pre-Acquisition Environmental Site Assessment," NPS, WRST.

_____. 1988. *Management Policies*. Washington, DC.

_____. 1991. *Final Environmental Impact Statement, Cumulative Impacts of Mining, Wrangell-St. Elias National Park and Preserve, Alaska*. National Park Service, Alaska Regional Office, Anchorage, Alaska.

_____. April 1991. "Kennicott, Alaska: A Partnership Proposal". Wrangell-St. Elias National Park and Preserve.

Navin, Thomas R. 1978. *Copper Mining and Management*. University of Arizona Press, Tucson, Arizona.

Nordell, O. and A. Schmitt. 1978. "Vascular Plants from the McCarthy Area: Wrangell Mountains, Alaska."

Orth, Donald J. 1967. *Dictionary of Alaska Place Names*, U.S. Geological Survey Professional Paper 567 U.S. Government Printing Office, Washington.

Robert Peele, ed. 1918. *Mining Engineers' Handbook*. New York: John Wiley & Sons.

- Peterson, Steven M., et al. 1991. "Kennecott National Historic Landmark; Condition Assessment and Stabilization Cost Estimate." NPS, Alaska.
- Peterson, Steven M., et al. 1992. "Historic Structures Report: Kennecott National Historic Landmark 1992 Emergency Stabilization Recommendations." NPS, Alaska.
- Peterson, Steven M., and Logan W. Hovis, "Kennicott National Historic Landmark: Integrated Emergency Stabilization and Lead-Based Paint Management Program." NPS, 1997.
- Peterson, Steven M., Raymond Todd, and Richard Silva, *Historic Structures Report: Kennecott National Historic Landmark NPS*, Anchorage, Alaska, 1992.
- Rohn, Oscar, "A Reconnaissance of the Chitina River and the Skolai Mountains, Alaska," *US Geol. Survey Twenty-First Annual Report, 1899-1900*.
- Salterlee, Herbert L., *J. Pierpont Morgan: An Intimate Portrait*. New York: The MacMillan Company, 1939.
- Schrader, Frank and Arthur Spencer. 1901. "Geology and Mineral Resources of a Portion of the Copper River District, Alaska," *U.S. Geological Survey Bulletin Special Publication*.
- Sherwood, Morgan. 1965. *Exploration of Alaska, 1865-1900*. Yale University Press, New Haven.
- Simon Kay, America North/EMCON Inc. to Gerald D. Schultz, Kennecott Corporation. 1993. "Proposed Cultural Mitigation Strategies for Remediation Options at the Kennicott Mine Site, Alaska"
- Smith, Sumner S. 1917. *The Mining Industry in the Territory of Alaska During the Calendar Year 1915*. US Bureau of Mines Bulletin 142. U.S. Government Printing Office, Washington.

State of Alaska. 1992. "Preliminary Assessment Report for Kennicott Mine Site." Juneau, Alaska.

_____. *Report of the Territorial Mine Inspector to the Governor of Alaska for the Year[s] 1917, 1921.*

Stearns, Robert. 1975. "Alaska's Kennecott Copper and the Kennecott Copper Corporation." *Alaska Journal* 5 : 130-139.

Stevens, Horace J. 1909. *The Copper Handbook*, vol. 9 Houghton, Michigan: Horace J. Stevens.

Sullivan, Michael Sean et al. 1981. "Kennecott, Alaska; A Historic Preservation Plan." Historic Preservation Program of the Department of History and the Bureau of Faculty Research, Western Washington University, Bellingham, Washington.

Terrasat Consultants. 1991. "Geological and Geophysical Investigation of the Kennicott Area, Kennicott, Alaska." Anchorage, Alaska.

Tower, Elizabeth A. 1990. *Ghosts of Kennecott: The Story of Stephen Birch*. Privately published.

Weaton, Rodd L. October 13, 1976. "Architectural Evaluation Kennecott, Alaska." National Park Service, Rocky Mountain Regional Office, Denver, Colorado.

Weed, Walter H. 1913. *Copper Handbook*, vol. 10. Horace J. Stevens, Houghton, Michigan.

Windisch-Cole, Briggitta. February, 1997. "A Showcase of Alaska's Frontier-The Copper River Region." *Alaska Economic Trends*.

Winkler, John K. 1930. *Morgan the Magnificent: The Life of J. Pierpont Morgan, 1837-1913*. New York: Garden City Publishing Co., Inc.

SPECIAL COLLECTIONS AND ARCHIVES

Polar Collection, Rasmussen Library, University of Alaska, Fairbanks.

Clara Rust Collection, Rasmussen Library, University of Alaska, Fairbanks.

Photographic Archives, Museum of History and Industry, Seattle, Washington.

Washington State Historical Museum, Tacoma, Washington.

Special Collections, Allen Library, University of Washington, Seattle, Washington.

Photograph and Map Collection, Wrangell-St. Elias National Park and Preserve
Kennecott Kids Collection, Jean Girard photographs.

United States Geological Survey. Photographic Library.

OTHER

Alaska and Northwest Mining Journal. 1914.

Northwest Mining Journal. 1907–1909.

The Chitina Leader. 1912–1914.

The Pacific Mining Journal. 1913.

「APPENDICES」

- A. INTERIM OPERATIONS PLAN
- B. COMPENDIUM OF SENSITIVE SITES
- C. HAER DOCUMENTATION—KENNECOTT
NATIONAL HISTORIC LANDMARK, 1986
- D. VEGETATION LAND COVER TYPES
- E. RARE PLANT COLLECTIONS
FROM BONANZA RIDGE
- F. RARE PLANTS KNOWN TO OCCUR
IN THE CHITINA VALLEY
- G. VEGETATION DOCUMENTATION FOR
THE CULTURAL LANDSCAPE REPORT:
KENNECOTT MILL TOWN
- H. SITE HISTORY—KENNECOTT MINE SITES
- I. EVALUATION OF HISTORIC STRUCTURES
- J. CHRONOLOGICAL LIST OF HISTORIC
ARCHITECTURAL/ENGINEERING DRAWINGS:
KENNECOTT MINES

INTERIM OPERATIONS PLAN KENNECOTT NATIONAL HISTORIC LANDMARK

The purpose of this Interim Operations Plan for the Kennecott National Historic Landmark (NHL) is to develop management strategies for the National Park Service (NPS) at the NHL in the Wrangell-St. Elias National Park and Preserve. Such a plan became necessary when the National Park Service acquired the privately owned site in June 1998. The Kennecott site, mined for its copper in the early 1900s, is in the center of the park, approximately 5 miles from where the McCarthy Road ends at the Kennicott River. The National Park acquired 2,839 acres, including much of the historic mill town, the subsurface rights to the mine, and the surrounding natural area.

With this acquisition, the Park Service assumed new responsibility for protecting the important elements of the historical, cultural and natural landscape. In addition to being a historic site of national significance, the NHL also includes natural areas easily accessible to visitors and is a gateway to the park's backcountry. Its cultural landscape reflects a mixture of historic mining era buildings and artifacts intermixed with the ongoing life of an Alaska bush community, members of which own lands and businesses intermingled with NPS holdings at Kennecott and in the nearby area of the town of McCarthy.

Preserving such a site and providing visitor access to and interpretation of Kennecott requires analysis of the condition of the historic landscape and stabilizing selected important elements that are deteriorating, determining where visitor services should be located, and providing visitors with ways to explore the history of the site. It requires an understanding of the natural features and processes of the site, in order to both preserve historic values and provide appropriate protection of, access to and interpretation of its natural values for visitors. And it requires cooperation with residents and non-federal landowners, whose partnership is necessary for protection and public appreciation of the area. Existing Mill Site Unit covenants will be modified to more closely reflect the current and anticipated future land usage. There is provision within the covenants for modification of the restrictions by majority lot owner vote by September 2001.

Under private ownership, several important structures were stabilized through the efforts of the nonprofit group Friends of Kennicott. However, many health and safety problems remain on the site, artifacts continue to be lost, historic buildings continue to deteriorate, and many remaining artifacts are at risk. In addition, as part of the preliminary scoping for this plan with the community, there are many issues pending that which are beyond the scope of this effort which will require future planning efforts. Some of these issues include the proposed McCarthy Road upgrade, the impact of the new Princess Hotel in Copper Center on visitation, and identified utility and infrastructure needs of the larger community. This plan, along with the forthcoming associated cultural landscape report, will be an amendment to the park's General Management Plan. This interim operations plan will be for approximately a five year period, which represents how long it will take for the NPS to get basic operations underway. At the conclusion of this interim, start-up period, there will be an opportunity to re-evaluate the plan and make any needed adjustments.

Kennecott's designation as a NHL reflects its exceptional importance to the history of the United States - only 3% of properties listed on the National Register have the status of a NHL. Its significance as an early 20th century mining landscape is multi-dimensional, a fact represented in the many themes of American history that can be discerned through the layers of its material culture. Among others, these themes include the evolution of mining technology at one of the richest copper ore sites in the United States, the physical development and evolution of a company mill town over four important decades of industrial growth, and the history of labor, family life, and environment on one of the last American frontiers.

The site's interpretive potential as a cultural landscape is compelling. As defined by the National Park Service, cultural

landscapes are geographic areas, including cultural and natural resources, associated with a historic event, activity, or person. However, a landscape's age and associations do not automatically warrant preservation. As a cultural landscape, Kennecott's preservation is critical because its physical structures, characteristics, and features defining its historical significance remain. Individual buildings and archeological features are important, but when considered within the holistic context of the cultural landscape, they are of an even greater value in communicating that significance. Because this landscape is largely intact, understanding Kennecott as a cultural landscape is a useful approach to preserving and interpreting its historical legacy.

Stewardship of the cultural landscape at Kennecott is addressed through the many aspects of this Interim Management Plan, which covers a wide range of topics including: cultural resources (including landscape features, land use, and design standards, archeological resources, museum collections and archives, buildings, and structures), natural resources (air quality, surface water, wetlands, vegetation, and wildlife), and interpretation. Integral to the Kennecott plan are management issues related to its administration and operations such as building leases, tours and seasonal use, land acquisition and easements, concerns related to utilities and infrastructure, and the paramount needs for safety and security.

The plan includes the following components:

Provides for both short-term and long-term NPS actions focused on compatible design, incremental change, and the reestablishment of the historic character of the site. Over the next five years the NPS would initiate rehabilitation of the company store for a visitor contact station, offices, and storage. Interpretive programs would be offered by the NPS, concessioners, and other cooperators. Exhibits would be developed in coordination with the McCarthy Museum. Structures would be stabilized on a priority basis. A number of buildings would be opened for visitors to tour independently. Historical pathways would be reestablished and some vegetation clearing would take place. The NPS would work cooperatively with the community to address the rehabilitation of the community building and fire and EMS response.

Management Concept

The primary NPS management goals of this Interim Operations Plan (see figure 103 in preceding Cultural Landscape Report) is to enhance visitor understanding of Kennecott by preserving, protecting and interpreting key remaining structures and landscape features, patterns and relationships that define the historic, cultural and natural character of the NHL.

The approach taken would reflect the 1997 Park Service report supporting federal ownership of the NHL, "Kennecott Acquisition Past, Present and Future". That report stated (page 25):

"What is (to be) maintained is the sense of ..., a site abandoned but still haunted by past residents, a place that has not been... sanitized. It is a place of discovery for the visitor, but one where investigation and inquiry can be done safely and with respect for the remaining historic objects and structures."

The plan incorporates key aspects of more than a decade of public discussion of acquisition and management of the NHL. One key result of the discussion was the desire for cooperative management of the NHL by the Park Service and local residents and nonprofit organizations.

More recently, the community and one such local nonprofit organization, the Friends of Kennicott, have endorsed a shared vision for the NHL. This shared vision will provide a strong foundation for the work that follows and a way to evaluate NPS plans and actions. Most interested parties within the community envision a future in which Kennecott:

- is stabilized to prevent deterioration of historic structures or artifacts and to make them available to the public.
- is managed with a "light touch" in which projects are undertaken in small steps, at modest costs, with minimal intervention process.
- is not just an abandoned mining town, but also is a place that reflects the vitality, creativity, and community spirit of today's residents.
- retains the slow pace, quiet, and spaciousness that foster contemplation and individual reflection.
- is part of a larger community in which residents act both individually and collectively to guide the future of the area.
- contributes to a strong, reasonably diverse economy that includes locally owned and operated businesses, community-based nonprofits, and traditions of barter and subsistence.
- protects and honors small-town values: safety, cooperation, self-sufficiency, and personal freedom.
- Is a place where tourism is allowed to evolve within the capacity of the community, rather than a place where external intervention and control accelerate growth.
- Is seen by local residents and visitors alike in its true context: a remote outpost of civilization in the midst of an enormous mountain wilderness.
- Is managed to protect the cultural and natural resources of this historic mining district and the surrounding glacial landscape; and provides a safe, educational, and rewarding experience for the area's visitors and residents.

The NPS supports the goals that the community and Friends of Kennicott have articulated above. The NPS will endeavor to implement this plan so that these goals are realized. While the NPS does not anticipate that these goals would conflict the NPS goals, policies and mandates, if such a conflict were to occur, NPS mandates would have to take precedence.

Major actions in this plan would include implementing a program of stabilization for historic structures; reestablishment of historic circulation routes; restoration of selected historic views and vistas through selective thinning of vegetation; preservation treatment of significant archeological features; and the addition of interpretive facilities, including trails, waysides, and a visitor contact station. This plan would also allow development within the historic landmark to the degree that proposed changes would be compatible with the historic character of the site. In this regard, individual actions, such as a change in land use or the addition of new structures within the historic district, would be considered and evaluated within the context of the cultural landscape as a whole.

Partnerships

The National Park Service considers itself a partner with the community. In consultation with local residents, landowners and organizations, the Park Service will establish procedures for early and regular discussion with the community of proposed Park activities at Kennecott. These discussions will occur at strategic times, such as prior to when the Park intends to submit budget proposals, before large scale projects are implemented, and on a periodic basis to clarify ongoing operations. It is understood that there may be some activities proposed where complete consensus may not be reached. While the NPS is committed to resolving such conflicts, there may be some instances where NPS mandates may take precedence over community concerns. In establishing these discussions, the Park Service acknowledges that:

- the success of the Kennecott NHL depends on the quality of relationships between NPS and its neighbors.
- there are a variety of vested interests in the area that are not necessarily organized into one official "representative" body, but all of whom will have the opportunities to participate in setting the course of action.
- conflicts should be resolved locally if possible.

The NPS will be receptive to participation in ongoing conversations with the community on issues of mutual concern. Specifically, the NPS considers itself a partner with the community in seeking funding to rehabilitate the community building for community functions and for visitor interpretive programs. The NPS would rent a private building as a temporary community center and park office space. Additionally, the NPS will foster community participation in a variety of ways, such as;

- establish a communication and conflict resolution process for implementing the NPS and community partnerships.
- establish a procedure for joint NPS/community review of proposed adaptive reuse of structures within the prescribed area..
- Consult with interested community members before implementing activities in administrative area, including selective thinning, routing of trails and boardwalks, development of interpretation and evaluation of techniques that may minimize flooding along National Creek.
- Coordinate with community members on certain infrastructure and utility rights-of-ways issues.

Additionally, the National Park Service, in consultation with the local community, will explore partnership proposals from nonprofit organizations that wish to share in the operation and management of Kennecott. Friends of Kennecott have expressed an interest in developing such a relationship. Accordingly, such a strategy will be evaluated. Additionally, the National Park Service will be developing a concessions plan for the NHL. It is hoped that this strategy will be integrated in the overall partnership strategy.

This plan is based on the evaluation of cultural landscape resources, NPS management guidelines and legal mandates, discussions with private landowners, and public meetings. The NPS would continue to work in partnership with the local residents to manage the area in a manner that protects natural and cultural resources and serves the long-term interests of the community by ensuring the protection of private property and access for all landowners.

The living aspects of day-to-day life in Kennecott, both summer and winter, are of significant interest to visitors. The NPS recognizes this and will seek means of satisfying this visitor interest in a way that does not adversely impact the private lives of the area residents.

The National Park Service recognizes that a viable and diverse community of families and individuals existed prior to the area being designated a national park, and will work with this local community to manage the landmark in such a way as to maintain the character of Kennecott and McCarthy.

Architectural Control Committee and Mill Site Subdivision Covenants

When the NPS purchased the 2,839 acres within the landmark boundaries, it became the largest landowner of the area, but not the majority landowner within the Mill Site Unit, which contains most of the original buildings and in-holder lots. Lots within this unit were originally conveyed with residential-type covenants and these covenants now require modification to more closely reflect current land uses and to meet the needs of the NPS as outlined within this document. Modifications of existing covenants will be initiated through an open and inclusive process of all Mill Site lot owners, determined by majority vote and implemented and enforced by the Unit's Architectural Control Committee (ACC). It is the NPS' intention to recruit other landowners to serve on the ACC, as part of this process.

Cultural Resources

Cultural Landscape

The National Park Service has a responsibility to abide by regulations governing the management of historic resources. It must comply with the legal and regulatory requirements as outlined in Director's Order-28: *Cultural Resource Management*, the National Historic Preservation Act, and *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*, among others. Those regulatory requirements address NPS policy, federal legal mandates, and acceptable standards for the treatment of the Kennecott historic properties. The National Park Service will also abide by the covenants attached to the mill site town subdivision.

Land Use. This plan responds to historic land use patterns and uses (see Land Protection Plan, figure 102 in preceding Cultural Landscape Report) while providing for contemporary uses (within the historic context). Six land use "zones" would be delineated with the necessary covenant modification, providing for appropriate contemporary uses within the primary historic use areas that include the industrial core, administrative complex, housing areas, and service-related areas. The following chart outlines the six land use "zones," according to their contemporary and historic use. These zones will promote sensitive and appropriate development and will protect the historical nature of the Mill Site area.

TABLE 1: LAND USE DESIGNATION

Zone	Name	Historic Land Use	Appropriate Uses
1	Administrative Core	Office, manager's residence, depot, hospital, staff housing	NPS Operations, offices, interpretation, visitor center
2	Industrial Core	Concentration Mill, tram deck, power plant, leaching and flotation plant, machine shop, tailings, flume structures, warehouses	Interpretation, storage, equipment repair, workshop, utility infrastructure
3	Residential "A"	Silk stocking row: old lodge, barracks, local access roads	Interpretation, residential, lodging, tent cabins
4	Residential "B"	North end cottages	Private residences, interpretation
5	Residential "C"	Vegetated hillsides, cleared hillsides, historic dumps	Residential, undeveloped, natural resource protection
6	Commercial	Store, post office, storage, resident services, meat house, community facilities, housing, tent cabins	Concession/commercial (outfitters, bike rentals, guided tours, guest services, gift shop, bookstore), offices, community center

Design Standards. To guide development in the Kennecott NHL — especially in the mill town subdivision — the park would work with the community to establish design standards and guidelines for structures and landscape features consistent with the modified covenants. These guidelines would address the use of appropriate materials as well as the size, scale, massing, and character of individual structures and landscape features. The architectural control committee has the responsibility for implementing these guidelines with the Mill Site Subdivision. The ACC will be composed of representatives from the NPS, other non-NPS Mill Site property owners.

Circulation and Access. Vehicular access would continue on all current routes. All abandoned vehicles would be removed from NPS properties. The park would work with the community to remove all other abandoned vehicles from properties within the NHL, particularly along the historic railroad bed. Primary and secondary pedestrian paths would be

identified and reestablished within the NHL, particularly in the mill town subdivision. The primary pedestrian corridor would continue along the historic railroad bed and the existing road through the mill town. Existing service access roads will continue to be used.

Foot trails and pedestrian paths would serve a variety of functions, including interpretive, hiking, and local access for residents. All pedestrian routes that are adjacent to or pass through private property will be developed with consultation of the landowners.

An interpretive trail would be established on the west side of the mill town with views to the powerhouse, the machine shop, and the leaching plant. A footbridge across National Creek would be added to the trail to provide access to the company store. A pedestrian walking loop would be established which begins at the Company store and follows a historical road up National Creek to the footbridge and continues back down the creek to the Assay Office. With further evaluation, portions of this route may have limited vehicle access. Other pedestrian trails — including those to both Silk Stocking Row and Bonanza Mine, the historic carriage road to McCarthy, and paths behind the mill building — would be maintained. The primary pedestrian trail to Root Glacier would continue to be maintained north of the mill town.

Views and Vistas. In this proposal, historic views and vistas at Kennecott would be addressed. Selective thinning of vegetation on NPS properties would enhance historic viewsheds throughout the cultural landscape yet be consistent with maintaining the character of the abandoned mining town partially reclaimed by nature. The type and degree of clearing would be based on recommendations in the Kennecott Cultural Landscape Report. Selective thinning means removal of key trees to enhance a significant landscape feature and provide protection to the buildings and site from the effects of fire. Selective thinning would occur to mark the location of manager's residence, Birch residence, staff house annex, assay office north of National Creek, and areas adjacent to the mill. Selective thinning would also occur around the machine shop, power house, mill and leaching plant. If asked the NPS would assist landowners in planning selective thinning on their properties.

Archeological Resources

Features determined noncontributing to the historic district would be removed if they presented a safety hazard to visitors or residents. All other archeological resources, including historic dumps, would remain.

Museum Collections and Archives

The National Park Service would amend an existing scope of collections statement regarding the collection of artifacts and would follow regulations and NPS *Director's Order #28: Cultural Resource Management* to ensure the preservation and protection of artifacts.

Historically significant, site-related artifacts would be retained in their present locations unless they were at risk or contributed to interpretation. Artifacts determined to be noncontributing and incompatible to the historic district would be removed.

Historic documents, manuscripts, archival material, and associated papers within the scope of collections would be collected from NPS properties and placed in appropriate curatorial storage. Objects not requiring special environmental considerations will be curated in a NPS repository on site. NPS will provide technical assistance to the McCarthy Museum to assist the museum with caring and preserving its collection.

Structures

The National Park Service has a responsibility to abide by regulations governing the management of historic resources. It must comply with the legal and regulatory requirements as outlined in Director's Order-28: *Cultural Resource Management*, the National Historic Preservation Act, and *The Secretary of the Interior's Standards for the Treatment of Historic Properties*, among others. Those regulatory requirements address NPS policy, federal legal mandates, and acceptable standards for the treatment of the Kennecott historic properties.

Buildings. A structural stabilization program would be developed for NPS-Kennecott properties according to a three-tiered plan: items to be addressed immediately (high priority); items to be addressed in the third and fourth years; and long-term needs beyond four years, subject to funding.

Assessments would be made as needed to identify high priority needs such as those created by environmental conditions or because of unforeseen circumstances. The park would continue to work with local residents in ongoing stabilization or contracting efforts. The park would stabilize as appropriate, the upper and lower portions of the mill structure, the powerhouse, and the machine shop to make them safe for unescorted visitor access. The park would work with local interests to rehabilitate the historic community building for community activities and NPS programs. Structures that would be available for adaptive reuse would be the company store, the school, the west bunkhouse, and the meat locker. The company store would be rehabilitated to provide a safe structure for NPS operations, curatorial storage, and limited visitor activities. NPS would seek the involvement and participation of cooperators in the rehabilitation and reuse of the company store. Individuals and groups interested in adaptive reuse would be subject to an agreement with the NPS. Proposed uses would be limited to those of an educational nature. Adaptive reuse of buildings in addition to the store and community building are not as likely in the next five years other than for some minor administrative uses.

PRESERVATION GOAL: The goal of the National Park Service's Kennecott preservation program is to stop the deterioration of key historic buildings within the Kennecott NHL by repairing and replacing deteriorated roofs, walls and foundations while preserving the present abandoned character of the site. This goal will preserve future management options as well.

Specific tasks include:

- Mitigate all life safety issues in and around the structures
- Stop the imminent collapse and damage to the structures, which has resulted from years of abandonment
- Preserve and protect the historic landscape of the site and retain the industrial artifacts in place as part of the landscape character
- Reestablish a weathering skin by repairing roofs, walls and foundations using materials compatible with the historic period and consistent with the Secretary of Interior's Standards for Rehabilitation
- Repair deteriorated structural connections at floors, walls, and foundations and resolve vertical and lateral loads on the buildings resulting from winds and snow
- Mitigate water problems due to rain, site percolation and periodic flooding of National Creek.
- Establish a day labor crew
- Undertake a site cleanup to remove noncompatible building materials resulting from recent demolition and mining activities.
- Preserve and protect documents and artifacts remaining within the structures.
- Acquire additional parcels deemed critical to protecting the historic integrity of the site and management of the site. A prioritization process for determining the critical parcels will be developed. Parcels would be acquired on a willing seller basis only.

The tailings dumped against the building in the 1950s as part of a demolition effort would be removed.

Tram Towers. Mine cables would be lowered from the tram towers as funds become available or as hazardous conditions require. The structural condition of tram towers and cables would be evaluated on an annual basis. Selected tram towers above the timberline would be stabilized to reinforce a sense of scale and extent of the historic district.

Bridges. A low-water crossing at National Creek in front of the assay office would be established to allow vehicular access for residents and for NPS administrative needs. The historic railroad trestle across National Creek would be stabilized and rehabilitated to offer safe access for pedestrians, people in wheelchairs, and on ATVs and bicycles. The park would work to reestablish the historic tracks across the National Creek railroad trestle from the company store north to the mill structure as an interpretive component. Pedestrian bridges across National Creek (one east of the historic railroad trestle) would be reestablished in its historic location as part of the trail system. A new footbridge would be constructed west of the trestle.

Historic Boardwalks. To provide access to historic buildings, boardwalks would be rehabilitated or reconstructed based on historical documentation. Priority would be given to re-establishing walkways in areas around the company store, school, meat locker, bunkhouse(s), leaching plant, machine shop, powerhouse, and parts of the manager's house and historic administrative area.

Character-defining architectural features, such as the powerhouse smokestacks, the concentration mill ore chute, and the leaching plant/mill conveyor, would be stabilized and reconstructed as necessary.

Natural Resources

As part of a comprehensive resource management program, the National Park Service would initiate programs for ongoing monitoring of natural resources at periodic intervals. This would include a program to monitor water quality and quantity on National Creek, an assessment and monitoring of wildlife populations and sensitive plant species documented on Bonanza Ridge in 1967, and development of a bear management plan. In addition, the mill site would be monitored for the establishment of invasive non-native plant species.

Selective thinning of vegetation would occur on NPS properties to reestablish historic views and viewsheds and to protect the site from the effects of fire and damage to the buildings. The focus of the selective thinning would be in the historic administrative area, including the manager's residence, Birch residence, the staff house annex, the assay office area north of National Creek, and areas adjacent to the mill structure. The NPS will undertake a demonstration project in a small section of the administrative area to illustrate what is meant by selective thinning to help community members understand what a finished project in the area might look like. Encroaching vegetation around the historic community building, the company store, the machine shop, the powerhouse, and the leaching plant would also be thinned.

Vegetation around historic structures would be selectively thinned to mitigate potential damage to the buildings and to enhance the historic character of the mill town. Vegetation removal would be necessary for lead paint abatement, building stabilization, site regrading, and fire management. In all other instances, natural processes would be allowed to continue. The park would work with private property owners who wanted to conduct selective clearing on their properties in a manner consistent with historic district goals and objectives. The park supports the continued functioning of the community garden.

The NPS would explore channelization of National Creek as one alternative to protect cultural and natural resources

from seasonal flooding through the historic administrative area and west of the historic railroad trestle. This would be consistent with historic channelization structures and methods, while acknowledging the post-mine re-establishment of natural stream processes. Other alternatives evaluated to protect historic resources include, moving structures and re-establishing the dam. The NPS realizes that none of the alternatives may be successful and flooding may continue to occur.

Parts of the NHL were not public land before the National Park Service acquired the property, and it was not open to subsistence uses. Hunting, berry picking, and gathering firewood would have only been permitted with permission of the previous landowners. As it is now public lands, subsistence activities would be permitted. However, if it appeared that such activities would interfere with NPS management of the property, the agency could seek to limit some subsistence uses.

Interpretation

The National Park Service would enter agreements with qualified local providers to conduct guided tours. For consistency and accuracy of interpretive content, yearly training would be provided by NPS. Interpretive programs at Kennecott would be expanded from existing levels, enabling visitors to learn about the mines and the mill town, the historic relationship of Kennecott to McCarthy, natural resources, and the contemporary community through a variety of media, interpretive techniques, and programs. The guided tours would be expanded to include a wider variety of tour subject matter and tour lengths.

Evening and special programs conducted by NPS personnel would continue. They would be conducted in various locations, including the historic company store and community building. The park also would offer seasonal interpretive tours through public areas. Consistent with the management philosophy a limited number of unobtrusive interpretive displays would be designed and installed in areas open to the public or where the public has a view into a structure such as in the leaching plant, powerhouse, the machine shop, and the concentration mill. In all cases, the park would work with commercial and nonprofit organizations, primarily locally based, using universal design principles to establish accurate and consistent interpretive information and program content. A bookstore offering educational and informational material, interpretive books, posters, and similar products would be encouraged in the historic company store. Interpretive wayside displays would be established in the historic administrative area north of National Creek in association with the former Birch house and the buildings that were the manager's house, the staff house, and the manager's office.

The safety of potential tours to the mine sites and through the underground tunnels would be assessed, and the National Park Service would evaluate the possibility of offering one or more such tours in the future. A short, captioned video production of the Kennecott story would be produced and displayed in the company store during visitor hours for a historical overview.

Interpretive wayside exhibits would be established in conjunction with selected circulation routes.

The development of interpretive exhibits, brochures, walking tours, and site-related information for Kennecott would be coordinated with the McCarthy museum so that they would be complementary and not competing. NPS would work with interested groups in the development of walking tour materials, brochures, and other interpretive media that would be available for their own use and for NPS use.

Accessibility

The Department of the Interior has administratively determined that it will follow the Americans with Disabilities Act Accessibility Guidelines, provided by the U.S. Architectural and Transportation Barriers Compliance Board, when such design guidelines are equal to or greater than those of the Uniform Federal Accessibility Standards. Since the Americans with Disabilities Act (ADA) was based on the requirements of section 504, ADA regulations and technical assistance materials, especially title I, provide additional in-depth resources for implementation of a reasonable accommodation process. The NPS would invite a panel of people with expertise in issues pertaining to handicap accessibility. The group will work with the NPS in developing a plan that provides long-term guidance on issues of programmatic and physical accessibility for the site.

Administration and Operations

Park Management

The park would pursue a short-term lease in a private building for onsite administrative office space and storage for interpretation and maintenance. These operations eventually would be relocated into the company store as funding became available for the necessary rehabilitation to bring the structure into regulatory compliance as an operations facility.

The National Park Service would enter if at all possible into multi-year agreements for others to conduct building tours, and to adaptively reuse some structures. All park-related management operations eventually would be located in the company store. Preference would be given to hiring local residents for concession agreements and for all rehabilitation and stabilization efforts undertaken and administered by the National Park Service.

The National Park Service would continue to evaluate opportunities to acquire additional properties and/or easements within the NHL as those opportunities arose. Acquisition would be limited to willing sellers on a priority basis. Priorities would be determined according to the land use designations outlined in this plan. (See Land Protection Plan map.)

Living space for the short-term and long-term seasonal, permanent and contractor employees would be managed in a variety of ways. Living space in the historic west bunkhouse would be made available for some employees as the rehabilitation of that structure was completed. Other structures that the NPS acquired would be evaluated as potential living quarters. Temporary cabins would be placed on NPS property that would be utilized for living space. Offsite housing would be sought as well. Additionally, some NPS employees and contractors' employees would find their own housing at market rates.

Work on historic buildings would be done between May and October of each year. Restroom, shower and laundry facilities would be required for work crews.

NPS Utilities and Infrastructure

Administrative and maintenance storage would be accommodated in the lower level of the company store. This would include the storage of minor equipment and materials. Hazardous materials, vehicles, fuel, garbage, and large materials would be stored at remote locations, including the McCarthy airstrip.

Vault toilets would be provided for visitor use along the main road through the site. The toilets would be installed in compliance with applicable Alaska Department of Environmental Compliance (ADEC) regulations. Toilets would be pumped every fall by contract and the sewage hauled to Glennallen. The park would seek long-term strategies for developing a septic system on NPS property or, if feasible, tying into a community sewer system to provide service to NPS facilities south of National Creek.

Bearproof trash containers would be placed at strategic locations along the main road. Trash would be hauled across the pedestrian bridge at McCarthy as needed and taken to a park-owned solid waste transfer facility at the end of McCarthy Road. A planned transfer facility would feature an incinerator, recycling bins, and dumpsters. Wastes associated with stabilization (lumber, packaging, and construction materials) would be hauled by a contractor from the transfer site to an approved landfill. Lumber coated with lead paint would be stockpiled and annually hauled across the river for incineration at the transfer site.

Generators and solar photovoltaic equipment would supply power for NPS structures when appropriate and feasible. In conjunction with community entities, the park would pursue long-term power supply strategies. Photovoltaic power, hydroelectric generation from National Creek, or a centralized community generator would be considered among other possibilities. Consideration will be given to technologies that are compatible and consistent with the cultural and natural environment of the abandoned Mill Site Area. Any potential threats to water resources from the construction and use of this type of facility would be addressed in a separate document.

No water would be supplied for visitors until the company store building was rehabilitated. Efforts would be made to arrange for a long-term water supply for visitors and for NPS operational use. This might be achieved by drilling a well or developing a surface water collection and treatment system on National Creek. The system installed would be to ADEC standards and preclude any conflict with other landowners.

Fuel for portable generators and all-terrain vehicles (ATVs) would be hauled in small quantities across the footbridge corresponding to immediate needs. As fuel requirements increase, aboveground bulk storage tanks would be located on NPS-leased property at the McCarthy airstrip. A contractor would deliver diesel fuel by air or ground transportation to a bulk tank. Fuel would be transferred from the bulk tank to Kennecott in a pickup-mounted tank.

Safety and Security

Hazardous materials and debris that could present safety concerns would be removed from NPS properties. This would include items like boards with exposed nails, shards of metal, cable fragments, miscellaneous tools or machinery, and other potentially dangerous articles.

NPS would initiate a program to limit and control access to buildings. Signs restricting or prohibiting access into NPS properties would be placed in appropriate locations. Broken doors and locks would be repaired and replaced as appropriate. Windows would be replaced, and mechanisms to prevent unauthorized and unsafe access would be used such as shutters, wire mesh, or other appropriate devices. Identified visitor access routes into and around buildings would be improved to remove all immediate dangers, and signs would be located appropriately to indicate safe routes.

According to the National Fire Protection Association, the single largest cause of fire in historic buildings is arson. The NPS would undertake a fire assessment and implement a fire prevention program. Fire extinguishers would be placed in all NPS-owned properties. Fire escape routes would be identified for all NPS-owned buildings, and battery lights would be available for emergencies. A local year-round caretaker would be hired to provide site security.

The park would work with the community to improve community firefighting capabilities, including participating in a volunteer fire department for the mill town and the ability to temporarily dam National Creek and pump water for fire suppression. A portable pump and hose would be on hand to draw water from National Creek for firefighting. There are existing water rights, and future requests to withdraw surface water would be analyzed individually.

In the long term, a system would be established to detect fire and security risks on all NPS-owned structures. As a water supply was developed, sprinkler systems would be installed in the visitor center and other occupied NPS buildings south of National Creek. The park would initiate hazardous-fuel reduction measures around NPS-owned properties to reduce the fire hazard from adjacent landscape elements and would work with the community to reduce fire hazards on private properties.

The park would continue to work with the community to develop a strategy for community-wide emergency medical services. Law enforcement would continue to be addressed individually through various jurisdictional entities including the NPS, where appropriate.

Hazards

As part of the acquisition of the Kennecott properties by the National Park Service, a number of stipulations pertaining to hazardous wastes and lead paint were established. The National Park Service has entered agreements with the Alaska Department of Environmental Compliance, the U.S. Environmental Protection Agency, and the Justice Department. Under those agreements, the National Park Service affirmed its obligation pertaining to the abatement of lead paint hazards in accordance with state and OSHA regulations pertaining to worker safety and training. Asbestos will be removed from Jumbo Mine; Erie Mine would be closed to access due to asbestos; and monitoring will be conducted in the dumpsites at the mill town. The historic dumps do not pose an unacceptable risk, but the groundwater will be monitored for hazardous substances.

Budget

The table below describes both projects that are ongoing and those that are anticipated within the next five years. There is no guarantee that projects on the requested list will be funded. The full scope of work and the budgetary requirements are presently being developed for a longer stabilization effort. As the NPS begins to work at the site, questions and operational procedures pertaining to logistics, production and capabilities of the local work crews, potential contracting options and technical difficulties are becoming more clearly defined. Accordingly, funding requirements in subsequent years will be clearer.

COMPLETED OR ONGOING PROJECTS	Costs (\$)
STRUCTURAL STABILIZATION	
Stabilize Ore Chute, Repair Mill Building, Regrade Creek area	225K
Correct Unsafe Building Deficiencies	55.7K
Stabilization of Kennecott Machine Shop & Railroad Depot	180K
Lead Paint Mitigation	1.5M
Stabilize Recreation Hall	150K
RESEARCH & DOCUMENTATION	
Collection Management Plan for Machine Shop	47.5K
Implementation of Kennecott Cultural Landscape Report	30.4K
Produce Kennecott Kids Oral History	10K
ENVIRONMENTAL	
Mine Openings Survey, Design and Safing	25K
FUTURE REQUESTS	Costs (\$)
STRUCTURAL STABILIZATION	
Stabilization of Assay Building	60K
Stabilization of Mill Building	140K
Stabilization of Manager's Office & Store	130K
Stabilization of Tram Turnhouse, Tailings Hoist House & Refrigeration Plant	120K
Stabilization of West Bunkhouse & Power Plant	120K
Stabilization of Kennecott Leaching Plant	140K
Rehabilitate Kennecott Store for Visitor Contact Station	700K
RESEARCH & DOCUMENTATION	
Historic Resource Study	150K
Kennecott NHL on CD-ROM	100K
HAER Documentation of Kennecott Tram System	33.6K

Visitation

Completion of major upgrades to the existing Chitina to McCarthy gravel road is not expected within the next five years. While levels of visitation may increase with improved maintenance of the road, high annual increases are not expected. However, when the McCarthy Road is upgraded a re-evaluation of visitor impacts will be needed.

The recently upgraded McCarthy airstrip has the potential for handling a greater number of visitors to the area. The new Princess Hotel slated for opening in Copper Center in 2002 may yield increased visitation by this means. However, it is not known at this time how many visitors this may entail.

Promotion of the area needs to be moderated by the desire of the NPS and the community to offer visitors a quality experience, and to minimize impacts on the surrounding community and natural areas.

Anticipated Visitation-

From McCarthy Road /Chitina Roundtable Project, April 2000 and State of Alaska Department of Transportation and Public Facilities . Statistics are from the low growth scenario of .75%

Year	Anticipated Number of Visitors by Road (vehicles)	Anticipated Number of Visitors by Air (planes)
2000	8,012	470
2005	8,704	822
2010	9,527	1174
2015	11,098	1526
2020	11,864	1878

Appendix B: Compendium of Sensitive Sites

The National Park Service is required by federal regulations in Title 36 CFR 2.1(5) to protect areas such as Kennecott National Historic Site by designating areas and conditions under which people may visit and use the cultural and archeological sites. The designations and conditions are designed to protect sensitive cultural and archeological sites and to protect the public from hazards in those sites. The Park Service proposes to continue to permit access to the Kennecott Historic Site with many of the same conditions that existed when the area was private property. The National Park Service does not intend these regulations to regulate the actions of people on private property in the National Historic Site.

The Park Service will continue to permit public access to the grounds throughout the historic site.

CONDITION 1) Entry is prohibited into buildings that are barricaded or signed as closed. Do not pass beyond barricades, climb through windows, or remove boards to enter closed buildings.

This closure protects both the historic structures and contents from vandalism and the public from the safety hazards found in these unstable buildings.

CONDITION 2) Mine tunnels and other openings in the Kennecott Historic Site are closed to entry.

STAY OUT AND STAY ALIVE. These abandoned mines contain hazards that could result in serious injury or death. They have decayed support timbers, unsafe ladders, rotten structures, unstable explosives, deep pools of water, cave-ins, rocks falling from unstable ceilings and walls, deadly gas, lack of oxygen, concealed or thinly covered vertical shafts in tunnel floors. ***YOU ARE COURTING SERIOUS INJURY OR DEATH BY ENTERING THESE OPENINGS. STAY OUT AND STAY ALIVE.***

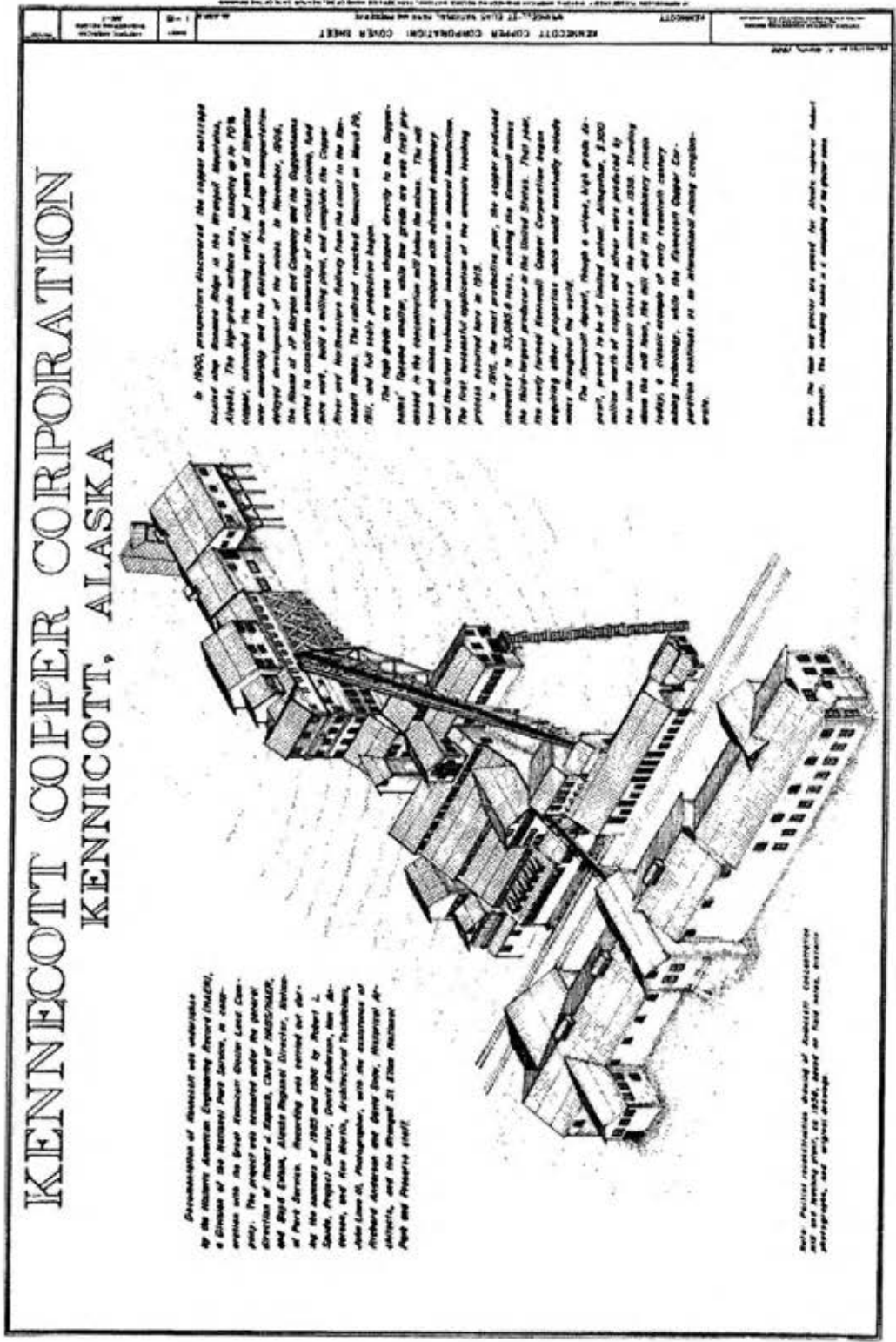
CONDITION 3) Camping is not permitted in, or on, any of the historic structures in the Kennecott National Historic Site. Camping is not permitted in the mill town. The mill town is the collection of buildings clustered around the mill on both sides of National Creek.

Part of the attraction of the Kennecott Mill Town is the historic scene presented by the mill buildings. Camping is prohibited to preserve the historic scene and to lower the temptation to use the buildings for shelter. Camping is permitted north of Jumbo Creek.

CONDITION 4) Fires are not permitted inside of any building or within 300 feet of any of the historic buildings or structures in the Kennecott National Historic Site.

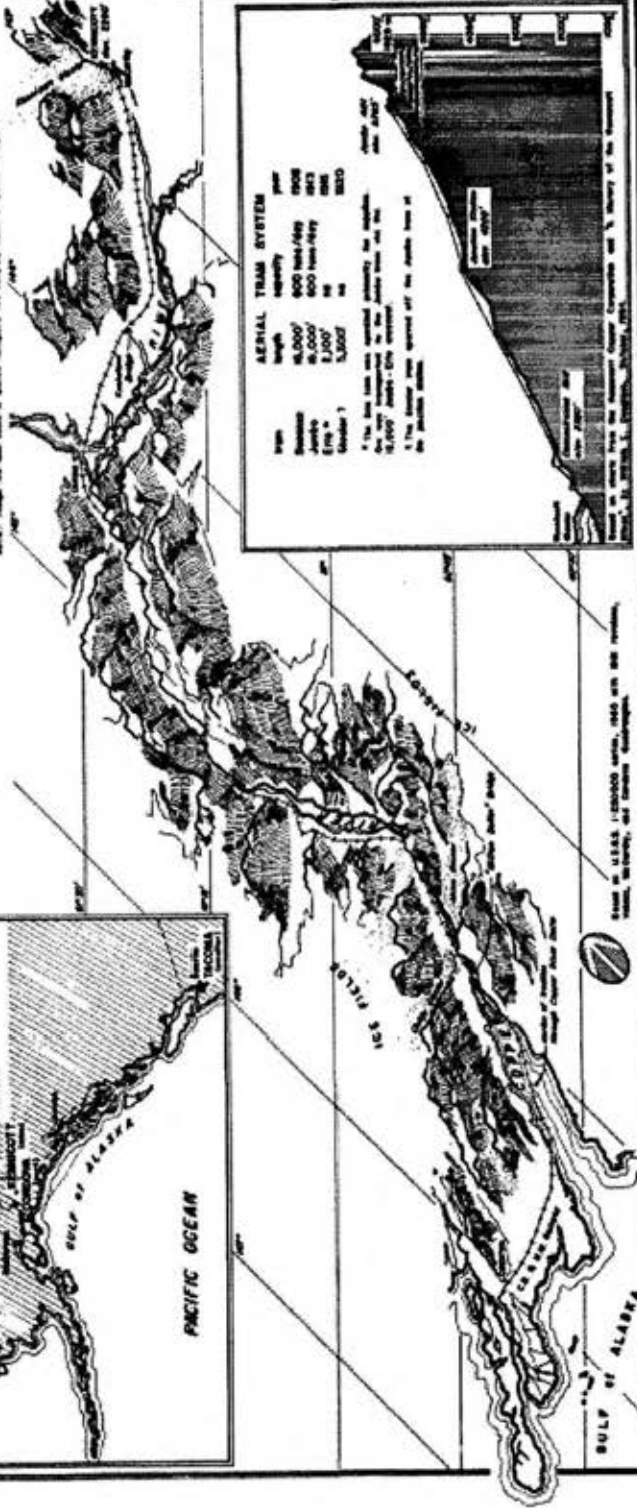
The historic buildings and structures are made of wood. There is no way to put out a structural fire at the site.

HAER MAPS



Three kinds of transportation services Kalamazoo are then able to market:

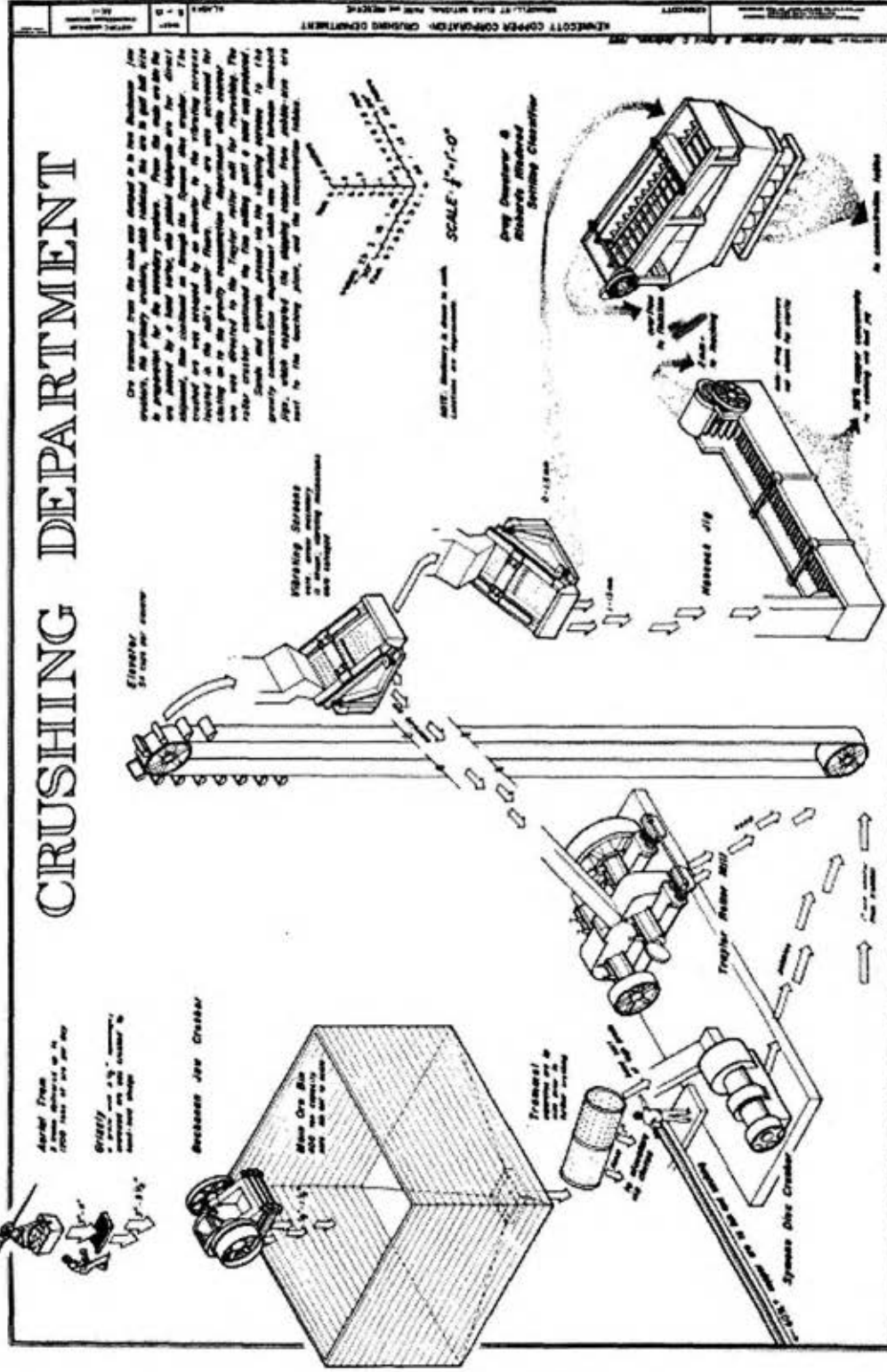
1. Local Timelines (unsubsidized by the Transit fare collector)
2. Suburban Line (operated by the Kalamazoo County Transit Authority, a 1964 state bus fleet transfer to Kalamazoo County, Kalamazoo County Transit Authority, 1964, 1965, 1966, 1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2

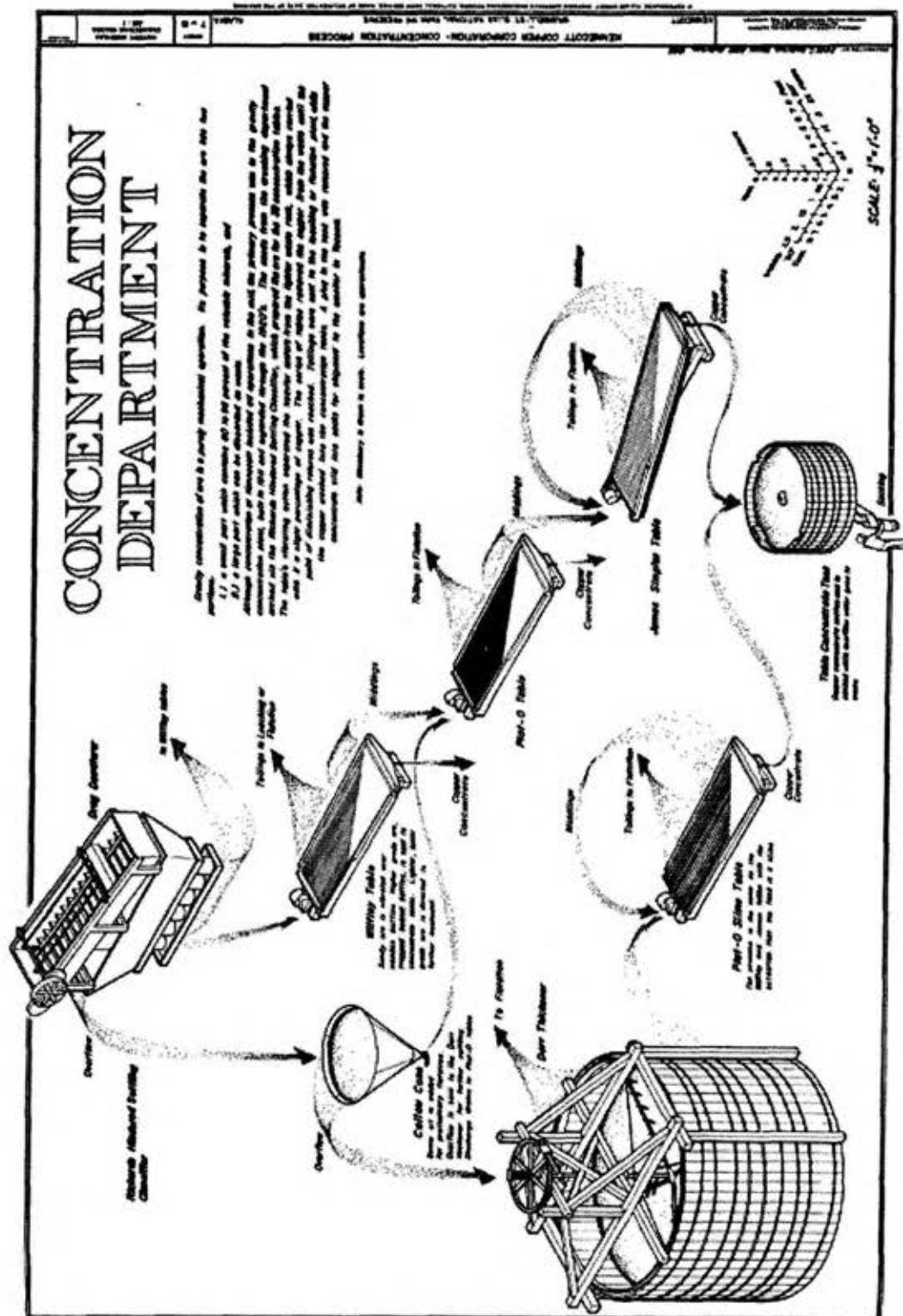


AERIAL TRAM SYSTEM	
train	length capacity
Swissair	16,000' 900 tons/day
Jurata	18,000' 600 tons/day
Erft *	2,100' 14
Stadler †	3,500' 14

1 The bank was opened Saturday at 10 o'clock.
2 The bank was opened at 10 o'clock.

Printed in U.S.A. 1-250000 series, 1945 with 200 reprints.
Volume, 100 pages, and 100 copies of 100 pages.



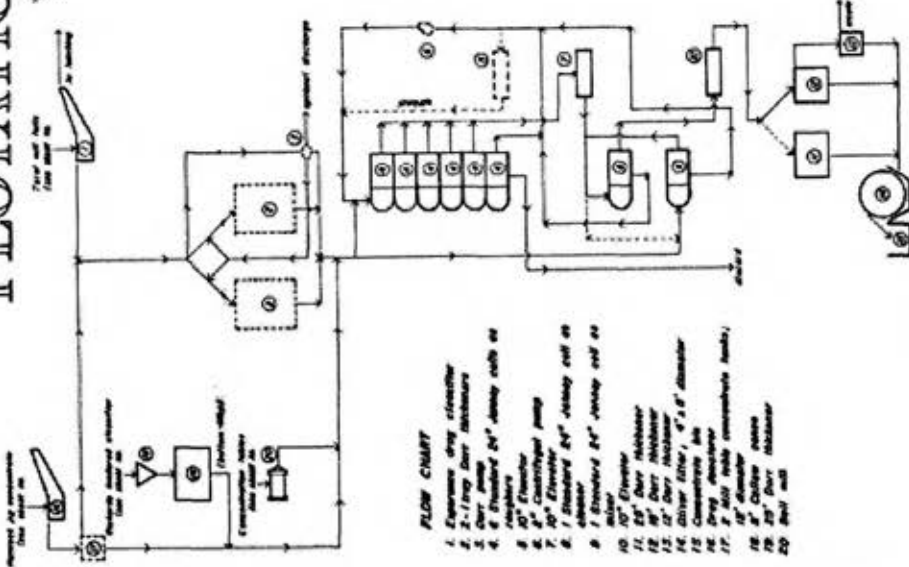
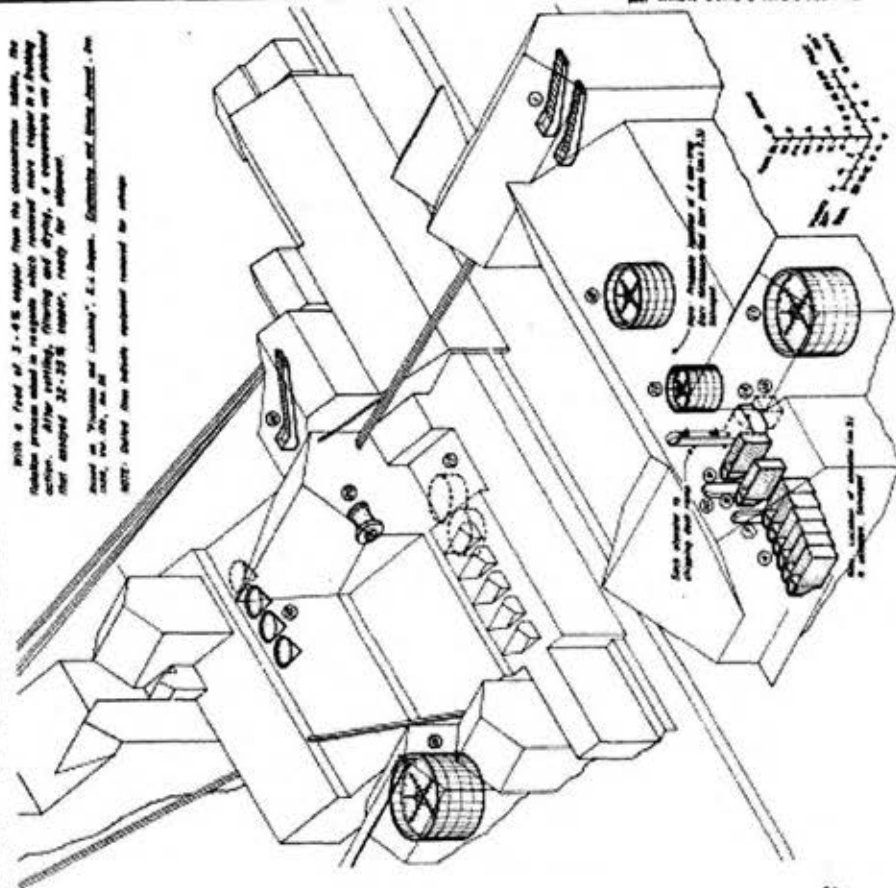


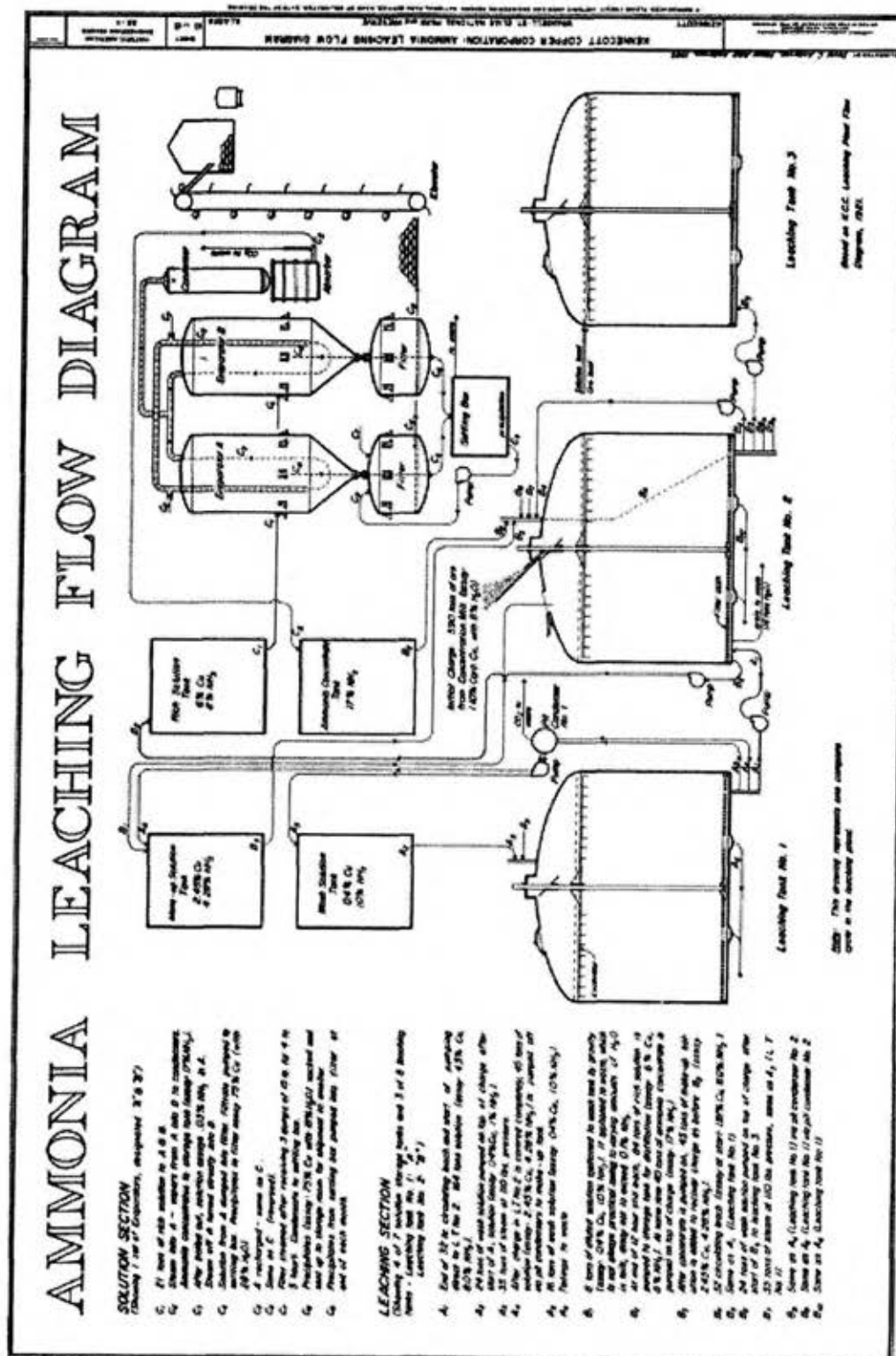
FLOTATION DEPARTMENT

With a feed of 2-4% copper from the concentration mill, the flotation process used a reagent which contained more copper than a regular reagent. After settling, filtering and drying, a concentrate was produced that averaged 32-33% copper, ready for shipment.

Plant in "Normal and Capacity", 6.4 days. EXHIBITS OF THIS PLANT - See page 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

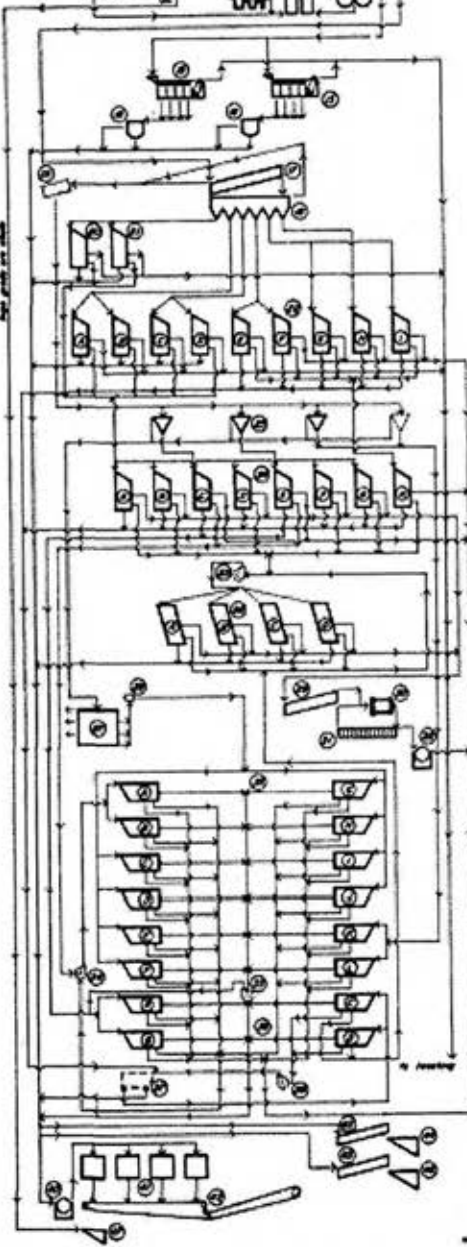
NOTE: During this definite period, the plant was in operation.





1000-gallon liquid nitrogen storage tank

Diagram illustrating the components of a 1000-gallon liquid nitrogen storage tank, including numbered callouts (1-10) and a note: "New 1000-gallon storage tank. Components removed for safety."



- 2 *S. 2022195*
- 3 *S. Buchanan jaw structure: 13" x 24"; 230 rpm, 3 1/2" opening*
- 4 *Clabbing marginal*
- 5 *S. Conspicuous: Jumbo B. Banana - 22" width, 6 ply*
- 6 *Dr. Ho - 4200 ton, 32" width, 32" length, 25" depth*
- 7 *Stevens - detour across ferry*
- 8 *Conspicuous: 60" length, 32" width, 5 ply, 60 rpm*
- 9 *Conspicuous: 52" length, 32" width, 5 ply, 60 rpm*
- 10 *Truncated: 4' diameter, 27" - 32cm, 30" x 1" rest, 16 rpm*
- 11 *Sorting conveyor: 60" length, 32" width, 5 ply, 30 rpm*
- 12 *Synopsis disc crusher: 36", 332 openings, 130 rpm, 1" opening*
- 13 *S. Elevators: 58" length, 60" width, 10 ply, 280 rpm, 54 cone*
- 14 *4 vibrating screens*
- 15 *Theory: dia. 36" x 20", 83 rpm*
- 16 *Conspicuous: dia. 120 rpm, 1/2" lift, 1/2" cone, 3" x 1 1/2" depth of pocket, 3" x 7 1/2" width of pocket*
- 17 *S. Hops: dia. 203 rpm, 1/2" stroke, 4 mm screen*
- 18 *Drug detector: 52" length, 25" width, con. 830 rpm, 3 3/4" x 12"*
- 19 *Richards Anderson sorting classifier: 6 supports, 30" screen*
- 20 *Chip separator: 2" length, 10" width, 100 rpm*
- 21 *Chip separator: 10" length, 10" width, 100 rpm*
- 22 *Plat-O-Hole: 18" stroke, 1/2" in 12" slope, 304 rpm*
- 23 *S. 2022196*

series	type	shape per foot	stroke
A	256	15/16	3 1/4
B	270	1/2	1
C	248	7/8	7/8
D	278	6/8	1 1/8
E	238	1 1/8	1 1/8
F	257	1 1/8	1 1/8
G	289	1 1/8	1 1/8
H	236	1 1/8	1 1/8
I	280	1 1/8	1 1/8

- 23 4 Coffee cones: 6" diameter
24 8 Pear-O nibble:

	rpm	slips per foot inch	stroke, inches
A	333	$\frac{2}{3}$	$\frac{1}{2}$
B	333	$\frac{2}{3}$	$\frac{4}{5}$
C	333	$\frac{1}{4}$	$\frac{3}{4}$
D	267	$\frac{1}{2}$	$\frac{1}{2}$
E	370	$\frac{1}{2}$	$\frac{1}{2}$
F	267	$\frac{2}{3}$	$\frac{2}{3}$
G	302	$\frac{2}{3}$	$\frac{1}{2}$
H	330	$\frac{2}{3}$	$\frac{1}{2}$

- PS shutoff centrifugal pump. 2
20' x 4' James tables;

	run	slope per foot inches	stroke inches
A	243	$\frac{5}{8}$	$\frac{1}{4}$
B	247	$\frac{5}{8}$	$\frac{5}{8}$
C	250	$\frac{5}{8}$	$\frac{3}{4}$
D	250	$\frac{1}{2}$	$\frac{1}{2}$

27. 2-tray Carr Hoteler 20" diameter, 4' height
28. Dorr pump
29. Dorr classifier
30. Dorr mill 4' x 4', 30 rpm
31. Chapman classifier
32. Flyash dust
33. 2.5 ft. Pear-O stone roller: each 300 rpm, $\frac{1}{2}$ " is 40" stone, $\frac{1}{4}$ " stroke
34. Foster pump: 40" x 4"
35. Foster pump: 40" x 4"
36. 4. 200-2 stone roller

Strain	rpm	stroke, inches
A	305	8 1/2
B	305	8 1/2
C	290	9 1/2
D	280	9 1/2

37. 2 input chiller
38. Byron Jackson centrifugal pump: 2" x 3"
39. Wilfley centrifugal pump: 4"
40. Franklin pump: 40" x 6"
41. 4 Table concentrate tanks: 3' diameter, 6' height
42. 4 Compars: 25" height, 42" width, 3 ply, 140 gpm, 3 1/2" to 42" slope
43. Drug distributor (from Franklin jet concentrate): 26" length, 40" width, 3 1/2" to 42" slope, 12 gpm
44. Bin: 600 gal capacity
45. Drug distributor (from ball jet concentrator): 26" length, 44" width, 3 1/2" to 42" slope, 12 gpm
46. Bin: 140 gal capacity
47. High grade are 5 lb

Based on 1949 New York State "Population and Housing", U. S. Bureau, **CHENOWETH, NY**
1949 Census, 1949, and on 1949 field observations

APPENDIX D: KENNECOTT NATIONAL HISTORIC LANDMARK LANDCOVER TYPES

	Landcover Type	Acres	% of Total Acreage	% of Total Cloudless Acreage	% of Total Vegetated Acreage
<u>Vegetated Areas</u>					
Trees	Closed broadleaf	380.29	2.68	3.04	6.75
	Open white spruce	128.54	0.91	1.03	2.28
	Open broadleaf	20.24	0.14	0.16	0.36
Total acreage		529.07	3.73	4.23	9.39
Low and tall shrubs	Closed tall shrub	1,020.10	7.20	8.15	18.09
	Open low shrub	767.02	5.41	6.13	13.60
	Closed low shrub	462.57	3.26	3.69	8.20
	Open tall shrub	327.58	2.31	2.62	5.81
Total acreage		2,577.27	18.18	20.59	45.70
Dwarf shrubs		689.63	4.87	5.51	12.23
Herbaceous plants	Graminoid	239.07	1.69	1.91	4.24
	Dry Bryoid	89.85	0.63	0.72	1.59
	Wet Bryoid	12.45	0.09	0.10	0.22
	Forb	1.33	0.01	0.01	0.02
Total acreage		342.70	2.42	2.74	6.07
Sparse vegetation ¹		1,499.13	10.57	11.970	26.59
Total acreage		5,637.80	39.77	45.04	
<u>Unvegetated Areas</u>					
	Barren ²	5,077.16	35.82	40.54	
	Glacier/snow	1,799.36	12.70	14.37	
	Water	7.78	0.05	0.06	
Total acreage		6,884.30	48.57	54.97	
<u>Clouds/shadows</u>		1,650.36	11.64		

Classification based on Pacific Meridian Resources, "Wrangell-St. Elias National Park and Preserve Landcover Mapping Project: Final Report" (1997). Map has an overall minimum classification accuracy of 78.7%.

APPENDIX E: RARE PLANT COLLECTIONS FROM BONANZA RIDGE

ABBREVIATIONS:

G = global rank

R = state rank

G1 = critically imperiled globally, (5 occurrences or fewer)

G2 = imperiled globally (6-20 occurrences)

G3 = either very rare and local throughout its range or found locally in a restricted range, 21-100 occurrences, threatened throughout its range

G4 = widespread and apparently secure globally, although it may be quite rare in parts of its range, especially at the periphery

G5 = demonstrably secure globally, although it may be quite rare in parts of its range

T# = global rank of the described subspecies or variety

G#G# = global rank of species uncertain, best described as a range between the two ranks

G#Q = some uncertainty about taxonomic status that might affect global rank

S1 = critically imperiled in the state, 5 or fewer occurrences

S2 = imperiled in the state, 6-20 occurrences

S3 = rare or uncommon in the state, 21-100 occurrences

Taxon	Common Name	Family	AKNHP Rank ¹	Collector	Coll. No.	Date	Habitat	Herb ²
<i>Aphragmus eschscholtzianus</i>	Aleutian cress	Brassicaceae (mustard family)	G3/S3	Nordell & Schmitt	163	1976		LD; ALA
<i>Carex preslii</i>	Presl's sedge	Cyperaceae (sedge family)	G4/S1	Nordell & Schmitt	544	1976	Very common along the old road, up to about 1,200 m., forming dense tussocks up to 40 cm tall	LD
<i>Cystopteris montana</i>	Mountain fragile fern	Dryopteridaceae (wood fern family)	G5/S3	Nordell & Schmitt	580	1976	Solitary specimens in <i>Populus</i> scrub	LD; ALA
<i>Juniperus horizontalis</i>	Creeping savin	Cupressaceae (cypress family)	G5/S1S2	Nordell	s.n.	1976		LD; ALA
<i>Minuartia biflora</i>	Mountain stitchwort	Caryophyllaceae (pink family)	G5/S2	Nordell & Schmitt	95 416b 450	1976		LD; ALA
<i>Papaver alboroseum</i>	Pale poppy	Papaveraceae (poppy family)	G3/S3	Dodge		1993	Rubble and talus slope, 5,800 ft.	WRST
<i>Papaver albsroseum</i>	Pale Poppy	Papaveraceae (Poppy Family)	G3/S3	Nordell & Schmitt	1 101 160 166 171 301 464	1976		LD; ALA

1. AKNHP = Alaska Natural Heritage Program

2. Herbarium of deposition. ALA = University of Alaska, Fairbanks Museum. LD = Lund University, Norway; WRST = Wrangell-St. Elias National Park and Preserve.

APPENDIX F: RARE PLANTS KNOWN TO OCCUR IN THE CHITINA VALLEY
(besides those on Bonanza Ridge that are listed in Appendix E)

ABBREVIATIONS:

G = global rank

R = state rank

G1 = critically imperiled globally, (5 occurrences or fewer)

G2 = imperiled globally (6-20 occurrences)

G3 = either very rare and local throughout its range or found locally in a restricted range, 21-100 occurrences, threatened throughout its range

G4 = widespread and apparently secure globally, although it may be quite rare in parts of its range, especially at the periphery

G5 = demonstrably secure globally, although it may be quite rare in parts of its range

T# = global rank of the described subspecies or variety

G#G# = global rank of species uncertain, best described as a range between the two ranks

G#Q = some uncertainty about taxonomic status that might affect global rank

S1 = critically imperiled in the state, 5 or fewer occurrences

S2 = imperiled in the state, 6-20 occurrences

S3 = rare or uncommon in the state, 21-100 occurrences

Taxon/Family/Common Name	AKNHP Rank ¹	Number of Occurrences in Park	Habitat
<i>Agoseris glauca</i> Asteraceae (sunflower family) pale agoseris	G4G5 S1	2	Alpine meadows
<i>Agrostis thurberiana</i> Poaceae (grass family) Thurber's bentgrass	G5 S2	2	Mesic alpine meadows
<i>Arabis calderi</i> Brassicaceae (mustard family) Calder's rockcress	G3G4 S1 New to Alaska	1	Alpine and subalpine meadows
<i>Arabis codyi</i> Brassicaceae (mustard family) Cody's rockcress	G1G2 S1 New to Alaska	1	Unstable alpine slopes
<i>Arabis drepanoloba</i> Brassicaceae (mustard family) rockcress	G? S? ² New to Alaska	1	Alpine talus slopes
<i>Arenaria longipedunculata</i> Caryophyllaceae (pink family) longstem sandwort	G3G4Q S3	1	Calcareous or serpentine gravels and rock crevices
<i>Arnica mollis</i> Asteraceae (sunflower family) hairy arnica	G5 S1	1	Alpine meadows
<i>Astragalus harringtonii</i> Fabaceae (pea family) Harrington milkvetch	G5T2T3 S2S3	3	Meadows, streambanks and scree
<i>Carex crawfordii</i> Cyperaceae (sedge family) Crawford's sedge	G5 S2S3	1	Well-drained lake and river meadows
<i>Carex eburnea</i> Cyperaceae (sedge family) bristleleaf sedge	G5 S2S3	2	Dry sand or rocky places
<i>Carex interior</i> Cyperaceae (sedge family) inland sedge	G5 S1	1	Wet or damp calcareous meadows

Taxon/Family/Common Name	AKNHP Rank ¹	Number of Occurrences in Park	Habitat
<i>Carex lenticularis</i> var. <i>dolia</i> Cyperaceae (sedge family) tufted sedge	G5T3 S3	4	Muddy shores, sheltered ponds, lakes, and river flats
<i>Carex parryana</i> Cyperaceae (sedge family) Parry's sedge	G3G4 S1	1	Wet places, gravel bars
<i>Carex preslii</i> Cyperaceae (sedge family) Presl's sedge	G4 S1	1	Dry grassy alpine meadows
<i>Castilleja miniata</i> Scrophulariaceae (figwort family) scarlet Indian paintbrush	G5 S3	5	Alpine and subalpine meadows
<i>Douglasia alaskana</i> Primulaceae (primrose family) Alaskan Douglasia	G2G3 S1	3	Sandy soil, gravel, scree slopes in the alpine
<i>Draba incerta</i> Brassicaceae (mustard family) Whitlowgrass	G5 S2S3	11	Calcareous screes
<i>Draba kananaskis</i> Brassicaceae (mustard family) longstalk Whitlowgrass	G51Q S1	2	Rocky alpine slopes
<i>Draba oblongata</i> Brassicaceae (mustard family) Whitlowgrass	G3 S?	1	Clay and gravel slopes, silt and sand gravel flats, rocky open areas, exposed hillsides, rocks and swales
<i>Draba porsildii</i> Brassicaceae (mustard family) Porsild's Whitlowgrass	G3 S1S2	7	Alpine scree, gravel and open shale slopes and meadows
<i>Draba praelia</i> Brassicaceae (mustard family) tall Whitlowgrass	G5 S1S3	1	Alpine shale cliffs, moist banks, steep hillsides, limestone talus, subalpine slopes
<i>Draba ruaxes</i> Brassicaceae (Mustard Family) Rainier Whitlowgrass	G3 S2S3	24	Windy ridge, scree slopes and cliffs
<i>Draba stenopetala</i> Brassicaceae (Mustard Family) Anadyr Whitlowgrass	G3 S3	27	Stony ridges and rocky alpine summits
<i>Eriophorum viridi-carinatum</i> Cyperaceae (sedge family)	G5 S2	1	Subalpine and alpine meadows
<i>Erysimum pallasii</i> Brassicaceae (mustard family) Pallas' wallflower	G4 S3	10	Alpine scree, talus, gravel slopes, and meadows; often near animal burrows
<i>Festuca brevissima</i> Poaceae (grass family)	G3 S3	16	Exposed, dry rocky tundra and scree slopes
<i>Festuca lenensis</i> Poaceae (grass family)	G4 S2S3	9	Gravel and scree slopes
<i>Festuca minutiflora</i> Poaceae (grass family)	G? S? ² New to Alaska	1	Alpine tundra, meadows, and scree slopes
<i>Minuartia dawsonensis</i> Caryophyllaceae (pink family) rock stitchwort	G5 S?	4	Moist, sandy places

Taxon/Family/Common Name	AKNHP Rank ¹	Number of Occurrences in Park	Habitat
<i>Najas flexilis</i> Najadaceae (naiad family) naiad	G5 S1S2	1	Shallow fresh or brackish water
<i>Oxytropis huddelsonii</i> Fabaceae (pea family) Huddelson's locoweed	G3 S2S3	24	Ridge tops, alpine tundra, heath
<i>Phacelia mollis</i> Hydrophyllaceae (waterleaf family) soft phacelia	G2 S2S3	19	Dry slopes, roadsides, sandy or gravelly soils, rock outcrops, and open woods
<i>Potentilla drummondii</i> Rosaceae (rose family)	G5 S1	6	Meadows to ridges, subalpine to alpine
<i>Rumex beringensis</i> Polygonaceae (buckwheat family) Bering Sea dock	G2G3 S2S3	18	Sandy places on tundra, solifluction lobes, frost boils
<i>Salix setchelliana</i> Salicaceae (willow family) Setchell's willow	G3G4 S3	6	Gravel bars and sandy slopes
<i>Saxifraga adscendens</i> ssp. <i>oregonensis</i> Saxifragaceae (saxifrage family) small saxifrage	G5T4T5 S2S3	8	Moist gravelly and rocky alpine sites
<i>Stellaria alaskana</i> Caryophyllaceae (pink family) Alaska starwort	G3 S3	24	Rock outcrops, talus slopes and moraines in alpine tundra
<i>Swertia perennis</i> Gentianaceae (gentian family) star gentian	G5 S3	2	Mesic subalpine meadows
<i>Taraxacum carneocoloratum</i> Asteraceae (sunflower family)	G3Q S3	10	Alpine slopes and coarse, well-drained substrates
<i>Thlaspi arcticum</i> Brassicaceae (mustard family) Arctic pennycress	G3 S3	1	Scree slopes and turfy places in alpine tundra
<i>Trichophorum pumilum</i> var. <i>rollandii</i> Cyperaceae (sedge family)	G? S? ² New to Alaska	1	Moist grassy slopes and tundra, willow and alder thickets, meadows and along creeks; alpine and subalpine
<p>NOTE: Plants with an Alaska Natural Heritage Program (AKNHP) state rank of <3 are considered rare.</p> <p>1. AKNHP = Alaska Natural Heritage Program. G = Global Rank. R = State Rank.</p> <p>2. Some taxa new to Alaska have not yet been ranked.</p>			

**Vegetation Documentation
for the
Cultural Landscape Report: Kennecott Mill Town**

**Kennecott National Historic Landmark
Wrangell-St. Elias National Park and Preserve**

March 1998

By
Michael G. Loso
Wrangell Mountains Center

PO Box MXY, McCarthy
Glennallen, AK 99588

INTRODUCTION

Wrangell-St. Elias National Park and Preserve is in the process of completing a Cultural Landscape Report for the Kennecott town site. As part of that documentation it is necessary to characterize the vegetation, as it existed prior to, during, and after the mining era. Based on fieldwork and photo interpretation conducted in the spring of 1998, this report delineates, describes, and discusses the vegetation of the Kennecott National Historic Landmark for 5 historical time periods:

- Pre-Mining
- 1900-1908
- 1908-1915
- 1915-1938
- Existing Conditions

STUDY AREA

The town of Kennecott (61°28' N, 142°52' W) was built along the active lateral margin of the Kennicott Glacier, at an elevation of approximately 2000 feet. Slope aspect in the town site is generally west, and slopes angles range from 0° (flat) to 25°. Bedrock under the town site consists of greenstone with intrusions of porphyritic dacite (MacKevett, 1978), but soils are primarily derived from the lateral glacial deposits of the Kennicott Glacier. The ages and character completely submerged under ice during both the Early Wisconsin and the Late Wisconsin glaciations (Bateman, 1922), with the ice retreating from its maximum position 17 thousand years ago to approximately its current position by 11.5 thousand years ago (Williams, 1989). Work by Denton and Karlen (1977) in the nearby Skolai Pass region found evidence of two smaller glacial advances during the Holocene: one from 2900-2100 years ago, and a second, slightly smaller one (the Little Ice Age) from 450-138 years ago. Both of these Holocene advances partially covered the study area with advancing ice, and stagnant ice from the latest of these advances is still retreating from the lowest reaches of the study area. With the minor exceptions of fluvial deposits along National Creek, poorly drained peats in topographic depressions, and recently deposited mining tailings, then, soils in the study area have developed from well-drained tills ranging in age from 11.5 thousand years to virtually newborn.

The climate of the Kennicott Valley is transitional between maritime and continental, with long, cold winters and short, warm growing seasons. Mean annual temperature for the Valley is -2° C and mean annual precipitation is 40 cm, distributed mostly evenly throughout the year (Pewe, 1975). Spruce-hardwood forests dominated by white spruce (see attached species list for scientific names of all plants discussed in text) are the predominant forest type on well-drained soils in this region.

Given enough time free from major disturbance, virtually all of the study area (which has little or no permafrost) would likely develop into a spruce-hardwood forest dominated by mature, open to closed stands of white spruce and scattered paper birch over a very dense shrub layer of Sitka alder and willows with an understory of clubmosses, horsetails, and red-currants. But as the following narrative will explain, the Kennecott mill town has a history of major disturbances the result of advancing glaciers, floods, spruce beetle infestations, fire, and humans. The current vegetation of the Kennecott mill town is best understood as a patchwork of related vegetation types in differing stages of primary or secondary succession.

The following is a description of each vegetation unit (polygon) in the mill town site, through each of the key historic periods. Vegetation units are mapped and identified on maps and were delineated to level IV of the Alaska Vegetation Classification (Viereck et al., 1992).

DESCRIPTIONS OF HISTORICAL VEGETATION

Pre-Mining

Before mining development, the land that eventually became the Kennecott mill town was recovering from a series of Holocene Glacial advances as described above. The Kennicott Glacier was still actively depositing till (a heterogeneous mixture of boulders, rocks, sands, silts, and clays with little or no organic materials) as it continued its retreat from the Little Ice Age Maximum. Above that active lateral moraine, the glacier's previous fluctuations had left a series of surficial deposits on the adjacent hillside, three of which were prominent in the study area: (from lowest to highest) the lateral moraine left by the 1860 glacial advance, the lateral moraine left by an earlier Holocene advance (2900-2100 years ago) and subsequently undercut by the Little Ice Age advance, and well-developed soils deposited by a mixture of colluvial processes and the late-Wisconsinan (over 12,000 years ago) glacial advance.

Before 1900, all of these areas were in some successional stage of white spruce forest. Without any photos available of this pre-mining vegetation, and with no evidence of 19th century fires, spruce beetle outbreaks, or human activity in the study area, it is assumed that the age and character of the surficial deposits described above (and not secondary disturbances) provided the primary determinants of vegetation type. Polygons are delineated on the basis of unpublished surficial geology field notes for the study area (Yehle, 1996). Because of the lack of photographic evidence, and because the characteristics (species composition and density, individual plant size, etc.) that distinguish early from late-serial stages of white spruce forest are subtle, it should be understood that the vegetation polygon boundaries are approximate.

Before the mining era, there were probably only two exceptions to this close coupling of surficial deposits. First, a wet, poorly drained topographic depression in the northern portion of the study area had a unique mixture of dwarf birch and willow. Second, the immediate vicinity of National Creek from the gorge down to the glacier was periodically flooded, scouring the banks and maintaining an open mixture of alder and willow.

a1) Barren

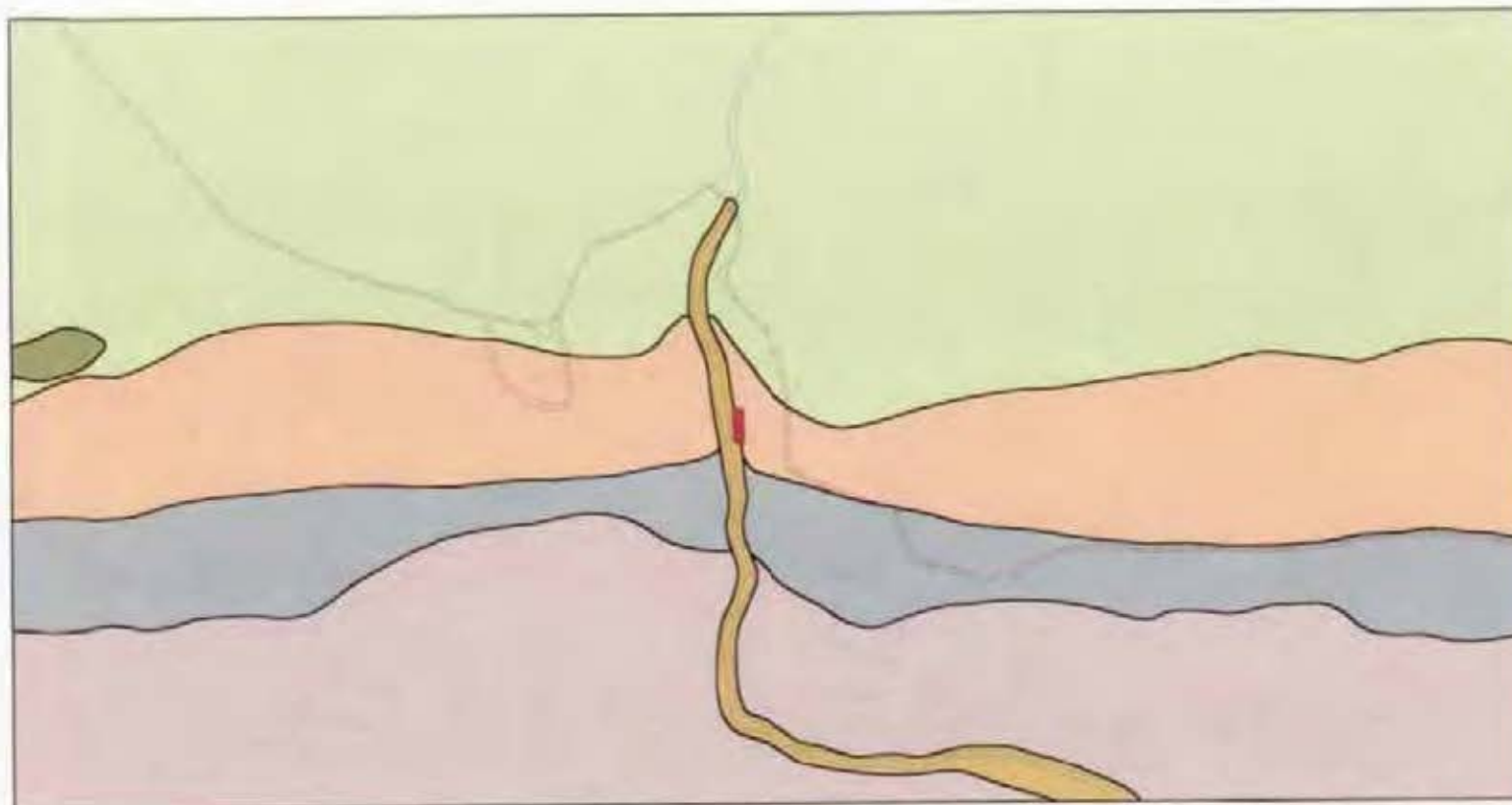
The active lateral moraine of the Kennicott Glacier. A thin covering of barren till overlay ice, which was much higher than it is now, with little to no soil development. On this cold and unstable surface, there was no vegetation here except for the very occasional fireweed, prickly saxifrage, or yellow dryas.

a2) III.B.1.a. Seral Herbs

The recently abandoned lateral moraine of the Kennicott Glacier, deposited during the Little Ice Age advance that peaked around 1860. By this time the moraine had been stabilizing and warming for less than 100 years, but significant colonization by fireweed, yellow dryas, soapberry, and willow seedlings had already taken place. These pioneer plants were contributing organic matter and nitrogen to the barren soil, which probably qualified by this time as excessively well drained entisol: a mineral soil with weak or nopedogenic horizons. The organic (duff) layer was 1-2 cm deep. Successional stage within this polygon varied from still barren to well-developed willow thickets.

I.A.2.e. Open White Spruce Forest

Surficial deposits in this polygon had their origins in the 2900-2100 year old glacial advance, and soils were hence developed to a much greater degree than in #a2. They were well-drained entisols, but with greater



Buildings
National Creek
Roads

300 0 300 600 Feet

Vegetation Type

- Barren
- III.B.1.a. Seral Herbs
- I.A.2.e. Open White Spruce Forest
- I.A.1.j. Closed White Spruce Forest
- II.B.2.d. Open Tall Alder-Willow Shrub
- II.B.2.e. Open Tall Birch-Willow Shrub

Pre-Mining Era

Vegetation Documentation
for Cultural Landscape Report:
Kennecott Townsite

quantities of organic matter and nitrogen and a generally deeper duff layer: from 2-8 cm. On the other hand, the Little Ice Age glacial advance tended to undercut the steeper slopes in this polygon, however, destabilizing the ground surface and promoting small sluffs and slides. The mature spruce forest in this polygon was kept somewhat open by this instability and perhaps the cold microclimate generated by the nearby glacier, leaving room for balsam poplars, scattered paper birch, and a fairly dense understory of willow and alder.

a4) I.A.1.j. Closed White Spruce Forest

This area had not been disturbed by glaciation or major landslides in over 10,000 years, and a fairly dense white spruce forest had developed on these inceptisols: moderately well-drained soils with much higher organic matter, base saturation, and nutrient content than the entisols further down slope. Duff layers here ranged from 8-15 cm. There is no evidence of fire, spruce beetle outbreak, or other catastrophic disturbance to this area in the last 500 years, and the forest had developed old-growth characteristics: mixed age distribution, large quantities of standing and downed dead wood in various states of decay, and low recruitment rates for young spruce. Paper birch was a common tree associate, and the understory was sparse to fairly dense alder and scattered willow.

II.B.2.d. Open Tall Alder-Willow Shrub

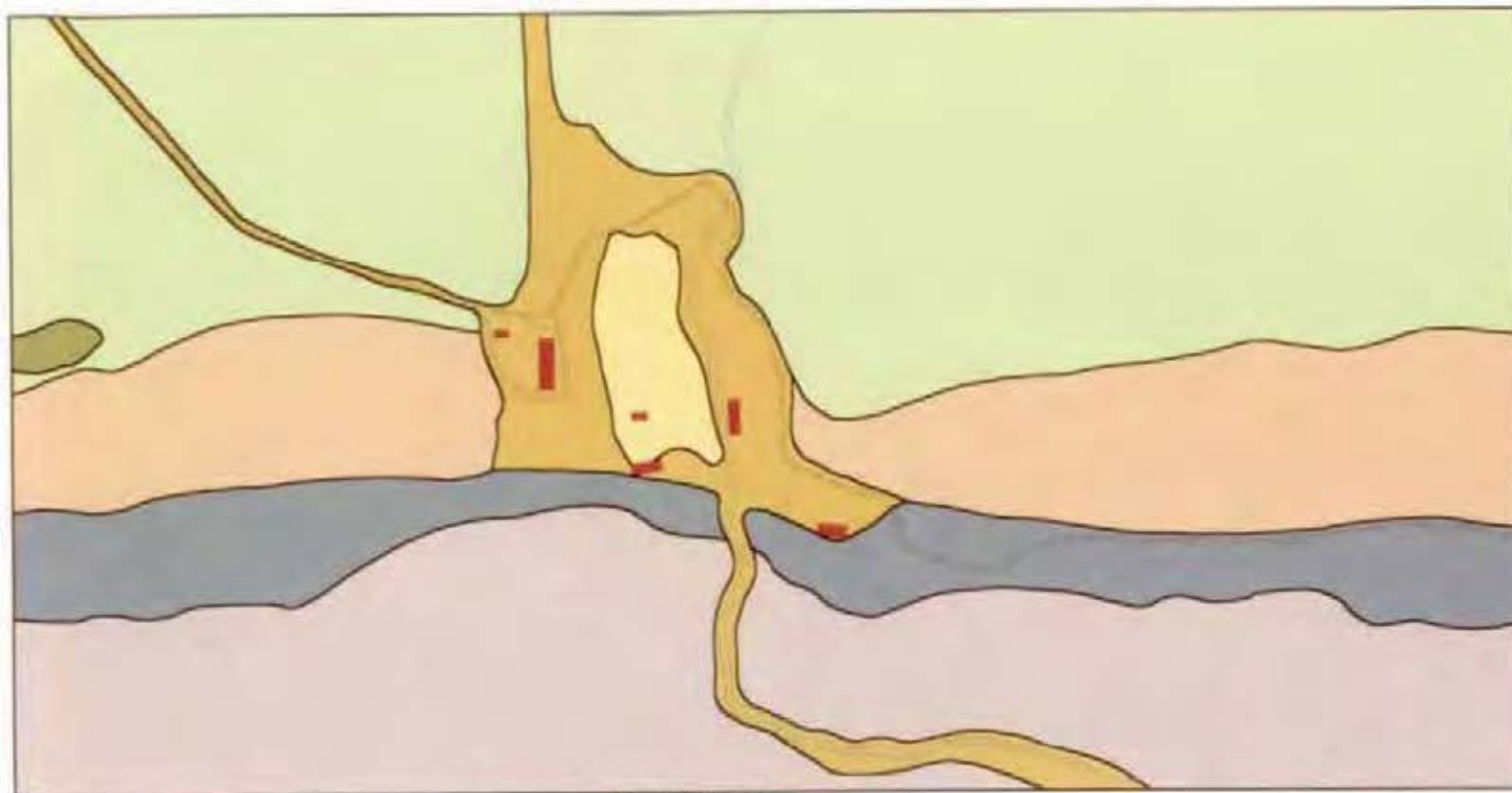
The "riparian zone" along lower National Creek. As it winds its way through a bedrock gorge and then spills out onto the lateral moraine of the Kennicott Glacier, National Creek frequently flooded and changed course. These frequent disturbances prevented the soils from developing past the early stage of entisols with a minimal duff layer, and maintained an open mosaic of willow, alder, and barren ground.

a6) II.B.2.e. Open Tall Birch-Willow Shrub

This topographic depression in the northern portion of the study area caught surface and subsurface flow from the hillside above and developed very wet, cold, organic-rich soils. These aquepts (poorly-drained inceptisols) had a deep layer of undecomposed organic matter and duff over 20 cm deep, and supported dwarf birch, shrub willows, and the very occasional white or perhaps black spruce where this polygon intergrades with #a4 on drier microsites.

1900-1908

In this first period of development, three major kinds of disturbance took place: logging to provide lumber and minimize fire danger; clearing for pasture, camping areas, roads and buildings. Most land was cleared by simple logging, and subsequently revegetated with alder, willow and eventually new tree seedlings. A large central area on the north bank of National Creek, however, shows a more "manicured" appearance in early photos. This area was logged and probably burned - a common practice of early miners to clear land and provide pasture for livestock (Lutz, 1956). For much of the mining era, this central area (which eventually became the site of Stephen Birch's house, the Manager's house, the Staff house, and the Manager's Office) was probably the largest area of open ground, actively maintained either by grazing or hand clearing. Most other lands in the study area, with the exception of building and storage areas, gardens, trails, and roads were simply logged and then left to re-grow in whatever mix of scrubby native vegetation took hold.



Buildings
Roads
National Creek
300 0 300 600 Feet

Vegetation Type	
	Barren
	II.B.2.a. Open Tall Willow Shrub
	I.A.2.e. Open White Spruce Forest
	I.A.1.j. Closed White Spruce Forest
	II.B.2.e. Open Tall Birch-Willow Shrub
	II.A.2.d. Open Tall Alder-Willow Shrub
	III.A.2.c. Bluejoint-Shrub

1900 - 1908
Vegetation Documentation
for Cultural Landscape Report:
Kennecott Townsite, 1998

b1) Barren

Active lateral moraine of the Kennicott Glacier, mostly unchanged from #a1. A few more plants may have colonized the still-retreating glacial moraine. Minimal disturbance by miners.

II.B.2.a. Open Tall Willow Shrub

Around this time, enough willows had colonized this recently abandoned lateral moraine and to overtop the seral herbs and justify a reclassification of the polygon. Compared to #a2, there is a more waist-to-chest high willow, a denser understory of soapberry, and fewer herbaceous perennials like fireweed and yellow dryas. Some of the southern portion of this unit was disturbed by construction of the first road into Kennecott, and some of the central portion might have been buried by debris sliding downhill from the mill construction site. Sitka alder was uncommon in this polygon, but would have been a strong component of the vegetation that began re-colonizing these disturbed areas.

b3) I.A.2.e. Open White Spruce Forest

What remained of this polygon after being diminished by logging was probably little changed from the characteristics of #a3.

b4) I.A.1.j. Closed White Spruce Forest

What remained of this polygon after being diminished by logging was probably little changed from the characteristics of #a4.

b5) II.B.2.d. Open Tall Alder-Willow Shrub

This vegetation type, which originally occupied only a small area along National Creek, was by this time entering a period of rapid expansion. Most of the forested areas logged by early miners were left rather raw: a combination of stumps, ragged brush, and abandoned slash. Vegetation recovery was usually swift, dominated by alder and willow. Some scattered poplar, paper birch, and white spruce may have remained and also started in as seedlings. Areas adjacent to road, building, and other construction were probably more heavily disturbed and alder returned more vigorously than willow on these sites, some of which remained barren for several years. Even the original, "natural" vegetation of this type, in National Creek, was probably quite disturbed by water diversions, tailings and gravel deposition, and the like.

b6) II.B.2.e. Open Tall Birch-Willow Shrub

No change from #a6.

b7) III.A.2.c. Bluejoint-Shrub

This was probably the very first area cleared in Kennecott, even prior to the logging of polygon #b5. The original clearing probably included both logging and burning, and for many years this area contained the most maintained vegetation cover in the area. At least one corral is visible in old photographs of this area and grazing was probably one way of maintaining the relatively open character of this meadow. After the initial burning, increases of bluejoint grass and fireweed would be expected because (in addition to favoring the enhanced light levels), both species reproduce by rhizomes and rapidly invade burned areas of boreal forests

(Dyrness et al., 1986). No photos show it appearing completely grassy, and it is likely that fireweed, wild rose, raspberry, red currant, alder, and willow shared the site with bluejoint.

1908-1915

By 1908, logging opened a great deal more land, and the mill is surrounded by a large area in various stages of secondary succession. At the same time, primary succession is continuing on the younger moraines of the glacier margin. Both of these processes are causing a dramatic overall increase in the amount of willow and alder in the study area, and the total area of spruce forest is continually diminishing. The first significant amounts of mining tailings are evident in the mill town, appearing to the south and north of the mill building. These tailings provide additional areas for succession, but tailings generally lack the very fine silts and clays common in glacial till and are consequently slower to develop a significant vegetative cover.

c1) III.B.1.a. Seral Herbs

Around this time, enough herbaceous perennials had colonized the lateral moraine of the Kennicott Glacier to justify reclassifying this polygon. Although many barren areas remain, it is clear from old photos that this polygon had begun to stabilize and fireweed, yellow dryas, and dwarf willows had all begun to occupy these soils in greater number. In addition, the size of this polygon had by this time grown substantially as completion of the railroad, further road construction, and the ongoing growth of the mill and its associated tailings created large new areas of essentially barren soil that entered directly into primary succession. Some of these areas were kept barren on purpose, especially near roads, buildings, and the railroad tracks; other areas were kept barren as an indirect consequence of severe soil disturbance. As a consequence, plant colonization was quicker and diversity higher near roads, the mill, and new building site than they were on the moraines undisturbed by humans. Weeds such as dandelion, wormwood, and fireweed were probably common.

c2) II.B.2.a. Open Tall Willow Shrub

Diminished in area from #b2 by ongoing construction, and with a greater density of willow, but otherwise little changed.

c3) I.A.2.e. Open White Spruce Forest

Much diminished in area from #b3 by ongoing logging, but little changed where the original vegetation remained.

c4) I.A.1.j. Closed White Spruce Forest

Diminished in area from #b4 by ongoing logging (including the construction of the second tramway), but little changed where the original vegetation remained.

c5) II.B.2.d. Open Tall Alder-Willow Shrub

This polygon was still increasing in area as development of the mill town continued. By this time, lumber was being brought to the site by rail and most logging activities were undertaken to clear land for new building sites, or minimize fire danger. As some areas were being logged for the first time, other areas were over a decade into their recovery with significant re-growth of poplar and white spruce, leaving this large area was a heterogeneous mix of dense shrub thickets, almost barren ground, and everything in between. Many of the



- Buildings
- Roads
- Railroad
- National Creek
- Garden

300 0 300 600 Feet

Vegetation Type

- I.A.1.j. Closed White Spruce Forest
- I.A.2.e. Open White Spruce Forest
- II.B.2.a. Open Tall Willow Shrub
- II.B.2.d. Open Tall Alder-Willow Shrub
- II.B.2.e. Open Tall Birch-Willow Shrub
- III.A.2.c. Bluejoint-Shrub
- III.B.1.a. Seral Herbs

1908 - 1915

**Vegetation Documentation
for Cultural Landscape Report:
Kennecott Townsite, 1998**

soils in this area were by this time heavily disturbed, and the overall proportion of alder in this area had increased.

c6) II.B.2.e. Open Tall Birch-Willow Shrub

No change from #b6.

c7) III.A.2.c. Bluejoint-Shrub

The construction of several new buildings, boardwalks, and a large garden in this area diminished the overall area extent of the vegetation, but probably did little to alter its essential character. Notably, the buildings constructed here in this period and subsequently were the homes and offices of the town's upper classes. In addition to the limited evidence provided by early photos, this fact supports the notion that this area was "groomed" more than most other areas in the town. Sitting on the north bank of National Creek, with adjacent corrals for horses and quite probably flower gardens planted near the buildings, this "meadow" was the pastoral home of the manager, higher staff, and eventually Stephen Birch.

c8) Gardens

This is mapped as an early garden, but because this area was buried under the tailings deposits of the Consolidated Wrangells Mining Company, there is currently no evidence of what was grown here.

1915-1938

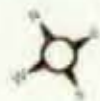
In this period, the heyday of the Kennecott mines, removal of vegetation reaches its most extreme. Much of the original vegetation in the study area has been destroyed, whether by logging, burning, road construction, or burial under the rapidly growing tailings piles. Even as this activity takes place, however, the processes of primary and secondary succession are taking place. Most of the study area is slowly recovering from some form of disturbance by growing an increasingly dense cover of herbs, shrubs, and tree seedlings. Gardens are tended, roadsides, trails, and the railroad are kept clear, and the central open area is still maintained. The majority of land cleared for mining activities has however, become an area covered with high shrubs, spruce stumps, slash, and mining debris.

d1) III.B.1.a. Seral Herbs

In the lower area of this polygon, the Kennicott Glacier was continuing its rapid retreat, and the slow invasion of perennial herbaceous plants and perhaps willow was continuing. Higher up, ongoing development and industrial activity was creating new barren land at the same time that older disturbed areas were becoming overgrown by native pioneer species. During this period, one important change was the drastic increase in the area covered by mining tailings, particularly below the leaching plant and to either side of National Creek. These areas, by virtue of continual disturbance and the extremely poor suitability of tailings for vegetation, remained virtually barren for many years (in some areas, up to the 1990s).

d2) II.B.2.a. Open Tall Willow Shrub

Little change from #c2 with the probably exception of sporadic and small-scale disturbances by human activity.



- Buildings
- Roads
- Railroad
- National Creek
- Gardens

300 0 300 600 Feet

Vegetation Types

- I.A.1.j. Closed White Spruce Forest
- I.A.2.e. Open White Spruce Forest
- III.B.1.a. Seral Herbs
- II.B.1.d. Closed Tall Alder-Willow Shrub
- II.B.2.a. Open Tall Willow Shrub
- II.B.2.d. Open Tall Alder-Willow Shrub
- II.B.2.e. Open Tall Birch-Willow Shrub
- III.A.2.c. Bluejoint-Shrub

1915 - 1938

**Vegetation Documentation
for Cultural Landscape Report:
Kennecott Townsite, 1998**

d3) I.A.2.e. Open White Spruce Forest

Much diminished in area from #c3 by ongoing logging, but little changed where the original vegetation remained. There may have been scattered selective cutting of white spruce in these areas by this time.

d4) I.A.1.j. Closed White Spruce Forest

Logging to clear land, but little changed where the original vegetation remained. At the margins of this mature spruce forest, adjacent to logged areas, old photographs show that large trees were suffering relatively heavy mortality, due largely perhaps to their increased exposure to wind and snow-loading. The edges of this polygon were thus growing more "ragged" over time.

d5) II.B.2.d. Open Tall Alder-Willow Shrub

The simultaneous processes of logging, soil disturbance, and re-growth continued in this area. At this point in time, the northern part of this unit (near the powder shack) was probably characterized by chest-high vegetation with lots of stumps scattered in the brush. The rest of the unit was probably getting very overgrown (maybe even closed) with alder, tall, tree-like willow, and ramets (clonal clumps) of poplar gaining height.

d6) II.B.2.e. Open Tall Birch-Willow Shrub

No change from #c6.

d7) III.A.2.c. Bluejoint-Shrub

No change from #c7, except for the addition of Stephen Birch's house at the upper (eastern) edge of this polygon.

d8) Gardens

Numerous gardens were now scattered around the mill town during this period, with the largest garden now located along the northern bank of upper National Creek. One photo from this period shows a cow in a cow-pen somewhere near the old dairy barn, in the southwestern portion of the study area. Further research was unable to determine the exact location of this pen.

d9) II.B.1.d. Closed Tall Alder-Willow Shrub

By this time, several parts of the "open tall alder-willow shrub" polygon (#d5) probably had enough cover to warrant the designation "closed." Only one area, down by the southern bank of lower National Creek, alders and willow had grown in quite densely and numerous white spruce seedlings were notable in the understory.

Existing Conditions

There is more total vegetation cover today than at any time since the start of the mining era. This is due primarily to the ongoing retreat of the Kennicott Glacier and the consequent colonization of its abandoned lateral moraines. Virtually all of the land cleared during the mining era has revegetated to some degree, and most roadways and trails have either disappeared or become narrow paths through a tunnel of encroaching alder and willow. With the exception of privately-owned property (the Kennicott Glacier Lodge, Silk Stocking



Vegetation Types

- III.B.1.a. Seral Herbs (Light grey)
- II.B.2.a Open Tall Willow Shrub (Dark blue/grey)
- I.A.2.e. Open White Spruce Forest (Light orange)
- I.A.1.j. Closed White Spruce Forest (Light green)
- II.B.1.d. Closed Tall Alder-Willow Shrub (Yellow)
- II.B.2.d. Open Tall Alder-Willow Shrub (Brown)
- II.B.2.e. Open Tall Birch-Willow Shrub (Dark green)

Existing Conditions
Vegetation Documentation
for Cultural Landscape Report:
Kennecott Townsite, 1998

Row cabins, etc.) virtually all of the vegetation in Kennecott is now unmaintained. The old gardens are grown over, the central open area has been obliterated by encroaching brush and the tailings deposits of the Consolidated Wrangells Mining Company, and even the old railroad corridor (now the main road through town) is sprouting an occasional shrub or bush.

Just as it was before the miners ever arrived, virtually all of the vegetation is a seral stage of white spruce forest. Boundaries between these various seral stages are in some cases quite vague, leaving the casual observer with a general impression of shrubbiness. Small patches of emerging spruce, poplar, and birch crown dense alders and willows, and little of the site's complicated history is readily apparent. One change is obvious, however. The total proportion of vegetated land in early to middle succession is much higher than it was a hundred years ago, and the proportion of late successional (mature) white spruce forest is much reduced. An ongoing spruce beetle outbreak that began in 1990 has killed many mature spruce in these latter areas and will probably contribute to an even further reduction in the total area of mature forest in the foreseeable future.

e1) III.B.1.a. Seral Herbs

The colonization of this now stabilized lateral moraine by fireweed, yellow dryas, and now a significant component of willow and poplar in some areas continues. Much barren ground remains, but as organic material and seed sources in this area increase, vegetation growth should be expected to accelerate in this area. Tailings piles remain very resistant to colonization, however, and will probably take many decades to revegetate to any significant degree. This is due largely to the absence of fine-grained material in mining tailings, with consequently poor water retention and nutrient availability.

e2) II.B.2.a. Open Tall Willow Shrub

Head-high and taller willows are now common in this area, and many spruce and poplar saplings have begun to overtop the willows. This area will soon be an open white spruce forest.

e3) I.A.2.e. Open White Spruce Forest

With some evidence of selective logging by miners and probably modern residents, the mature spruce remaining in this forest, which was quite open even before the mining era, is very reduced. Nonetheless, many old spruce remain in the small remaining area of this polygon and there is moderate recruitment by young spruce and paper birch.

e4) I.A.1.j. Closed White Spruce Forest

That any old-growth forest remains so close to the Kennecott town site is perhaps surprising. The mature white spruce forest that remains in the study area is a testament to the Kennecott Mines' reliance on outside supplies of wood and fuel. The near future for this forest is grim, however. On average, 40% of the mature spruce in this polygon have been killed by a spruce beetle outbreak that began in 1990, and more are still being killed each year (though the outbreak seems to be slowing). Furthermore, recruitment of young spruce in these beetle-killed areas is very low, and a recent study predicted that the current recruitment rate is insufficient to balance the continuing mortality of mature trees (Loso, 1998). Even in the absence of selective logging by local residents (which occurs sporadically), it is likely that the forest in this polygon will become much more open over the next few decades, and that without a ground-clearing disturbance such as fire, the recruitment of new spruce to fill these gaps will be slow, if it occurs at all. Under this scenario, the density of alder and willow is expected to grow.

e5) II.B.2.d. Open Tall Alder-Willow Shrub

With a few exceptions where the activities of current residents or visitors are disturbing the vegetation, this large heterogeneous polygon of brush and emerging trees is continuing its process of secondary succession. Poplar, tall willows, and white spruce are slowly turning some of this area into a young forest, but most of this polygon is revegetating more slowly than the rest of what was #d5, which is now categorized as "closed tall alder-willow shrub" (#e9). The reason for this slight difference in regrowth is not known. The area along National Creek has been flooded several times, as in the past, and remains in a very open stage much like it did before the commencement of mining operations in the early century.

e6) II.B.2.e. Open Tall Birch-Willow Shrub

No change from #d6.

e7) Gone

As a result of secondary succession by alder and willow and more directly because of tailing deposition by the Consolidated Wrangells Mining Company, nothing remains of the historic "meadow" that occupied the central portion of the town site.

e8) Gardens

Rhubarb and chives are known to still grow in the remnants of the largest garden, and further fieldwork this summer may provide evidence of the hardy crops that have survived the ensuing decades of neglect.

e9) II.B.1.d. Closed Tall Alder-Willow Shrub

Much of what was formerly "open tall alder-willow shrub" has now filled in with enough alder, tall willow, spruce, birch, and poplar to qualify as "closed." Some of the area is almost young forest. This closed and almost impenetrable thicket is a dominant vegetation type in the vicinity of many historic buildings now.

Site History

Kennecott Mine Sites

By Logan Hovis

Introduction

The Kennecott mines are located on Bonanza Ridge, high above the mill town, and several thousand feet above the Kennicott Glacier. The structural complex associated with these mines were industrial communities in their own right, distinct from the mill town below. During the winter months, the extreme cold, heavy snow, and high winds frequently isolated these camps. Wagon roads and trails quickly disappeared in the snow and high winds curtailed operation of the aerial tramway. In response to these conditions, the camps were became self-supporting to the degree possible, providing housing for the miners and support facilities to advance the underground works.

Over the life of the operation at Kennecott four principal underground mines were developed, each with its associated surface camp: the Bonanza, Jumbo, Mother Lode, and Erie mines.¹ The locations of the camps were somewhat precarious to say the least, built on steep mountain slopes and in avalanche paths. Access to the ore in such a hostile mountain environment forced site selections that were usually the lesser of several evils. All four major camps were adjacent to the greenstone-limestone contact, which defined the locations of the ore. Once constructed, securing the structures and protecting them from extreme weather became a basic part of the operation. For example buildings were cabled to the rock, snow fences and avalanche breakers were placed to direct the flow of snow between the buildings and around structures. In other cases, such as the aerial tramways, ongoing maintenance included the seasonal need to reconstruct towers and restring cable damaged by wind and snow.

Two surface operations were also established as satellites of the Bonanza camp. The Glacier Mine and the Slide ore body were summer operations on the west and east sides of the Bonanza outcrop respectively. The Glacier Mine had a few, smaller crew shacks erected on the glacier. This unusual mine, which recovered high-grade ore from the ice of the glacier, was connected to and supported from the Bonanza Mine camp. The Slide ore body was located on the slope below the Bonanza camp.

Both the Slide and Glacier operations were connected to the larger operations by aerial tramways. A short stub tramway fed ore from the Slide up to the Bonanza loading terminal. The Glacier was doubly connected with ore going down slope to join with the Jumbo tramway at the Angle Station and a short tramway running up from the Glacier to the Bonanza to transport men and supplies.

¹ The Mother Lode Mine is not described in detail in this report because it remains private property within the boundaries of the NHL. It should be noted however, that the Mother Lode Mine was historically an important ore body and integral to the operations at Kennecott during the historic period.

The relative significance of the mines can be crudely expressed in terms of total production figures.²

Mine	Ton of Ore	Tons of Copper
Bonanza	1,523,526	194,922.9
Jumbo	1,505,768	215,021.0
Mother Lode	1,340,162	166,038.3
Glacier	163,028	3,526.3
Erie	56,941	8,565.5
Slide Ore	36,484	3,461.4
Totals	4,625,909	591,535.4

These figures provide a somewhat distorted view when they are used to compare the various mine camps. Ore from the Mother Lode Mine was raised through the Bonanza Mine for transport to the mill, as was the ore from the Slide deposit. In addition, the Glacier mine was in part a satellite of the Bonanza even though it was connected to the mill by a tramway.

Over the life of the Kennecott operations, the Bonanza and the Jumbo camps were regularly occupied until the entire operation closed. The Bonanza, Mother Lode and Jumbo mines served by these camps operated continuously once they went into production. The other camps operated for shorter periods of time or intermittently as indicated below.

Mine	Years of Operation
Bonanza	1911 – 1938
Jumbo	1913 – 1938
Slide Ore	1913 – 1916
Mother Lode	1914 – 1938
Erie	1916 - 1918, 1924 - 31, & 1937 - 38
Glacier	1920 - 1928

Within broad limits and making some allowances for non-production exploration and supply operations at the Erie, the camps associated with these mines can be assumed to have operated on similar schedules.³

Collectively, these mine camps were the contact points between the production and processing functions at Kennecott. Broken ore was raised to the surface at the mine camps and transferred to aerial tramways for transportation to the mill for concentration and shipment to the smelters and world markets. They also reflected over time, changing corporate realities and the progress of the mining operations.

The importance of any single mine camp reflected the wealth of the mine it served and the development sequence of the underground workings. The Bonanza camp was first prominent as the readily accessible outcrop of ore was exploited and the outcrop explored at depth. The Jumbo camp to the west of the Bonanza supported the exploration and mining of a separate and equally rich ore body. To the east, across

² "Kennecott Copper Corporation, Kennecott Mines, Total Ore Production, 1911 to Date [1938]," NPS/AKSO files.

³ *Ibid.* All Kennecott mines were closed 1933-34. The date for when the Mother Lode first shipped is from Alfred H. Brooks, "The Alaskan Mining Industry in 1914," in Mineral Resources of Alaska: Report on Progress of Investigations in 1914, US Geological Survey Bulletin 622 (Washington: USGPO, 1915), p. 44. Kennecott production figures for the Mother Lode do not start until acquisition in 1919.

the ridge in the McCarthy Creek drainage the Mother Lode camp supported the efforts of the Mother Lode Copper Mining Co., a separate and competing entity until 1919.

Once Kennecott acquired the Mother Lode, the camp was little used and ore from the Mother Lode was transported underground to the Bonanza where it was raised to the surface. The Erie camp was established to support the exploration of the Erie ore body. Once it was found to be smaller than hoped, the Erie camp served as a supply point for further explorations deep in the mountain. Over time, the various mines were connected underground allowing options in the servicing of the mines and the transportation of ore. At the end, it was possible to enter the mines at the Erie Mine overlooking the Root Glacier, pass through the Jumbo, Bonanza, and Mother Lode mines, and exit in Independence Gulch overlooking McCarthy Creek.

The locations of the mine sites are fixed in geological realities and the camps to serve these mines were located as close as reasonably possible. The topographical extremes of Bonanza Ridge also imposed restraints on the location and configuration of the camps. Steep slopes, slide paths, and snow and ice fields did not prevent construction in a given area so much as they demanded engineering solutions and an acceptance of risk which, while common at the time, would not be accepted today.

At the present time, all the mines are in various states of collapse: the Erie bunkhouse is probably the most intact structure and the Mother Lode camp the most ruined of all. But all of these mine camps contain a wide variety of structures and artifacts to help define the nature of life in the Kennecott mines. All are more or less accessible to the general public and there is evidence of casual pilfering, looting and vandalism. The harsh environment is a mixed blessing. Long winters produce damage from high winds, avalanches and snow loads; the extreme cold freezes much in place for months on end and arrests the processes of decay.

Bonanza Mine

The Bonanza Mine camp is situated on an east-facing slope at the head of Bonanza Creek immediately below the Bonanza ore outcrop. The site is at approximately 6,000 feet elevation and is about three miles from the railhead and the mill site. Snow is on the ground nine months out of the year and in the air all year round. The Bonanza Mine was the first camp established on Bonanza Ridge. The outcropping of chalcocite and copper carbonate, both rich ores of copper, was first located in 1900. The camp was established sometime thereafter but was little developed until after 1906 when title to the mines had been clarified through litigation.⁴

Development work on the site prior to the end of the 1907 season included two crosscut tunnels driven into the ore one above the other. The lower tunnel started slightly above a "L"-shaped cabin that may have been constructed several years earlier. The cabin was described as the "miners lodgings" on company maps. The utilitarian nature of the structure is evident in its location immediately adjacent to the waste rock dump from the lower tunnel.⁵

Photographic evidence suggests the building was modified and expanded on several occasions to accommodate more miners. More important, early photographs show a level cut made in the hillside running south from the lower tunnel for approximately 200 feet. This cut carried the track from the mine to the waste dump. This linear feature appears on the basis of subsequent photography to define the main axis of all subsequent development on the site. The aerial tramway loading station was erected at the south end of the cut and shops at the north end.⁶

Constructing the Bonanza camp on a steep slope required the excavation of terraces and the erection of wood cribbed retaining walls to produce building platforms. Mine buildings were further secured to the

⁴ Considerable confusion and controversy persists about the discovery and early history of the Kennecott mines. While interesting, these questions are not germane to the Cultural Landscape. Litigation consolidated control in the hands of Stephen Birch and the Alaska Syndicate prior to major investment and construction activities. Versions of the discovery and initial ownership of the mines are discussed in Robert Stearns, "Alaska's Kennecott Copper and the Kennecott Copper Corporation," *Alaska Journal* 5 (1975): 130 - 139; see also Melody Webb Graumann, "Big Business in Alaska: The Kennecott Mines, 1898 - 1938," Anthropology and Historic Preservation, Cooperative Park Studies Unit, University of Alaska, Fairbanks, Occasional Paper #1, March 1977; see also her "Kennecott: Alaskan Origins of a Copper Empire, 1900-1938," *Western Historical Quarterly* 9,2 (April 1978): 197-211.

As the first mine to be brought into production, the Bonanza's name dominated the entire Kennecott operation for several years. For example, the facilities along National Creek were initially included as one in the same in discussions of the Bonanza Mine and later as the Bonanza-Kennecott Mine. Once the Jumbo Mine became important contributor to production, the name distinction between the mill town and the various mines became common, even assumed, in the literature.

⁵ Fred H. Moffit and A.G. Maddren, "The Mineral Resources of the Kotsina and Chitina Valleys, Copper River Region" in mineral resources of Alaska: Report on Progress of Investigations in 1907, US Geological Survey bulletin 520 (Washington: USGPO, 1908), pp. 163-164; and Fred H. Moffit and Stephen R. Capps, *Geology and Mineral Resources of the Nizina District, Alaska*, USGS Bulletin 448 (Washington: USGPO, 1911), p. 87; see also "Bonanza Surface Plant & Underground Work," Kennecott Mines Map Inventory, Drawer 40, Roll 6, n.d. (M-59), copy in NPS/AKSO files.

⁶ Two early views of the cabin and the side hill cut are provided by USGS geologists; see USGS Photographic Library, Capps, S. R. # 119 and Moffit, F. H. # 364. A photograph taken approximately 5 years later shows the cut covered with a snow shed connecting the tunnel with the top of the tramway loading station. New buildings, presumably bunkhouses and shops are erected above and below the snow shed; Alaska Mining photo #141 34 [circa. 1912], Photographic Archives, Museum of History and Industry, Historical Society of Seattle and King County, Seattle, Washington.



LEGEND

- Adit
- Wood Scatter
- Dump
- Decking
- Telephone Line (fallen)
- Cable
- Trail

BUILDING LEGEND

- 1 Bunkhouse
- 2 Shed (unknown function)
- 3 Tram Terminus
- 4 Transformer Building
- 5 Steel Shed/Blacksmith
- 6 Tent Frame (site only)

Bonanza Mine
Existing Conditions

Cultural Landscape Report: Kennecott Mill Town
Wrangell-St. Elias National Park and Preserve

10/87

Aerial Photographs, NPS, 1991; Topographic
Survey, 1991-92, Drawing no. 190/80021;
Archaeological records and files, WRST, HABS
Documentation, 1982; Field Investigations, 1997.

mountainside with steel cables. Most major structures at the mine were positioned at a similar elevation with the line of buildings following the arc of the cirque.

Early access to the mine was by trail. In 1908, the wagon road to the mine was widened and graded to permit winter sledding of supplies. Construction of the aerial tramway connecting the Bonanza mine with the railway at National Creek started in 1908 and was completed in 1909. It started operation in August that year. The tramway provided the necessary connection to place the mine in production once the railway arrived at Kennecott.⁷

In addition to the early cabin and the tram terminus, other construction was underway or completed by 1912, after regular production began. New buildings included a two-story, "T"-shaped bunkhouse located below the snow shed and near the original cabin. A second significant structure was erected at the north end of the snow shed containing a blacksmith shop, compressor room, and heating plant. In 1911, the ore bins and loading terminal were enlarged to increase capacity.⁸

Mining operations proceeded underground and on the surface. In 1912, a larger donkey engine pulled itself up the mountain and was used to run scrappers mining the Slide ore. This ore was located down slope from the Bonanza outcrop and contained a large amount of loose chalcocite and other copper ores. The donkey engine was positioned above the snow shed on a small platform excavated into the hillside. The cables ran through or over the shed. How the ore was raised to the tramway-loading terminal is not immediately obvious in the photograph although a stub tramway was constructed in 1917 to connect the slide ore deposit with the terminal.⁹ Workers at the slide area, a seasonal activity, may have been housed at the Bonanza or in tents closer to their work.¹⁰

In early 1913, the tramway and compressor plant was destroyed by a snow slide and fire, forcing the Bonanza mine to shut down. By March, the company was erecting a new compressor building at the mouth of the mine and was repairing the tramway damaged by the slide.¹¹ Additions to the camp around this time include changes to the ore bins with a new tunnel connecting the underground workings directly to the loading terminal. Additional housing—a three-story bunkhouse—and a privy block were constructed south of the loading terminal and connected to it by a covered walkway.

Major modifications in 1916 and 1917 included significant changes to the organization of the mine

⁷ Fred H. Moffit, "Mining in the Kotsina-Chitina, Chistochina, and Valdez Creek Regions," in Mineral Resources of Alaska: Report on Progress of Investigations in 1908, US Geological Survey Bulletin 379 (Washington: USGPO, 1909), pp. 153-154; Fred H. Moffit, "Mining in the Chitina District," in Mineral Resources of Alaska: Report on Progress of Investigations in 1909, US Geological Survey Bulletin 442 (Washington: USGPO, 1910), pp. 160; and "Bonanza Copper Mines," Northwest Mining Journal 7:1 (January 1909): 7.

⁸ See Alaska Mining photo #141 34 [circa. 1912], Photographic Archives, Museum of History and Industry, Historical Society of Seattle and King County. Dating is based on the presence of the large donkey engine used to raise Slide ore to the snow shed level. This equipment did not arrive on site until 1912; see "Activity at Kennecott Mine and McCarthy," The Chitina Leader 2nd year, No. 21 (1 March 1912); 1. For tram terminal expansion see Kennecott Mines Company [drawing], "Mine Ore Bin and Loading Terminal, Cross Section and Side Elevation, 1911 Installation," NPS/AKSO files.

⁹ Fred H. Moffit, "Mining in Chitina Valley," in Mineral Resources of Alaska: Report on Progress of Investigations in 1912, US Geological Survey Bulletin 542 (Washington: USGPO, 1913), p. 84; "Activity at Kennecott Mine and McCarthy," The Chitina Leader 2nd year, No. 21 (1 March 1912); 1; "Bonanza Surface Plant ...," *op. cit.*; and Kennecott Copper Corporation, "East Slide Tram Terminal," Drawing No. T-7, July 6, 1917.

¹⁰ A small tent camp immediately below the Bonanza Mine was recorded during the 1997 existing conditions survey.

¹¹ Alfred H. Brooks, "The Alaskan Mining Industry in 1913," in Mineral Resources of Alaska: Report on Progress of Investigations in 1913, US Geological Survey Bulletin 592 (Washington: USGPO, 1914), pp. 60-61; and "Activity in Copper Mining," The Chitina Leader 3,22 (18 March 1913); 1.

site. In 1916, a newly constructed four-story bunkhouse burned.¹² In 1917, a site was cleared to build a new bunkhouse. When completed later that year, the combination bunkhouse and mess hall also served as a recreation and amusement hall.¹³

As new structures appeared, others disappeared. The snow shed connecting the miners' lodgings with the loading terminal was gone as were the original miners lodgings and the "T" shaped bunkhouse. The snow shed still connected the buildings but now they went from the vicinity of the heating plant to the lower levels of the tramway loading terminal as well as from the upper level of the terminal to the earlier three story bunkhouse to the south.

By 1926, the mine site was essentially as today's ruins suggest. Moving from north to south, the main structures include the Steel Shop at the original mine portal and the Transformer House located above the portal. To the east is the one-story frame Heating Plant. The four-story Bunkhouse, Messhall and Amusement Hall dominate the north end of the site. The center of the site is dominated by the Ore Bins and tramway-loading terminal. Further to the south are the older three-story frame bunkhouse and the privies. Show sheds still connected the major elements of the site.¹⁴

The new four-story bunkhouse followed designed developed for the major bunkhouses in the mill town. As a group they were three to four stories tall with shed-roofed dormers. Floor plans were also similar with the buildings severing a variety of ends: cooking, dining, recreation, and change rooms for washing and drying clothes. Aesthetic details such as the red with white trim paint scheme were also employed in this last major construction at the Bonanza mine.

While no new significant structures were added to the camp after 1918, smaller modifications to the physical plant were probably the norm. Increases in the capacity of the tramway in 1918 may have been reflected in changes to the ore bins and the loading station. During periods of construction, small tent cities came and went as necessary. Finally, minor modifications to the buildings occurred almost up until the end. In 1936, the Company reported enlarging the cook's quarters by building another room in the Bonanza Bunkhouse.¹⁵

During peak production, approximately 72 men worked the Bonanza mine, most of whom were undoubtedly housed at the Bonanza camp. Another 146 worked the Mother Lode that was supplied through the Bonanza mine. In all, well over 200 men worked and lived in the camp at its height.¹⁶ By 1924 the Bonanza camp supplied compressed air for the connected mines.¹⁷ When finally closed, the Bonanza incline

¹² The loss of this structure and the subsequent housing shortage it created may have contributed to tensions among the workers, and the miners' strike the following year

¹³ Graumann, *op. cit.*, p. 27; Alaska Territorial Mine Inspector, *Report of the Territorial Mine Inspector to the Governor of Alaska for the Year 1917*; Kennecott Copper Corporation, and *Third Annual Report of the Kennecott Copper Corporation for the Year ended December 31, 1917*.

¹⁴ Kennecott Copper Corporation, "Fire Insurance Map, Bonanza Mine," Drawing No. G-5, March 14, 1922 updated to November 20, 1926.

¹⁵ Kennecott Copper Corporation, *Fourth Annual Report of the Kennecott Copper Corporation for the Year Ended December 31, 1918*, p. 8; photographic evidence of the housing of construction workers in tents may be found in Rasmusen Library, UAF, Clara Rust Collection, 67-110-401N, and WRST, Kennecott Kids Collection, Jean Girard photographs; Kennecott Copper Corporation, "Annual Report for 1936, Alaska Mine," p. 12.

¹⁶ Employment figures taken from "General Points of Interest on the Kennecott & Mother Lode Mines, Kennecott, Alaska, July 15, 1924," p. 1, NPS/AKSO files.

¹⁷ "Outline of Geology and Mining Methods of Kennecott Mines, Kennecott Copper Corporation, Kennecott, Alaska, [c. 1924], p. 10, NPS/AKSO files.

giving access to the mine extended downward from the 150 foot level where the camp was located to the 1250 foot level, a depth of 1,100 feet. At that depth a crosscut connected the Bonanza Mine with the Mother Lode where the incline went down through the production and exploration levels to 2800 foot level, 2, 650 feet below the Bonanza camp.¹⁸

Production continued in the Bonanza Mine until the end of October 1938; the last shipment of ore left on October 31st. Salvage operations continued until November 10th. The camp was permanently abandoned on December 23rd.¹⁹ Sometime around the end of November the last man left the Bonanza Mine.

The camp remained relatively undisturbed until the 1950s when the Consolidate Wrangell Mining Company attempted to recover surface ores from the Bonanza basin. By this time, the surface title had passed from Kennecott Corporation to Alaska interests. Reportedly, to reduce personal liability by preventing people from occupying the bunkhouse at the mine, the building was set fire and destroyed. The fire also destroyed the power plant and the snow shed at the north end of the camp. Additional damage to the site came from exposure to the elements overtime.

Consolidated Wrangell Mining Company built roads into the Bonanza basin in 1964, and erected a small camp including a small bunkhouse and copper recovery plant at the 4,000 foot level. the following year, 1965. The process was not a success and the camp and plant was abandoned in favor of an operation based near the Kennecott concentrator. This operation closed in 1967. The camp in the Bonanza basin was eventually destroyed by a snow slide.²⁰

Sixty years after Kennecott Copper walked away from the site, the Bonanza camp is still a complex site, despite the ravages of fire and time. Little is as it was; almost every building is in some degree of collapse. The tramway terminal and loading station are solidly built and relative intact. The roof is collapsed on the blacksmith shop but the walls are still up and many small tools remain inside. The transformer building is sound even though its metal skin has been stripped away. The ashes of the bunkhouse and power plant are mixed with twisted metal girders, the remains of the boilers and rusting bed frames. Today, the Bonanza Mine is visited frequently by those willing to hike up the mountain. While many appreciate the site for itself, others take the opportunity to loot this most accessible of all the Kennecott mines.

¹⁸ Kennecott Copper Corporation, "Projection Showing Bonanza-Mother Lode Vein in Relation to Various Ore Bodies," copied 1/30/66, Kennecott Mines Map Inventory, Drawer 40, Roll C. There were at least eleven levels in the Bonanza mine and thirteen in the Bonanza-Mother Lode. There were also numerous sub-levels. As to the spacing between levels, "Formerly [prior to c. 1924] levels were driven each hundred feet, this distance was increased to 200 feet, which was found to be too great, and 150 feet has been accepted as the best distance, all things considered," "Outline of Geology and Mining Methods," *op. cit.*, p. 7.

¹⁹ W. A. Richelsen to E. T. Stannard, February 17, 1939, copy in NPS/AKSO.

²⁰ Telephone interview with Howard Knutson, a partner in Consolidated Wrangell Mining Co., 19 October 95, Logan Hovis, NPS/AKSO.

Jumbo Mine

The Jumbo Mine was the second ore body located on Bonanza Ridge. Like the Bonanza, it was located in 1900, and by the same party. And, like the Bonanza the Alaska Syndicate did not develop it to any degree until after the consolidation of ownership of the mines in 1906. As of 1907, the ore body was explored by two short, 12-foot long tunnels in the south face of the ridge towering above the glacier at the head of Jumbo Creek.²¹

Once the Bonanza mine was established and shipping, attention was extended to the Jumbo where "a considerable body of ore was in sight at the surface before any work was done."²² A tramway was purchased and shipped to Alaska in 1911. Work proceeded slowly, and the tramway was not completed until 1915. None-the-less, the Jumbo managed to ship limited quantities of ore by hauling it to the mill in wagons.²³

The location and construction of the Jumbo camp presented a number of problems. The only space available to build was on the edge of a small glacier and the buildings were constantly moving. Several solutions were devised to meet the demands of the site. The Jumbo bunkhouse was set on rollers and the building was anchored to the cliffs with cables. Consequently, the foundations moved while the buildings remained fixed.²⁴ Triangular avalanche barriers between the cliff and the camp provided additional protection from ever-present snow slides. These rock filled cribs split the force of the snow slides and directed them between the buildings.²⁵

By 1915, the Company felt that both mines were well equipped with bunkhouses, blacksmith shops, compressors and other necessary equipment. In 1917, a new transformer house was erected at the east end of the camp where much of the early development had occurred. In 1919, additional protection was provided to the aerial tramway and the workmen by moving the Jumbo loading station underground.²⁶

The sequence of construction at the Jumbo camp is little understood at this time. It is safe to assert that the major expansion of the site came along with the discovery of additional rich deposits of copper ore in 1914 and the completion of the aerial tramway in 1915. Compressors and power were installed early on and large numbers of men were engaged in the construction efforts.²⁷ When the bunkhouses and other structures were erected can be derived with some accuracy from the 1926 Fire Insurance Map of the Jumbo Mine.

²¹ Stearns, *op. cit.*, p. 135; and Moffit and Maddren, USGS Bulletin 520, *op. cit.*, p. 165.

²² Moffit, USGS Bulletin 542, *op. cit.*, p. 84.

²³ Graumann, *op. cit.*, pp. 21-22; Brooks, USGS Bulletin 592, *op. cit.*, p.60; and Sumner S. Smith, *The Mining Industry in the Territory of Alaska During the Calendar Year 1915*, US Bureau of Mines Bulletin 142 (Washington: USGPO, 1917), p. 37.

²⁴ Alan M. Bateman and D. H. McLaughlin, "Geology of the Ore Deposits of Kennecott, Alaska," *Economic Geology* XV.1 (January-February 1920): 16; B. D. Stewart and B. W. Dyer, *Annual Report of the Territorial Mines Inspector to the Governor of Alaska, 1921*.

²⁵ The construction dates for the avalanche control devises is problematic at this time. They do not show on the 1926 fire insurance plan of the Jumbo mine.

²⁶ Smith, USBoM Bulletin 142, *op. cit.*, p. 38; Kennecott Copper Corporation, Jumbo Transformer House, April 14, 1917, Drawing No. B-38; and Fred H. Moffit, "Mining in Chitina Valley," in *Mineral Resources of Alaska; Report on Progress in Investigations in 1919*, USGS Bulletin 714 (Washington: USGPO, 1921), p. 195.

²⁷ "News of the Camps," *The Pacific Mining Journal* 2:6 (June 1913): 116; "News of the Camps," *Alaska and Northwest Mining Journal* 5:1 (July 1914): 157.



LEGEND

- Adit
- Wood Scatter
- Dump
- Tramway
- Trail

BUILDING LEGEND

- 1 Tram Terminus
- 2 Bunker
- 3 Bunkhouse
- 4 Multi-Purpose Building
- 5 Horseshoe Pit

Jumbo Mine Existing Conditions

Cultural Landscape Report: Kennecott Mill Town
Wrangell-St. Elias National Park and Preserve

10/97

Aerial Photographs, NPS, 1991; Topographic
Survey, 1991-92, Drawing no. 190/80021;
Archaeological records and files, WRST, HABS
Documentation, 1982; Field Investigations, 1997.

Earlier constructions were necessary to advance the underground works. At the east end of the camp an adit with a snow shed connected to small shops and storage areas. As services were moved underground, the service area became less important and 1926 erected a new blacksmith shop directly over the rail bed. The tramway station, close by another adit, was erected sometime between 1911 and 1915. This structure was not removed when the loading station was moved underground in 1919. There are four bunkhouses numbered sequentially from one to four, which may be significant in itself. Given that the "Bunkhouse No. 1" is close to the tramway station, not in line with the other three, and atypical in design, it is probably the first bunkhouse on the site. The other three—three, two, and four story respectively—may well have been added in sequence. At some point prior to 1926, a heating plant and other minor structures were added to create the footprint evident today.²⁸

The less severe slope of the camp site allowed a more casual orientation of the buildings. They are spread in a general east-west sweep across the edge of the glacier. The long axes of the bunkhouses as all major features on the site run north south, but hardly parallel. The bunkhouses followed the wood-frame and gable style adopted elsewhere at Kennecott. Tarpaper covered most of the exterior walls rather than paint. A five-hole privy was located south of the heating plant.

After 1926, only minor changes were made to the surface plant. In 1930, the blacksmith shop was moved underground to better serve a larger area of the mine. Power transmission lines relocated underground so that the Jumbo was supplied through the Bonanza mine. Ongoing repair costs due to snow slides and weather in general were greatly reduced.²⁹

The Jumbo mine closed in 1938, along with the rest of the Kennecott operations. Often called the "richest mine," the Jumbo produced more copper if not more ore than any of the other four mines.

Lack of maintenance and the general extremes of the climate and elevation took their toll although the site held up well for at least ten to fifteen years. In the 1950s, Ray Trotoshau constructed a road to the Jumbo.³⁰ Mine waste down slope from the camp was recontoured in the fashion of a dike or wall along the south face of the camp. At one point the aerial tramway cables come into contact with the road surface. There is no immediate record of Wrangell Consolidated Mining Company efforts at the Jumbo.

Few structures remain standing. One bunkhouse, a tramway break-over, and the surface bunkers associated with the original loading facility. Even these structures are in poor repair and in danger of collapse as the ground continues to shift and twist the buildings. Everything else is in ruins. Bunkhouse No. 4 may have been partially salvaged, or the roof and upper stories may have been carried away by a slide.

²⁸ Kennecott Copper Corporation, "General Surface, Fire Insurance Map, Jumbo Mine," November 25, 1926, Drawing No. G-4, NPS/AKSO. The heating plant at the Jumbo was replaced at least once as the older plant was installed in the Erie mine camp in 1937; see Kennecott Copper Company, "Annual Report for 1937, Alaska Mines," p. 15.

²⁹ Kennecott Copper Corporation, "Alaska Mines, Annual Report, 1930, p. 12.

³⁰ Knutson Interview, *op. cit.*

Erie Mine

The Erie outcropping was located in 1900, shortly after the discoveries made at the Bonanza and Jumbo. It is highly likely that the prospectors simply followed the line of the contact west from one showing to another. Initially, the deposit proved to be too small and too remote. Development of the site was delayed in favor of the larger Bonanza and Jumbo deposits. The Erie was located on a steep mountain slope about 3 miles north of National Creek and a little over 1,000 feet above the Glacier. Little work was initially done on the Erie. As of 1909, debris had been cleared away and an open cut made in the contact to better expose the ore.³¹

The relative isolation of the Erie mine raises questions about where and how the work force was housed and supported. Tents can be assumed at first and more permanent structures would follow. A number of smaller frame structures were observed in the ravine approximately 200 feet below the present Erie camp during the 1993 survey of mine openings associated with the Kennecott operations. These ruins would have supported work on the 310 portal. Similar structures may well have erected on the site of the present bunkhouse when work was initially undertaken on the 100 Level where the bulk of the structures are now clustered.³²

Significant exploration and development work began on the Erie in 1913.³³ Access to the site was by way of a trail, later upgraded to a wagon road, along the eastern moraine of the Kennecott and Root glaciers. 1916 had driven three prospecting tunnels driven at the Erie. The upper most, at the present camp level, was 700 feet long. Access to the Erie was by way of an aerial tram from the moraine to the upper tunnel. Ore mined from the Erie was sacked and stockpiled for sledding to the mill once enough snow was on the ground.³⁴

Building space was at a premium at the Erie. The main tunnel and the tramway terminal were located in the limestone cliffs at the head of a steep gully. The flanks of the gully were steep necessitating cutting trails, building terraces and at least one structure—the blacksmith shop—into the rock. Support structures were tightly clustered along the gully wall close to the tunnel and tramway.

Work continued at the Erie in a "desultory manner" with some ore mined and sledded to the mill in 1918.³⁵ When the main bunkhouse was built is not known with certainty. It was designed in its current configuration in 1924; this work may have been additions and modifications to an existing structure.³⁶ The need for the bunkhouse was real in 1924, as the Erie had been successfully connected underground with the Jumbo mine on July 15th. The Erie-Jumbo Cross-Cut intersected five ore bodies which were mined more or less continuously until 1931.³⁷

³¹ Moffit and Capps, USGS Bulletin No. 448, *op. cit.*, pp. 91-92.

³² See Danny Rosenkrans, "1993 Kennecott Mine Openings and Tram Survey Report;" and L. W. Hovis field notes and photologs for July 19, 1993, NPS/AKSO.

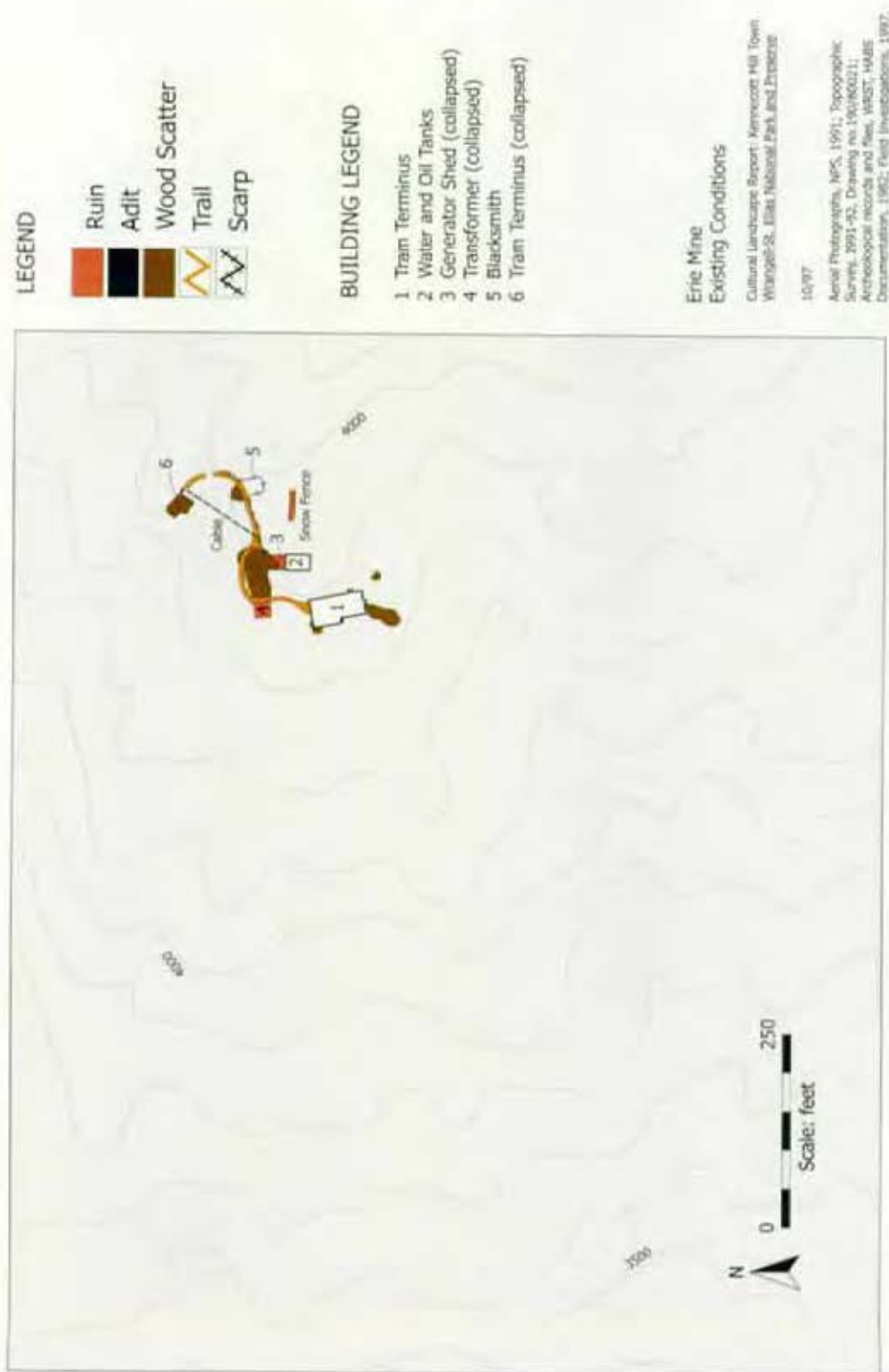
³³ "Mines Tributary to Cordova," The Chitina Leader 4,15 (27 January 1914): 3; and "Alaska Coast Development," Alaska and Northwest Mining Journal 4:1 (January 1914): 3, 4.

³⁴ Moffit, USGS Bulletin No. 662, *op. cit.*, pp.173-174.

³⁵ "General Points of Interest," *op. cit.*, p. 8.

³⁶ Kennecott Copper Corporation, "Erie Mine, General Drawing of Bunkhouse, 1924 Addition – Surface Plant," August 18, 1924, Drawing No. B-19, NPS, AKSO. The question remains was the bunkhouse an addition to an existing building or completely new addition to the surface plant.

³⁷ Kennecott Copper Corporation, *Tenth Annual Report of the Kennecott Copper Corporation For the Year Ended December 31, 1924*, p. 6.



The Erie mine and camp was a smaller operation; seventeen men were employed on average in 1924 when the bunkhouse was erected or enlarged. Production levels, and presumably manpower levels, remained steady through the 1920s suggesting few major alterations to the camp during the period.³⁸ The three-story frame bunkhouse included rooms, washing facilities, a kitchen and mess hall, a reading room, a commissary, which was a part of the larger foreman's office and quarters. Rooms were available for twenty men on the second floor: 14 in shared rooms and six in private rooms including one each for the cook and the foreman. The other four may have been for lead hands or others of higher status.

The bunkhouse was covered with tarpaper and left unpainted. The privy was connected to the south end of the bunkhouse by a boardwalk. Upslope and closer to the mine entrance a frame storage building held water and fuel tanks. An addition to this structure housed a generator with concrete footings. The transformer building north of the bunkhouse was built on pilings to compensate for the lack of level space. The blacksmith shop, one of the earlier facilities on the site was recessed into the rock face.

Just as the local topography defined the placement of buildings, circulation was equally limited. The principal pathway connected the bunkhouse with the mine adit. Between the adit and the blacksmith shop the trail was cut into the rock. Walkways and staircases connected the other structures. Handrails were provided.

Access to the Erie was probably by the aerial tramway of through the mines once the connections were in place. Sections of a well defined trail connecting the camp with the moraine can be seen in the steep gully immediately south of the camp, and all mines were more or less connected by a trail that traced the contact from the Bonanza mine to the Erie. Once the mines were connected underground, ore traveled to the Jumbo and the Erie tramway was reserved for supplies. This situation continued until 1930, when the Erie Bunkhouse was closed on November 1st. A new shop built underground at the Jumbo mine, which improved the overall efficiency of the operation, replaced the blacksmith shop. Ore continued to be produced for another year; support for the operations came from the Jumbo mine camp.³⁹

In the final years of operation, a few new ore bodies were discovered in the Erie mine and the bunkhouse was reopened in June 1937. Repairs were made to the roof at the time, and heating stoves, which had originally warmed the building, were replaced with a low-pressure steam boiler and radiator system previously used in the heating plant at the Jumbo mine. Power lines connecting the Erie with the mill town were also repaired.⁴⁰ The Erie remained open nearly to the end: "Mining operations at the Erie mine were discontinued at the end of the shaft on October 14, however, main level haulage continued over to Jumbo until October 15, when the entire personnel and camp equipment were moved to Bonanza."⁴¹

No further work has taken place at the Erie. As at the other mines, natural processes, particularly wind and snow slides have damaged or destroyed the structures. The bunkhouse, the water and oil storage building and the tramway terminal are the only relatively intact structures. The paths are precarious or swept away. Despite the relative inaccessibility of the place, looters have taken many of the portable items—including the pool table—in recent years.

³⁸ "General Points of Interest," *op. cit.*, p. 1; and "Total Ore Production," *op. cit.*

³⁹ KCC, "Alaska Mines, 1930," *op. cit.*, p. 12.

⁴⁰ KCC, "Alaska Mines, 1937," *op. cit.*, pp. 7, 16.

⁴¹ Kennecott Copper Corporation, "Annual Report for 1938, Alaska Mines," p. 19.

Glacier Mine

The Glacier mine was the most unusual ore body worked at Kennecott. Like the Slide Ore, the Glacier deposit was formed by the rapid and continued erosion of the extremely high-grade ores on the ridge above at the Bonanza outcrop. Unlike the Slide Ore, the Glacier material was encased in ice, not loose in the scree. As the material fell down it was encased in the glacier and the lateral moraine of the alpine glacier. Ice literally became the "country rock" for ore. Miners worked in the ice—drilling, blasting, and even timbering as they would in rock.⁴²

Initially, two tunnels—the Glacier Tunnel and the Upper Tunnel—were driven in the ice to explore the potential of the deposit. A third tunnel was driven later to further define the extent of the ore. The main tunnels ran parallel to the lateral moraine and several cross-cuts ran at right angles to establish the width of the deposit. During the exploration phase, access to the Glacier was by way of an aerial tramway connecting the surface of the glacier with the Bonanza mine 500 feet above.⁴³

The decision to mine the Glacier was made sometime prior to 1918 when construction started on the 5,000-foot long Glacier tramway to connect the mine with the Jumbo tramway. The tramway was completed in 1920 and immediately put into operation. Production was heavy from the first.⁴⁴

Once the Glacier mine went into production, drilling and blasting were abandoned in favor of scrapers to move the material the sorting facilities at the head of the Glacier tram. The mine was worked for approximately three months out of the year, July through September, when the ice melted sufficiently to release about 30,000 tons of ore. Some experiments were conducted in artificial thawing, but the increased costs of mining during the cold months were deemed too great for the return.⁴⁵

The winch house and the tramway terminal building were the two major structures at the Glacier mine. The tramway terminal was located at the toe of the glacier as was the associated sorting facilities and waste rock dump. The winch house was built on skids, a movable structure, and was placed as advantageous. In all probability, moves were not frequent as blocks and other rigging devices allowed the scraper cables to turn corner with relative ease. Cable anchors, loose cable, sheaves, and scrapers scattered about the site attest to various organizations of the works.

Accommodations on the Glacier were rude, probably no more than a tent frame or two. The remains of one, complete with a wood burning stove, are located up-slope from the winch house. This small shelter may have served as a lunch room, temporary quarters when it was unsafe to ride the tramway back up to the Bonanza mine, or as part of the regular quarters for men working on the Glacier. The seasonal nature of the work and the limited size of the ore body precluded any need or justification for additional, more extensive facilities.⁴⁶

⁴² Bateman and McLaughlin, *op. cit.*, pp. 23 - 24.

⁴³ "Bonanza Outcrop, Kennecott Mines Co., Glacier Mine," [circa 1917], Kennecott Mines Map Inventory, Drawer 40, Roll R (Drawing No. M-5), copy at NPS/AKSO; and Stewart and Dyer, *op. cit.*, p. 52.

⁴⁴ Kennecott Copper Corporation, *Fourth Annual Report of the Kennecott Copper Corporation for the Year Ended December 31, 1918*, p. 8, and *Sixth Annual Report of the Kennecott Copper Corporation For the Year Ended December 31, 1920*, p. 7; and Alfred H. Brooks, "The Alaskan Mining Industry in 1921," in *Mineral Resources of Alaska; Report on Progress of Investigations in 1921*, USGS Bulletin 739 (Washington: USGPO, 1923), p. 23.

⁴⁵ "Outline of Geology and Mining Methods, *op. cit.*, p. 9.

⁴⁶ WRST, "NPS Site Inventory Form, XMC-125," July 16, 1993. Several terraces are evident on the site suggesting other possible locations for the winch house and possible crew quarters.

Kennecott last produced ore from the Glacier mine in 1928. Over the nine seasons it operated the Glacier Mine shipped a little over 160,000 tons of ore containing a total of 3,526 tons of copper.⁴⁷ From the first to the last, the Glacier was an unusual operation: a placer mine on a glacier high in the mountains of Alaska.

⁴⁷ "Total Ore Production," *op.cit.*



Bibliography

- Alaska. Territorial Mine Inspector. *Report of the Territorial Mine Inspector to the Governor of Alaska for the Year[s] 1917, 1921.*
- Alaska and Northwest Mining Journal.* 1914.
- Bateman, Alan M. and D. H. McLaughlin. "Geology of the Ore Deposits of Kennecott, Alaska." *Economic Geology* XV.1 (January-February 1920): 16;
- Brooks, Alfred H. "The Alaskan Mining Industry in 1913." In *Mineral Resources of Alaska; Report on Progress of Investigations in 1913.* US Geological Survey Bulletin 592. Washington: USGPO, 1914.
- Brooks, Alfred H. "The Alaskan Mining Industry in 1914." In *Mineral Resources of Alaska; Report on Progress of Investigations in 1914.* US Geological Survey Bulletin 622. Washington: USGPO, 1915.
- Brooks, Alfred H. "The Alaskan Mining Industry in 1921." In *Mineral Resources of Alaska; Report on Progress of Investigations in 1921.* USGS Bulletin 739. Washington: USGPO, 1923.
- The Chitina Leader.* 1912 - 1914.
- Graumann, Melody Webb. "Big Business in Alaska: The Kennecott Mines, 1898 - 1938." Anthropology and Historic Preservation, Cooperative Park Studies Unit, University of Alaska, Fairbanks. Occasional Paper #1. March 1977; published as "Kennecott: Alaskan Origins of a Copper Empire, 1900-1938." *Western Historical Quarterly.* 9,2 (April 1978): 197-211.
- Historical Society of Seattle and King County, Seattle, Washington. Museum of History and Industry, Photographic Archives.
- Kennecott Copper Corporation. *Annual Report[s] of the Kennecott Copper Corporation for the Year[s] ended December 31, 1917, 1918, 1920, 1924*
- Kennecott Copper Corporation. Records. Copies held by the United State National Park Service, Alaska Support Office.
- Moffit, Fred H. "Mining in the Chitina District." In *Mineral Resources of Alaska; Report on Progress of Investigations in 1909.* US Geological Survey Bulletin 442. Washington: USGPO, 1910.
- Moffit, Fred H. "Mining in Chitina Valley." In *Mineral Resources of Alaska; Report on Progress of Investigations in 1912.* US Geological Survey Bulletin 542. Washington: USGPO, 1913.
- Moffit, Fred H. "Mining in Chitina Valley." In *Mineral Resources of Alaska; Report on Progress in Investigations in 1919.* USGS Bulletin 714. Washington: USGPO, 1921.
- Moffit, Fred H. "Mining in the Kotsina-Chitina, Chistochina, and Valdez Creek Regions." In *Mineral Resources of Alaska; Report on Progress of Investigations in 1908.* US Geological Survey Bulletin 379. Washington: USGPO, 1909.

- Moffit, Fred H. and Stephen R. Capps. *Geology and Mineral Resources of the Nizina District, Alaska*. USGS Bulletin 448. Washington: USGPO, 1911.
- Moffit, Fred H. and A. G. Maddren. "The Mineral Resources of the Kotsina and Chitina Valleys, Copper River Region" In *Mineral Resources of Alaska; Report on Progress of Investigations in 1907*. US Geological Survey Bulletin 520. Washington: USGPO, 1908.
- Northwest Mining Journal*. 1907 - 1909
- The Pacific Mining Journal*. 1913.
- Smith, Sumner S. *The Mining Industry in the Territory of Alaska During the Calendar Year 1915*. US Bureau of Mines Bulletin 142. Washington: USGPO, 1917.
- Stearns, Robert. "Alaska's Kennecott Copper and the Kennecott Copper Corporation." *Alaska Journal* 5 (1975): 130 - 139.
- United States Geological Survey. Photographic Library.
- United States National Park Service. Alaska Support Office. Telephone interview with Howard Knutson [Logan Hovis]. 19 October 95.
- United States National Park Service. Wrangell-St. Elias National Park and Preserve. [Danny Rosaenkrans]. "1993 Kennecott Mine Openings and Tram Survey Report," January 1994.
- United States National Park Service. Wrangell-St. Elias National Park and Preserve. Kennecott Kids Collection, Jean Girad photographs.
- United States National Park Service. Wrangell-St. Elias National Park and Preserve. "NPS Site Inventory Form, XMC-125," July 16, 1993.
- University of Alaska, Fairbanks. Rasmussen Library. Clara Rust Collection.

Evaluation of Historic Structures

August 20, 1998

Steve Peterson

Preservation of the Kennecott Mill Complex of buildings requires a clear set of priorities, substantial financial investment and years of focused work. The scale and extent of the work that is required to stabilize the buildings also needs to be cognizant of the limitations of a relatively short field season, the potential for the work effort to overwhelm the community and the intermittent availability of financial resources available to the NPS. Over 60 years of abandonment have resulted in many serious preservation problems that will not be resolved quickly. In recognition of these issues, the NPS has evaluated and prioritized the preservation tasks at Kennecott in the following manner.

Step #1: Evaluation of the Buildings to Establish Resource Value and Priorities for Preservation:

Each of the 13 historic buildings at the Kennecott mill complex was evaluated to determine their individual architectural value. Each building received a value ranging from very high to very low. To determine the value a single point was given for each of the criteria that the building met. Scores ranged from 4 points = very high, 3 = high, 2 = medium, 1 = low. The specific elements that were evaluated include;

- Architectural significance: A determination of architectural quality and importance was made for each building to determine if the building is of primary or secondary importance.
- Relationship to the railroad corridor: Is the building important in defining and delineating the railroad alleyway.
- Importance to mill complex: Is the building an important part of the milling technology or management of the enterprise?
- Value of the massing of the buildings: How important is the building to the massing and form of the mill complex. Would its removal significantly alter or change the character and massing of the complex of buildings?

The buildings were ranked from Very High to Very Low based upon the structure's historic function and thematic importance to the Kennecott mining activity and community.

In the Comparison Chart below the historic and architectural values were evaluated to determine an overall rating in order to establish the importance of a specific building relative to the other buildings and establish a long-term preservation priority.

Historical Value	Architectural Value				
	Very High	High	Medium	Low	Very Low
Very High	Very High	Very High	High	High	Medium
High	Very High	High	High	Medium	Medium
Medium	High	High	Medium	Medium	Low
Low	High	Medium	Medium	Low	Very Low
Very Low	Medium	Medium	Low	Very Low	Very Low

BUILDING RANKING

BUILDING	ARCHITECTURAL AND SPATIAL VALUE	HISTORIC VALUE	OVERALL VALUE
1. Mill Structure 85,000 sq ft	Very High	Very High	Very High
2. Mill Structure – Ore Chute	Very High	Very High	Very High
3. Leaching Plant – north section 22,200 sq ft	Very High	Very High	Very High
4. Powerhouse 13,218 sq ft	Very High	Medium	High
5. Machine Shop 5,550 sq ft	Very High	Medium	High
6. Company Store and Warehouse 13,185 sq ft	High	High	High
7. East General Manager's Office 2,451 sq ft	High	High	High
8. National Creek Bunkhouse 3,750 sq ft	High	Medium	High
9. National Creek Railroad Trestle	Medium	High	High
10. West Bunkhouse 11,830 sq ft	High	Medium	High
11. Schoolhouse 1,200 sq ft	Medium	High	High
12. Assay Building 512 sq ft	Low	High	Medium
13. Leaching Plant-south section 22,200 sq ft	Low	High	Medium
14. Recreation Hall (community hall) 2,280 sq ft	Medium	Medium	Medium
15. Depot Building 336 sq ft	Medium	Medium	Medium
16. Meat House 778 sq ft	Low	Low	Low

Stabilization of the Kennecott Buildings

The goal of the National Park Service's Stabilization Program is to stop the deterioration of the 13 historic buildings that the NPS acquired within the Kennecott National Historic Landmark. Stabilization tasks will include emergency stabilization or "triage", long term stabilization and possibly adaptive reuse of some of the buildings depending upon which of the alternatives is selected under this planning effort. Every effort will be made to protect the site and buildings to insure future management options and insure the preservation of the Kennecott Buildings. In order to do meet this goal, the NPS will;

- Conduct on a building by building basis a condition assessment to determine emergency and long-term stabilization needs.
- Conduct emergency stabilization or "triage" repair in the first two years to arrest the imminent collapse and irreversible damage to the structures as a result of over 60 years of abandonment.
- Beginning in year 3, Implement a systematic program of stabilization to reestablish of a weathering skin for the buildings by repairing roofs, walls and foundations using materials compatible with the historic period and consistent with the Secretary of Interior's Standards for the Treatment of Historic Properties.
- Repair deteriorated structural connections at floors, walls, and foundations to resolve vertical and lateral loads on the buildings as a result of winds and snow.
- Mitigate water problems due to rain, site percolation and periodic flooding of National Creek.
- Undertake a site cleanup to remove non-compatible building materials.
- Preserve and protecting documents and artifacts remaining in and around the structures.
- Mitigate of all hazardous materials identified at the site in compliance with the NPS/ADEC Agreement
- Undertake building modifications to facilitate visitor use in a manner that respects the historic character of the buildings.

Chronological List of Historic Architectural/Engineering Drawings, Kennecott Mines¹

Compiled by Logan Hovis, 1998

Year	Drawing Date	Drawing Legend and Numbers
1907	JUL 22, 1907	[Bonanza Tramway] , Final Location of Discharge Terminal, Drawing No. 2, File No. T-183
1907	AUG 23, 1907	Map Showing Location of Buildings at the Foot of National Creek , Kennecott Mines Co., Kennecott—Alaska, Drawing No. 8
1907	OCT 10, 1907	[Bonanza Tramway] , Sketch of Angle-Station with Ore-bin, Drawing No. 10
1907	OCT 21, 1907	Bunkhouse [East Bunkhouse, National Creek] at the Foot of National Creek, Drawing No. 12, File No. B-25
1907	DEC 06, 1907	[Bonanza Tramway] , Elevation of Loading Terminal for Kennecott Mines Co. Designed by the Trenton Iron Co., Trenton, N.J.
1910	JAN 04, 1910	[Concentrating Mill] , Concentrator, General Framing Plans for Lower Transfer Bins, A-4
1910	JAN 06, 1910	[Concentrating Mill] , Concentrator, Complete Drawing for Upper Transfer Bins, A-5
1910	JAN 12, 1910	[Concentrating Mill] , Concentrator, Detailed Framing Plans for Lower Transfer Bins, A-6
1910	SEP 12, 1910	[Concentrating Mill & Tramway] , Tramway, Skeleton of Store Bins and Housing for Lower Terminal Rail Extension
1911	JAN 06, 1911	[Concentrating Mill] , Concentrator, Framing Plans for Upper Transfer Bins, A-5
1911	JAN 12, 1911	[Concentrating Mill] , Concentrator, Detailed Framing Plans for Lower Transfer Bins, A-6

¹ Bracketed and bold titles in the drawing legend are provided by the editor (Hovis) and are for clarification of the information contained on the sheet. All other information in the drawing legend portion of the list is taken (verbatim) from the title block of each individual drawing. Bin numbers, reference numbers, file locations, and cross-references relate to system(s) used by the Kennecott Corporation during the historic period. To date, the most comprehensive extant file of these drawings is in the Alaska Regional Office of the National Park Service, Anchorage, Alaska.

1911	JAN 24, 1911	[Concentrating Mill] , Concentrator, Detailed Framing Plans for Lower Transfer Bins, A-4
1911	MAY 23, 1911	[Concentrating Mill] , High Grade Bin, General Drawing [revised Aug. 6, 1923]
1911	JUL 02, 1911	[Concentrating Mill] , Esperanza Dewaterer
1911	JUL 03, 1911	[Concentrating Mill] , Concentrator, Esperanza Classifier - Detail Drawing, Kennecott Office - DRG. No. [9532?]
1911	JUL 05, 1911	[Concentrating Mill] , Gen. Drg. Floors in Jig Section, C.M. 4
1911	AUG 22, 1911	[Concentrating Mill] , Crushing Plant, Storage Bins, General Drawings
1911	AUG 26, 1911	[Concentrating Mill] , Setting 36"x16" Recrushing Roll
1911	OCT 07, 1911	[Bonanza Tramway] , Passenger-Car for Kennecott Mines Co., Designed by the Trenton Iron Co., Trenton, N. J.
1911	OCT 11, 1911	Power Plant – General Plan, Mine File. Superseded by P.P. 90, Sept. 1924
1911	OCT 12, 1911	Power Plant – Sections, Mine File
1911	OCT 12, 1911	Power Plant – Sections, Mine File No.
1911	OCT 13, 1911	Power Plant – Section, Mine File No.
1911	NOV 12, 1911	[Bonanza Mine] , Mine Ore Bin and Loading Terminal, Cross Section and Side Elevation, 1911 Installation
1911	DEC 09, 1911	[Concentrating Mill] , Coarse Crushing Dept., Crusher Setting, Mine File No. 7, Superseded by Drawing No. CM-66 dated 1-17-23
1912	JAN 09, 1912	[Concentrating Mill] , Coarse Crushing Department, Conveyor Pit
1912	JAN 09, 1912	[Concentrating Mill] , Coarse Crushing Department, Conveyor Pit [plan at top of mill]
1912	FEB 18, 1912	[Concentrating Mill] , Sections of Building, Track Scale & Sacking Shed

1912	FEB 21, 1912	[Concentrating Mill], General Drawing, Track Scale & Sacking Shed
1912	FEB 28, 1912	[Concentrating Mill], Coarse Crushing Unit, Crusher and Conveyor [Section at top of mill]
1912	FEB 29, 1912	[Concentrating Mill], Coarse Crushing Unit, Crusher & Conveyor
1912	JUL 05, 1912	[Concentrating Mill], Mill Cribbing, Details of Crib No. 1
1912	JUL 10, 1912	[Concentrating Mill], Coarse Ore Bin Showing New Bracing
1912	SEP 07, 1912	[Concentrating Mill], Detail of Bull Jig, Traced from Tailing Jig, Bunker Hill and Sullivan M and C Co., 20-X11-1909, 2536
1913	JAN 04, 1913	[Concentrating Mill], Allis-Chalmers Co., Mining Department, Milwaukee, Wis., 19'-0" Hancock Jig L. H., General Drawing (Standard), Drawing No. MU 337.
1913	NOV 1913	Profile of Wire Rope [Jumbo Mine] Tramway, for Kennecott Mines Co., Sheet No. 2
1915	JAN 13, 1915	[Concentrating Mill], Location of Disc Crusher
1915	[MAR 4], 1915	[Concentrating Mill], Sampling Plant
1915	MAR 18, 1915	[Leaching Plant], Kennecott Mines Co., Arrangement of Ammonia Leaching Plant, Capacity 400 Tons Per 24 Hours, No. 1
1915	AUG 16, 1915	[Concentrating Mill], Proposed Arrangement of New Crushing Unit, Drwg No. 1
1915	AUG 16, 1915	[Concentrating Mill], Proposed Arrangement of New Crushing Unit, Drwg No. 2
1917	FEB 24, 1917	Surface Buildings, General Drawing of Apartment House , Lower Camp - South End, DRG B-6
1917	MAR 07, 1917	[Leach Plant], Ground for Proposed Extension to Leaching Plant, DRG No. L.P.-1 [Other structures showing include Machine Shop, Oil Tank Sack House, Leaching Plant, Sacking Shed, and Mill.]
1917	APR 01, 1917	[Leach Plant], Distributor Drive Gear, Kennecott Copper Corporation, Latouche, Alaska, DRG. No. L.P. 7

1917	APR 14, 1917	Jumbo Transformer House , Drg. No. B-38
1917	APR 17, 1917	Bunkhouse No. 1 [East Bunkhouse, National Creek] Proposed Alterations, DRG B-24
1917	MAY 31, 1917	Proposed Bunkhouse, Bonanza Mine , DRG. No. B-36 [marked Obsolete]
1917	JUL 06, 1917	East Slide [Bonanza Mine] Tram Terminal , DRG. No. T-7
1917	JUL 27, 1917	Ventilation Door, Bonanza [Mine] Bunkhouse , DRG B-33
1917	JUL 28, 1917	[Leach Plant] , Storage Bin, L. P. Addition, L. Plant, DRG. No. L.P.-34
1917	AUG 26, 1917	Bonanza [Mine] Bunkhouse , Floor Plans, First and Second Floor [BK 27]
1917	[AUG 28 1917]	Ammonia Leaching Plant , Capacity [8]00 Tons, L.P. 44
1917	SEP 09, 1917	Bonanza [Mine] Bunkhouse , Heating Layout, Brg. No. B-35
1917	DEC 1917	Power Plant Extension, Turbine Room, PP-11
1918	JUN 1918	[Mine Equipment] , 60 Cu. Ft. – 30" Gauge Ore Skip for Bonanza Mine, DRG No. MS 34
1918	JUL 27, 1918	Five Room House , B-28 [2 versions]
1918	SEP 03, 1918	Leaching Plant , General Drawing, Double Effect Evaporator Unit, L.P. 37
1918	NOV 22, 1918	Glacier Tramway , Station No. 1, DRG. No. T-159
1919	FEB 28, 1919	[Mine Equipment] , Jumbo Skip Pocket Deflector, DRG. No. M 92
1919	JUN 20, 1919	[Concentrating Mill] , Wearing Ring for Symons Crusher, Drg. No. C.M. 71
1920	JAN 03, 1920	Surface Buildings, Alterations to Annex in 1920, Building No. 26 – Lower Camp [Two-Story Bunkhouse, National Creek] , B-26
1920	JAN 13, 1920	[Concentrating Mill] , Plan, Platform for Sampler, Mill Tailings, C.M. 73

1920	FEB 23, 1920	[Mine Equipment] , The Wellman-Seaver Morgan Co., Cleveland, Ohio, USA, C.O. 8426, General Drawing of 36" x 36" Single Drum Geared Electric Hoist, Drawing No. 63019.
1920	JUN 15, 1920	[Mother Lode Mine] , Section Showing 1250 Level Pockets, Mother Lode Vertical Shaft, Drwg. No. M.L. - 12, Sheet 1
1920	JUL 17, 1920	[Concentrating Mill] , Proposed Change Hancock Jigs, Drg. No. CM-75
1920	OCT 30, 1920	Leaching Plant , Details of Rakes and Rake Arms, Excavator – 30 Ft. Diam. Leaching Tank, L.P. 64
1921	JAN 20, 1921	Leaching Plant , Flow Diagram, Representing One Complete Cycle, L.P. 65
1921	SEP 16, 1921	[Concentrating Mill] , Hancock Addition, C-48
1922	MAR 27, 1922	Power Plant , General Drawing, Addition For Diesel Installation, P.P. 63 (showing revisions date 4-5-22 and 5-4-22)
1922	APR 13, 1922	Concentrating Mill , Standard Brass Washer For-Simons Disc Crusher, DRG. No. C.M. 82
1922	AUG 18, 1922	Concentrating Mill , Timber Sets – Conveyor Tunnel
1922	AUG 28, 1922	Concentrating Mill , Foundation Drawing, Addition for Sample Mill, C.M. 91
1922	OCT 12, 1922	Concentrating Mill , General Drawing, Addition for Sample Mill, C.M. 107
1922	OCT 15, 1922	Concentrating Mill , Revision – West End, Addition for Sampling Mill
1922	NOV 01, 1922	Concentrating Mill , Floor Diagram – 3 rd , 4 th & 6 th Floors, Addition to Table Section
1922	DEC 09, 1922	Concentrating Mill , Conveyor Details, Addition for Sampling Mill, Final
1923	APR 18, 1923	Mine Equipment , General Drawing Matteson Mine Car, Self Dumping – Type 33 – Capacity 18.75 Cu. Ft., DRG. M.S. 20 [Manufactured by Joshua hendy Iron Works, San Francisco, Calif.]

1923	JUL 20, 1923	Leaching Plant , Details of Intermediate & Old Trusses, Sacking Shed – Flotation Unit, L.P. 32
1923	JUL 27, 1923	Leaching Plant , Roof Truss Details, Sacking Shed – Flotation Unit, L.P. 80
1923	AUG 04, 1923	Concentrating Mill , Proposed High Grade Bin, Sacking Shed [216 Tons Capacity]
1924	MAY 18, 1924	Concentrating Mill , Addition for Vezin Sampler, Sample Mill,
1924	AUG 18, 1924	Erie Mine , General Drawing of Bunkhouse , 1924 Addition – Surface Buildings, DRG. No. B-19
1924	AUG 19, 1924	Erie Mine , Basement and Second Floor Plans, 1924 Addition to Bunkhouse – Surface Buildings, DRG. No. B-19
1924	SEP 03, 1924	Power Plant , Details of Roof Truss, Boiler Unit, PP-94
1925	APR 10, 1925	Surface Structures, General Drawing, National Creek Flume , B-[?]
1925	MAY 20, 1925	Bonanza Tramway , Detail of Gear Wheel and Pinion, Tram Drive – Angle Station, T-146
1925	MAY 22, 1925	Mother Lode Mine , Standard Layout of Stations & Pockets, Mother Lode Incline, DRG. No. 3[0]
1925	OCT 16, 1925	Concentrating Mill , Alterations to Scale Pit, Track Scales – Loading Shed, C.M. 41
1926	MAR 30, 1926	Bonanza Mine , General Drawing of Skip Dump, Incline Shaft – Above 500 Level, DRG No. M-15
1926	JUN 18, 1926	Jumbo Mine , General Layout of Station & Pockets, 2100 Level, DRG. No. M-12
1926	OCT 20, 1926	Fire Insurance Map, Bonanza Mine , Drg No G-5
1926	NOV 25, 1926	General Surface, Fire Insurance Map, Jumbo Mine , Drg No. G-4
1930	JUN 21, 1930	Surface Structures, General Darawing & Details, National Creek [Foot] Bridge , Drw No. B-15-2

1932	SEP 19, 1932	Storage Diagram, Basement, Kennecott Warehouse and Store , B-44-3
[1932]	[SEP ?, 1932]	[Storage Diagram, First Floor, Kennecott Warehouse and Store]
1932	SEP 05, 1932	Storage Diagram, Second Floor, Kennecott Warehouse and Store , [?]
1933	JUN 10, 1933	Copper River Tramway , General Drawing and Profile. Lower or East Terminal, Drg. No. 69-1
1933	JUN 16, 1933	Copper River Tramway , General Drawing and Detail, Tension Station, Drg. No. 69-2
1937	FEB 04, 1937	Mine Equipment , Sleeve for 1" Sectional Drill Steel, Drg. No. M-147-1

Undated Drawings

Drawing No.	Description
6-[.]	[Two elevations of undefined timbered structure, possibly related to a tramway or tramway bunker or elements of Mother Lode mine camp], Mother Lode Coalition Mines Co., Kennecott, Alaska
11-73-P	Heine Safety Boiler Co., [Phoenixville, PA], Piping Plan for One Heine Boiler Made for Mother Lode Copper Mines Co., Alaska . Profile of Proposed [Bonanza] Wire Rope Tramway for Alaska Copper and Coal Co. (Angle Station Route)

Drawings Referenced but not found:

Drawing No.	Description
	SURFACE BUILDINGS DRAWINGS
B-19	Sheet No. 1 – General Drawing of [Erie Mine] Bunkhouse
B-19	Sheet No. 3 – Details of Ash Pit – T-36-8 Jdeed [?] Boiler

CONCENTRATING MILL DRAWINGS

- C.M. 108 [Sample Mill], Timber Foundation Drawing and Track Layout, [c. 1922]
C.M. 109 [Sample Mill], Roof Truss Details. [c. 1922]

MINES

- M. 16 Details of Skip Dump Above 500 Level, [Bonanza Mine, c. 1926]
M. 108 Details of Standard Shaft, Bonanza Mine [c. 1926]

POWER PLANT DRAWINGS

- P.P. 64 Foundation – Addition to Building [c. 1922/1924?]
P.P. 65 Foundation – Allis Chalmers Generator [c. 1922/1924?]
P.P. 66 Foundation – Gen. Electric Generator [c. 1922/1924?]
P.P. 67 Roof Truss and Details [c. 1922/1924?]
P.P. 68 Details of Crane Runway Girder [c. 1922/1924?]
P.P. 69 Plate Girder Details [c. 1922/1924?]
P.P. 70 Details of Roof Girder [c. 1922/1924?]
P.P. 71 Retaining Wall for East Side of Building [c. 1922/1924?]
P.P. 72 Steel Details [c. 1922/1924?]

P.P. 74 Sections Through Building [c. 1922/1924?]

P.P. 86 General Drawing of Power Plant (c. 1924)

P.P. 90 Foundation Drawing of Diesel & Boiler Unit (c. 1924)

P.P. 92 Roof Truss, Diesel Unit (c. 1924)
P.P. 93 Roof Truss, Turbine Unit (c. 1924)

P.P. 104 Details of Steel Purlins [c. 1924]