

a. Project Description

Project Summary

The Providence Mine Remediation Project is an effort to restore the abandoned Providence Mine site along Deer Creek in Nevada City, as part of a long-term effort to protect stream health and to return the site to safe reuse as a recreational trail corridor. Deer Creek is the source of the city's drinking water and remains one of the most highly impacted waterways in the Sierra, with dozens of abandoned gold mines along its 34 mile length as well as extensive diversions and three dams. Providence Mine, located a mile downstream from downtown Nevada City on the banks of Deer Creek, was a highly productive gold mine from which \$20 million worth of gold was extracted between 1851 and 1919. Once abandoned, the mine structures and shaft were left to crumble, and forest took over the once bustling industrial site, masking but not healing the toxic damage. The 38 acre parcel known as the Environs on which the mine sits was acquired by the city in 1983 for use as open space, and is used for hiking and fishing access. A new trail system within the Environs was recently completed with funds from Sierra Nevada Conservancy, which will link to the nine mile Deer Creek Tribute Trail system on both sides of Deer Creek via a planned new pedestrian bridge. The trail system will include a spur that runs alongside Providence Mine once the abandoned mine site is made safe for the public.

Providence Mine was the subject of a US EPA Brownfields assessment completed in 2009 by Sierra Streams Institute in partnership with the City of Nevada City. 29 of 31 samples taken from the large waste rock pile adjacent to the creek revealed high levels of all three constituents of concern, namely lead, arsenic and cadmium, with lead levels at a maximum of 550ppm. The waste rock pile is over 350' long and highly prone to erosion. In the eastern portion of the waste rock pile, which is the subject of this proposal, the slope is extremely steep and unstable, and includes an active landslide. Eroded material from the pile is entering the creek, contaminating the water and harming the fish and other wildlife.

The cleanup of Providence Mine consists of the following phases: i. Assessment; ii. Development of Remediation Action Workplan (RAW); iii. Hazardous waste removal from mining features area; iv. Regrading, soil placement, erosion control, and revegetation of west slope of mine waste pile; v. Mitigation of shaft depression area; vi. Regrading, soil placement, erosion control, and revegetation of east slope of mine waste pile; and vii. Mitigation of active landslide. Phases i-iv are funded by the US EPA. In this proposal, we seek funding of approximately \$342,211 for phases v.-vii, in which we plan to regrade and stabilize approximately 100' of steep, erodible mine waste slope along Deer Creek including an active land slide, and to plug and fill a collapsed mine shaft.

The overall **goal** of the Providence Mine Remediation Project is to protect Deer Creek by eliminating a significant source of contamination resulting from historic gold mining practices, with resulting water quality improvements that extend to downstream waterways.

Specific **goals** of the project are as follows:

1. Mitigation of mining contamination: a) Stabilize the steep and unstable waste rock pile along Deer Creek; and b) Remove the public hazard posed by the open mine shaft.
2. Water quality improvements: a) Reduce contamination entering Deer Creek; and b) Improve water quality downstream of the site
3. Native revegetation: a) Plant native plants with aggressive root systems to stabilize soil; b) Reduce erosion from slope; c) Restore native biodiversity; and d) Introduce native grasses and other plants known to accumulate the target contaminants through application of phytoremediation methods
4. Recreational Benefits: Protect recreational users of the area from incidental exposure to toxins, in particular lead, arsenic and cadmium.
5. Economic Benefits: 1. Enhance Nevada City's recreational appeal by restoring the Environs; 2. Increase hiking opportunities in the vicinity of tourism-dependent downtown Nevada City; 3. Increase pedestrian traffic for businesses in the downtown area.
6. Alignment with SNC Program Goals: The project clearly aligns with SNC's mission and addresses SNC's "triple bottom line" of environmental, economic and social well-being, by protecting Deer Creek, source of Nevada City's drinking water, while enhancing recreational and tourism opportunities. Specific SNC program areas addressed by the project are: 1. Provide increased opportunities for tourism and recreation by restoring public open space close to downtown Nevada City; 2. Protect, conserve and restore the region's physical and living resources by improving complexity of native vegetation and water quality; 3. Protect and improve water quality by stabilizing an erodible and contaminated mine waste pile along Deer Creek; 4. Undertake efforts to enhance public use and enjoyment of lands owned by the public by reducing risk of exposure to contamination for recreational users of city-owned open space and by creating interpretive signage that explains the history, environmental impact, and restoration of Providence Mine.
7. Consistency with Prop 84 goals: The project directly supports the goals of Proposition 84 by contributing to the protection and restoration of rivers, streams, their watersheds and associated land, water, and other natural resources. The project targets Deer Creek and provides for its protection by preventing erosion into the creek of contaminated material resulting from historic gold mining.

8. Contribution to SNC Action Plan items: The project fulfills an action plan item identified in the 2013-14 Action Plan, by improving water quality through removal of toxins associated with historic abandoned mines and preventing them from entering Deer Creek.

Location: The Providence Mine site is located in the northwestern portion of a 38 acre property owned by the city of Nevada City, which comprises APN 05-100-87, and is known as the Environs Property. The site is located to the north and east of Providence Mine Road along the south side of Deer Creek, approximately one mile downstream of downtown Nevada City, California.

Scope: The property is the subject of a US EPA-funded Brownfields cleanup, for which a Draft Removal Action Workplan was finalized in August 2013. Sierra Streams Institute on behalf of the City of Nevada City entered into a Voluntary Cleanup Agreement with CA DTSC to provide regulatory oversight and CEQA permitting. US EPA funds are being applied to cleanup of the mine area and the western portion of the waste rock pile. Sierra Nevada Conservancy funding is requested to complete the cleanup and stabilization of the eastern portion of the waste rock pile, stabilize and fill the mine shaft area, revegetate the site for maximum control of erosion, continue a study of the effectiveness of native plants to uptake heavy metals, and develop interpretive signage.

b. Workplan and Schedule Narrative

The cleanup for this site will implement a Removal Action Workplan (RAW) developed from the recommendations outlined in the Providence Mine Phase II Final Report completed as part of the Brownfield Hazardous Substances Community-wide Assessment Grant awarded to Nevada City in 2006. The draft RAW was completed in August 2013 with DTSC approval pending, expected December 2013.

The draft RAW includes and details the following activities for the project elements for which SNC funding is requested:

1. Mine shaft plug

The inclined mine shaft depression will first be cleared of vegetation and organic debris. An exploratory excavation will be advanced at the base of the east end of the depression to determine the presence of a previously installed plug, voids or open inclined shaft. If warranted, a concrete plug or retaining wall will be constructed to prevent migration of backfilled mine waste down the shaft.

2. Mine waste excavation and onsite placement

Accessible areas of loose, unstable mine waste in the Eastern Slope will be excavated to the native soil surface using special excavation techniques suitable for the extremely steep slopes in

this area. Excavation will be limited to areas above the 100-year flood elevation. Re-grading of the eastern slope will not be possible due to the slope's steepness and the proximity of the top of the slope to the shaft depression placement area. A portion of the debris fan at the toe of the active landslide above the 100-year flood elevation will also be excavated. Excavated mine waste from the Eastern Slope and slide debris fan will be placed as fill in the shaft depression.

3. Landslide stabilization

Landslide mitigation will be performed to stabilize the active landslide on the Eastern Slope and limit further erosion of mine waste into Deer Creek. Additional engineering evaluation will be performed to finalize landslide mitigation design. An earth retaining structure will be installed at the base of the slide and above the 100-year flood elevation. This will be a Gabion wall constructed from rock-filled wire baskets. Additionally, a shotcrete facing will be applied to the slide scarp face.

4. Erosion control and revegetation

The mine waste slope will be stabilized by revegetating as well as regrading by excavation and on-site placement, in order to reduce the slope gradient and eliminate the potential for erosion into the creek. The use of best management practices including installation of anchored coir fiber mats and rolls, hydroseeding or other methods to accelerate plant growth will reduce the extent of erosion and contamination during and after construction. Native vegetation, particularly plants with known capacity to uptake target contaminants, will be used in revegetation efforts. Please see attached Providence Mine Erosion Control and Revegetation Plan for details and plant list.

As part of the revegetation effort, we propose applying the findings of a pilot phytoremediation study conducted in the Environs in 2011-2012. "Phytoremediation" refers to methods that use plants to solve environmental problems. This particular case focuses on phytoextraction (the use of plants to physically extract contaminants from the soil) and phytostabilization (the use of plants to render contaminants chemically stable and less prone to movement), as well as simple erosion control by plants with substantial root systems. The pilot study demonstrated significant uptake of lead, arsenic, and cadmium in three native plants: Fescue, Purple Needlegrass (the state grass of California), and Sunflower. Fescue and Needlegrass also showed significant root growth in the contaminated soil, indicating potential for stabilizing erosion prone slopes in heavy metal contaminated areas.

The focus of the next phase of the study will be to characterize the microbial community associated with the selected plants, both mycorrhizal and bacterial, to determine whether augmenting the microbial community with the use of amendments will increase the plant's uptake capacity along with its growth rate, total biomass production, and root length and strength. We hypothesize that use of inexpensive amendments will significantly increase uptake

of contaminants and root length and strength, making this potentially a highly effective strategy for implementation across the rest of the site and at future cleanup sites.

Finally, we will create an interpretive sign that will introduce the public to the history and legacy of Providence Mine. The signage will coordinate with the signage created as part of the Environs Trail and the greater Tribute Trail system.

Workplan:

1. Project Management

- 1.1 Convene project team meetings
- 1.2 Finalize workplan and budget
- 1.3 Draft and finalize subcontracts/grants
- 1.4 Manage project budget
- 1.5 Submit financial and performance reports
- 1.6 Draft and submit final report
- 1.7 Coordinate and manage implementation

2. Mitigation of Shaft Depression Area

- 2.1 Engineering evaluation and shaft plug design
- 2.2 Geotechnical evaluation and engineering
- 2.3 Clear, grub and prepare shaft depression for backfill
- 2.4 Plug shaft opening with concrete
- 2.5 Back fill with non-hazardous contaminated soil excavated from landslide and eastern slope area cleanup

3. Mitigation of East Slope of Waste Rock Pile

- 3.1 Excavate loose and unstable mine waste from slope
- 3.2 Implement erosion control measures and revegetate with native plants identified in phytoremediation study

4. Land slide Mitigation

- 4.1 Complete geotechnical engineering evaluation and design
- 4.2 Excavate debris fan at toe of slide
- 4.3 Install earth retaining structure (gabion or concrete retaining wall) at toe of slide above 100 year flood elevation
- 4.4 Install shotcrete facing on slide scarp
- 4.5 Oversee engineering and construction

5. Interpretive Signage

- 5.1 Develop, produce and install one interpretive sign describing Providence Mine history, environmental impacts, and remediation efforts

6. Phytoremediation Study and Revegetation

- 6.1 Differentiate microbial communities found at the site via polymerase chain reaction (PCR) amplification
- 6.2 Assess the effect on root and shoot growth, biomass production and metal uptake of enhanced microbial communities compared with control microbial communities
- 6.3 Revegetate East Slope using most productive combinations identified in assessment
- 6.4 Conduct final monitoring and assessment to validate impact of revegetation with the

selected combinations on slope stability and plant vigor
7. Pre-, Mid- and Post-Project Monitoring
7.1 Monthly water quality monitoring at three sites upstream, within and downstream of the project area
7.2 Periodic heavy metal sampling at three sites before, during and after implementation
7.3 Storm sampling of sediment at three sites during each significant storm event for two years
7.4 Development and implementation of Operations and Maintenance Agreement with DTSC
7.5 Periodic terrestrial and avian wildlife usage surveys before, during, and after implementation

Detailed Project Deliverables	Timeline
Task 1	
Finalized workplan and budget	May 2014
Finalized subcontracts/grants	July 2014
Financial and performance reports to SNC	November 2014, May 2015, November 2015, May 2016
Draft Final Report	September 2016
Final Report	November 2016
Task 2	
Engineering evaluation report and shaft plug design recommendations	June 2014
Shaft Plug As-Built	August 2014
Daily Field Reports and compaction test results during shaft backfill	August-September 2014
Task 3	
Daily Field Reports during mine waste excavation	August, 2014
Erosion control and re vegetation As-built diagrams	November, 2014
Task 4	
Engineering evaluation and Landslide stabilization design recommendations	June, 2014
Daily Field Reports during construction	August - September, 2014
Retaining wall and shotcrete facing As-Built diagrams	August 2014
Task 5	
Interpretive Sign draft	December 2014

Contract with sign manufacturer	January 2015
Sign Installation As-Built	May 2015
Task 6	
Microbial Community Characterization and Candidate Plant Selection Report	July 2014 (email update)
Preliminary Amendment, Uptake, Erosion Control Report	October 2014 (email update)
Final Phytoremediation Report	June 2016
Task 7	
Monitoring Plan	May 2014
Monitoring Field reports	May 2014 and then monthly
Analytical Laboratory reports	July 2016
Operation and Maintenance Agreement	July 2016

c. Restrictions, Technical/Environmental Documents and Agreements Narrative

There are no known property restrictions or encumbrances that could adversely impact project completion. The overall project developed by Sierra Streams Institute with project partner the City of Nevada City is in the advanced planning stages with US EPA funding and DTSC oversight.

The property is owned by the city of Nevada City, who awarded a subgrant (attached) to Sierra Streams Institute to implement the cleanup of the Providence Mine site.

The Environs are restricted to open space use. Our project supports this restriction. There are no other known restrictions, easements or mineral rights.

The project implementation will be guided by the Removal Action Workplan, developed by Sierra Streams Institute with approval pending from DTSC.

d. Organizational Capacity Narrative

Project partners have the experience, expertise and capacity to complete the proposed project. **Sierra Streams Institute** (SSI) is a non-profit watershed science organization, founded in 1996 as Friends of Deer Creek to monitor Deer Creek on behalf of Nevada City during the construction of a road bridge over the creek. Since our founding, we have collected 13 years of monthly water quality monitoring data and have implemented numerous projects that address the issues affecting the creek, successfully working within time and budget constraints. We have successfully completed several assessment and remediation efforts throughout the watershed, including abandoned mine assessment of city owned properties, restoration of

Stiles Mill abandoned mine site (completion scheduled in October 2013), numerous revegetation projects and gravel augmentation for restoration of salmon habitat. SSI staff includes biologists, botanist, geologist, hydrologist and chemist, all with considerable expertise in project management. Among SSI's board members and volunteers are a microbiologist, hydrogeologist, former agency head at the State Water Quality Control Board, and the former manager of Nevada City's wastewater treatment plant. The proposed project will be managed by Kyle Leach, Professional Geologist, who has managed the cleanup of Stiles Mill mine site in Nevada City, developed the Removal Action Workplan for Providence Mine, and is project manager for the US EPA-funded cleanup of Providence Mine. Mr. Leach brings twenty years of assessment and remediation experience in a variety of abandoned mine land projects.

Project partner **Nevada City** is a small city that enjoys successful working relationships with local non-profits to complete projects. The City has over 150 years of experience managing projects for the public. Sierra Streams Institute has partnered with the city on many projects over the course of eighteen years, including abandoned mine assessment and remediation projects, watershed restoration, trail development, and extensive water quality monitoring.

Sierra Streams has established excellent working relationships with a number of local contractors with relevant expertise, including **Holdrege & Kull**, a Nevada City-based engineering firm who assisted with the Removal Action Workplan and will provide geotechnical expertise for modifications to the RAW and for site design plans. **Porter Engineering** will provide assistance preparing project plan, specifications, and cost estimates for project implementation. Two local firms, **Hansen Brothers** and **Robinson Enterprises**, experienced in implementation of cleanup including working in highly contaminated conditions, will be requested to bid on project implementation.

e. Cooperation and Community Support Narrative

The project was developed as a collaborative partnership with the **City of Nevada City**, the owners of the land on which the mine is located. The City of Nevada City entered a subgrant agreement with Sierra Streams Institute for implementation of the Providence Mine cleanup. Throughout the assessment and plan development period, the community has been engaged in the project through frequent public meetings at City Hall. There is widespread support of efforts to assess and remediate our mining legacy. Project progress will be communicated by media releases, Sierra Streams Institute website updates, updates at city council meetings, DTSC community participation mailings, and communication through the **Tribute Trail Forum**, an organization of stakeholders that meets quarterly to discuss issues related to the Deer Creek Tribute Trail.

We have consulted with **The Sierra Fund** on methodology employed in their mining reclamation work, with a guided site visit to their Humbug Creek Watershed Assessment and Management

Plan project. We have also engaged the services of local engineering firm **Holdrege and Kull**, who have prepared geotechnical recommendations and a Human Health Risk Assessment for the Providence Mine site.

Abandoned mine land remediation in the Deer Creek watershed was identified as a key priority of the Deer Creek Restoration Plan (2011), developed by **SSI, The Sierra Fund**, and **the Maidu**, with SNC funding.

Sierra Nevada AmeriCorps Partnership provides service members to our organization each year, and fully supports the conservation and restoration goals of this project. AmeriCorps members will assist with revegetation planning.

The local community has been involved since the project's inception in 2005 with the proposed reuse of the Providence Mine area as a recreational interpretive trail. Construction of the completed sections of the Tribute Trail, to which the Providence Mine loop will connect, was accomplished using volunteer labor organized by trail partners, with community outreach coordinated by the Tribute Trail Forum. Trail development has required many neighborhood meetings throughout the project planning and implementation stages, and extensive media coverage in the local and regional media.

The Nisenan Tribe is a project partner on the Sierra Nevada Conservancy-funded Tribute Trail project, which targets the left bank of Deer Creek including the Providence Mine site. The role of the tribe in this project is to develop interpretive signage that educates trail users on the ten thousand year history of the tribe in the Deer Creek watershed. The tribe has identified the remediation of its ancestral lands as its highest priority.

f. Long term Management and Sustainability Narrative

DTSC requires that a Land Use Covenant (Deed Restriction) be placed on the property after completion of remediation to limit future land use to recreational or open space uses. DTSC will also require an Operation and Maintenance Agreement which will include yearly inspection reports documenting the continuing integrity of the remediation efforts. Sierra Streams Institute will continue monitoring water quality in Deer Creek upstream and downstream of the project site in perpetuity, with thirteen years of monthly data collected to date.

The Environs property in which Providence Mine is located is owned by the City of Nevada City and was originally acquired to be opened up for recreational use as open space. Accordingly, the city Parks and Recreation Department has oversight of the property in perpetuity, with an interest in protecting the value of the resources.

**SIERRA NEVADA CONSERVANCY
PROPOSITION 84 - DETAILED BUDGET FORM**

Project Name: Providence Mine Remediation Project

Applicant: Sierra Streams Institute

SECTION ONE DIRECT COSTS	Year One	Year Two	Year Three	Year Four	Year Five	Total
Project Management Costs	\$30,000.00	\$10,000.00				\$40,000.00
Staff scientists	\$15,000.00	\$10,000.00				\$25,000.00
Contractor: Mobilization/Demobilization	\$22,000.00					\$22,000.00
Contractor: Excavation	\$19,250.00					\$19,250.00
Contractor: Gabion wall	\$21,450.00					\$21,450.00
Contractor: Shotcrete Facing	\$78,375.00					\$78,375.00
Contractor: Plug Construction for Mine Shaft	\$14,000.00					\$14,000.00
Consultant: Engineering and Construction Management	\$6,500.00					\$6,500.00
Construction Materials Testing	\$10,000.00					\$10,000.00
Consultant: Geotechnical Study	\$10,000.00					\$10,000.00
DTSC oversight	\$5,000.00	\$2,500.00				\$7,500.00
Revegetation plants and supplies	\$5,000.00	\$1,000.00				\$6,000.00
Erosion control materials	\$4,000.00	\$1,000.00				\$5,000.00
Contractor - City of Nevada City	\$3,000.00	\$2,000.00				\$5,000.00
DIRECT COSTS SUBTOTAL:	\$243,575.00	\$26,500.00	\$0.00	\$0.00	\$0.00	\$270,075.00

SECTION TWO INDIRECT COSTS	Year One	Year Two	Year Three	Year Four	Year Five	Total
Staff time for monitoring	\$5,000.00	\$5,000.00				\$10,000.00
Monitoring supplies	\$5,000.00	\$5,000.00				\$10,000.00
Heavy Metal Sampling	\$3,000.00	\$2,000.00				\$5,000.00
Publications, Printing, Public Relations, interpretive signage	\$1,500.00	\$1,000.00				\$2,500.00
						\$0.00
INDIRECT COSTS SUBTOTAL:	\$14,500.00	\$13,000.00	\$0.00	\$0.00	\$0.00	\$27,500.00
PROJECT TOTAL:	\$258,075.00	\$39,500.00	\$0.00	\$0.00	\$0.00	\$297,575.00

SECTION THREE Administrative Costs (Costs may not to exceed 15% of total Project Cost) :						Total
Overhead at 15%	\$38,711.00	\$5,925.00				\$44,636.00
						\$0.00
						\$0.00
						\$0.00
						\$0.00
ADMINISTRATIVE TOTAL:	\$38,711.00	\$5,925.00	\$0.00	\$0.00	\$0.00	\$44,636.00
SNC TOTAL GRANT REQUEST:	\$296,786.00	\$45,425.00	\$0.00	\$0.00	\$0.00	\$342,211.00

SECTION FOUR						
OTHER PROJECT CONTRIBUTIONS	Year One	Year Two	Year Three	Year Four	Year Five	Total
<i>List other funding or in-kind contributors to project (i.e. Sierra Business Council, Department of Water Resources, etc.)</i>						
US EPA Brownfields cleanup grant	\$200,000.00					\$200,000.00
Water quality monitoring volunteers (mon	\$4,752.00	\$4,752.00				\$9,504.00
						\$0.00
						\$0.00
						\$0.00
						\$0.00
Total Other Contributions:	\$204,752.00	\$4,752.00	\$0.00	\$0.00	\$0.00	\$209,504.00

NOTE: The categories listed on this form are examples and may or may not be an expense related to the project. Rows may be added or deleted on the form as needed. Applicants should contact the SNC if questions arise.

* Operating Costs should be allocated to the percentage that is applicable to the grant based on your cost allocation methodology and cannot exceed 15% of your total project costs.

Sierra Streams Institute

COST ALLOCATION PLAN

The purpose of this cost allocation plan is to summarize, in writing, the methods and procedures that this organization will use to allocate administrative costs to various programs, grants, contracts and agreements.

Direct costs are those that can be identified specifically with a particular final cost objective. Indirect costs are those that have been incurred for common or joint objectives and cannot be readily identified with a particular final cost objective.

Only costs that are allowable, in accordance with the cost principles, will be allocated to benefiting programs by Sierra Streams Institute.

The general approach of Sierra Streams Institute in allocating costs to particular grants and contracts is as follows:

- A. All allowable direct costs are charged directly to programs, grants, activity, etc.
- B. Allowable direct costs that can be identified to more than one program are prorated individually as direct costs using a base most appropriate to the particular cost being prorated.
- C. All other allowable general and administrative costs (costs that benefit all programs and cannot be identified to a specific program) are allocated to programs, grants, etc. using a base that results in an equitable distribution.

ALLOCATION OF COSTS

The following information summarizes the procedures that will be used by Sierra Streams Institute beginning October 1, 2013:

- A. Compensation for Personal Services – Documented with timesheets showing time distribution for all employees and allocated based on time spent on each program or grant. Salaries and wages are charged directly to the program for which work has been done. Costs that benefit more than one program will be allocated to those programs based on the ratio of each program's salaries to the total of such salaries (see Example 1). Costs that benefit all programs will be allocated based on the ratio of each program's salaries to total salaries (see Example 2).
 1. Fringe benefits (FICA, UC, and Worker's Compensation) are allocated in the same manner as salaries and wages. Health insurance, dental insurance, life and disability and other fringe benefits are also allocated in the same manner as salaries and wages.
 2. Vacation, holiday, and sick pay are allocated in the same manner as salaries and wages.
- B. Travel Costs – Allocated based on purpose of travel. All travel costs (local and out-of-town) are charged directly to the program for which the travel was incurred. Travel costs that benefit more than one program will be allocated to those programs based on the ratio of each program's salaries to the total of such salaries (see Example 1). Travel costs that benefit all

programs will be allocated based in the ratio of each program's salaries to total salaries (see Example 2).

- C. Professional Services Costs (such as consultants, accounting and auditing services) – Allocated to the program benefitting from the service. All professional service costs are charged directly to the program for which the service was incurred. Costs that benefit more than one program will be allocated to those programs based on the ratio of each program's expenses to the total of such expenses (see Example 3). Costs that benefit all programs will be allocated based on the ratio of each program's expenses to total expenses (see Example 4).
- D. Office Expense and Supplies (including office supplies and postage) – Allocated based on usage. Expenses used for a specific program will be charged directly to that program. Postage expenses are charged directly to the extent possible. Costs that benefit more than one program will be allocated to those programs based on the ratio of each program's expenses to the total of such expenses (see Example 3). Costs that benefit all programs will be allocated based on the ratio of each program's expenses to total expenses (see Example 4).
- E. Equipment – Sierra Streams Institute depreciates equipment when the initial acquisition costs exceeds \$500. Items below \$500 are reflected in the supplies category and expensed in the current year. Unless allowed by the awarding agency, equipment purchases are recovered through depreciation. Depreciation costs for allowable equipment used solely by one program are charged directly to the program using the equipment. If more than one program uses the equipment, then an allocation of the depreciation costs will be based on the ratio of each program's expenses to the total of such expenses (see Example 3). Costs that benefit all programs will be allocated based on the ratio of each program's expenses to total expenses (see Example 4).
- F. Printing (including supplies, maintenance, and repair) – Expenses are charged directly to programs that benefit from the service. Expenses that benefit more than one program are allocated based on the ratio of the costs to total expenses. Costs that benefit more than one program will be allocated to those programs based on the ratio of each program's expenses to the total of such expenses (see Example 3). Costs that benefit all programs will be allocated based on the ratio of each program's expenses to total expenses (see Example 4).
- G. Insurance – Insurance needed for a particular program is charged directly to the program requiring the coverage. Other insurance coverage that benefits all programs is allocated based on the ratio of each program's expenses to total expenses.
- H. Telephone/Communications – Telephone or communications expenses that benefit more than one program will be allocated to those programs based on the ratio of each program's expenses to the total of such expenses (see Example 3). Costs that benefit all programs will be allocated based on the ratio of each program's expenses to total expenses (see Example 4).
- I. Facilities Expenses – Allocated based upon usable square footage. The ratio of total square footage used by all personnel to total square footage is calculated. Facilities costs related to general and administrative activities are allocated to program based on the ratio of program square footage to total square footage (see example 5).
- J. Training/Conferences/Seminars – Allocated to the program benefitting from the training, conference or seminar. Costs that benefit more than one program will be allocated to those

programs based on the ratio of each program's salaries to the total of such salaries (see Example 1). Costs that benefit all programs will be allocated based on the ratio of each program's salaries to total salaries (see Example 2).

- K. Other Costs (including dues, licenses, fees, etc.) – Other joint costs will be allocated on a basis determined to be appropriate to the particular costs. (Grantee should describe methodology for applicable costs).

Example 1

Expense Amount = \$5,000

Costs that benefit two or more specific programs, but not all programs, are allocated to those programs based on the ratio of each program's personnel costs (salaries & applicable benefits) to the total of such personnel costs, as follows:

Grant	Personnel Costs	Percent	Amount Allocated
A	\$ 20,000	20%	\$1,000
C	\$ 30,000	30%	\$1,500
E	\$ 50,000	50%	\$2,500
TOTAL	\$100,000	100%	\$5,000

Example 2

Expense amount = \$10,000

Costs that benefit **all** programs are allocated based on a ratio of each program's personnel costs (salaries & applicable benefits) to total personnel costs as follows:

Grant	Personnel Costs	Percent	Amount Allocated
A	\$ 20,000	10%	\$1,000
C	\$ 30,000	15%	\$1,500
E	\$ 50,000	25%	\$2,500
All other programs	\$ 100,000	50%	\$5,000
TOTAL	\$200,000	100%	\$10,000

Example 3

Expense amount = \$4,000

Costs that benefit two or more specific programs, but not all programs, are allocated to those programs based on the ratio of each program's expenses (direct costs other than salaries & benefits) to the total of such expenses, as follows:

Grant	Expenses	Percent	Amount Allocated
A	\$ 20,000	20%	\$800
C	\$ 30,000	30%	\$1,200
E	\$50,000	50%	\$2,000
TOTAL	\$100,000	100%	\$4,000

Example 4

Expense Amount = \$8,000

Costs that benefit all programs will be allocated based on a ratio of each program's salaries to total salaries as follows:

Grant	Salary	Percent	Amount Allocated
A	\$ 20,000	10%	\$ 800
C	\$ 30,000	15%	\$ 1,200
E	\$ 50,000	25%	\$ 2,000
All other programs	\$ 100,000	50%	\$ 4,000
TOTAL	\$200,000	100%	\$8,000

Example 5

Facilities Expense Amount = \$10,000

Facilities costs are allocated based on square footage. Square footage for each program and general administrative activity is considered in the analysis. General and administrative facilities costs are further allocated to each program based on the square footage of each grant program to the total square footage of all grant programs. The calculation is as follows:

Grant	Personnel Costs	Percent	Amount Allocated
A	\$ 20,000	10%	\$1,000
C	\$ 30,000	15%	\$1,500
E	\$ 50,000	25%	\$2,500
All other programs	\$ 100,000	50%	\$5,000
TOTAL	\$200,000	100%	\$10,000

LONG TERM MANAGEMENT PLAN
for
PROVIDENCE MINE SITE
APN 05-100-87
Nevada City, California



Providence Mine in Nevada City, 1893, looking southeast. Champion Mine is at left, Deer Creek is in the foreground

Prepared by:

Sierra Streams Institute
431 Uren Street, Suite C
Nevada City, California 95959

October, 2013

The purpose of the long term management plan is to ensure sustainability of the remediation of Providence Mine for at least ten years.

1 INSTITUTIONAL CONTROLS

Signs will be placed at the two site access points at the eastern and western edges of the Mining Features Area to inform the public that mine waste with elevated metals concentrations is present on the site. California Department of Toxic Substance Control will be consulted regarding sign language. To provide additional human health protection, Land Use Covenants will be established for areas of the site where elevated concentrations of Constituents of Potential Concern will remain in place under proposed soil or existing vegetative cover. Future land use will be restricted to recreational use or open space. California Department of Toxic Substances Control will likely require an Operations & Maintenance agreement to include yearly monitoring and reporting of the integrity of the fill and signage. In addition, deterrent plants such as thorny shrubs or poison oak will be planted at potential access points from the Mining Features Area to the Waste Rock Area. Sierra Streams Institute does not anticipate that permanent fence installation will be required.

2 LAND USE COVENANT AGREEMENT FOR ON-SITE PLACEMENT AREA

A Land Use Covenant agreement and Operations & Maintenance agreement are recommended for the on-site placement area and all areas where mine waste is to be left in place beneath cover soil or vegetation. Land Use Covenant agreements are intended to protect public health and the environment by: 1) preventing inappropriate land use, 2) increasing the probability that the public will have information about residual contamination, 3) disclosing information for real estate transactions about residual contamination, 4) ensuring that long-term mitigation measures are carried out by protecting the engineering controls and remedy; and 5) ensuring that subsequent owners assume responsibility for preventing exposure to contamination.

In practice, the Environs property is owned in perpetuity by the City of Nevada City as recreational open space and it is not anticipated that there will be a change in ownership or land use.

3 DEED RESTRICTION

No specific deed restriction has been proposed for the site at this time. Sierra Streams Institute anticipates that details of a deed restriction will be negotiated between the City of Nevada City and California Department of Toxic Substances Control based on the outcome of the site cleanup.

Deed restriction pertaining to the project would comply with the following general provisions:

1. No activities that will disturb the mine waste within the on-site placement area or beneath other covered areas (e.g., excavation, grading, removal, trenching, filling, earth movement or mining) shall be allowed on the property without a soil management plan approved by California Department of Toxic Substances Control.
2. Restriction of the land use within the on-site placement area is to be established by Land Use Covenant agreement between the property owner and California Department of Toxic Substances Control. Successive owners, heirs and assignees are to be expressly bound by the covenant.
3. Prior to the sale, lease or sublease of the property containing the on-site placement area, the owner, lessor, or sublessor shall give the buyer, lessee, or sublessee notice that hazardous substances are located in the area.
4. The land use controls shall be incorporated by reference in each and all deeds and leases for the property.
5. The owner shall provide notice to California Department of Toxic Substances Control not later than 30 days after any conveyance of any ownership interest in the property containing the on-site placement area (excluding mortgages, liens, and other non-possessory encumbrances). California Department of Toxic Substances Control shall not, by reason of the covenant, have authority to approve, disapprove, or otherwise affect proposed conveyance, except as otherwise provided by law or by administrative order.
6. The Land Use Covenant shall be recorded in the County of Nevada.
7. The terms of the deed restriction run with the land and will continue in perpetuity unless a variance is granted or unless terminated. The property owner agrees to pay California Department of Toxic Substances Control's costs in administering the deed restriction.
8. An Operations & Maintenance agreement will establish requirements for monitoring, reporting and financial assurance.
9. Periodic monitoring of the cover soil and vegetation and annual reporting to California Department of Toxic Substances Control will continue to be required after any future recreational development is complete. Periodic monitoring of sign posting, and annual reporting to California Department of Toxic Substances Control will be required.

4 OPERATIONS AND MAINTENANCE AGREEMENT

California Department of Toxic Substances Control requires an Operations & Maintenance agreement, as set forth in CCR Title 22, including Sections 66264.147, 66265.143, 66265.145 and 66265.147. The Operations & Maintenance Agreement will

include annual monitoring of the integrity of the remedial measures, a letter report including pictures to be sent to California Department of Toxic Substances Control.

5 REVEGETATION AND EROSION CONTROL

Erosion control and re-vegetation will be provided by installing coir fiber blankets on graded or unstable slopes steeper than 2:1, H:V. The coir fiber blankets will be installed in an anchor trench at the top of the slopes. Stakes will also be installed to keep the blankets in place. Soil amendments and seed would be installed under the blankets.

Re-vegetation efforts will begin as soon as possible after excavation, slope grading and completion of soil cover placement and will include all areas where cover soil is placed. Sierra Streams Institute's restoration ecologist will be consulted regarding plant selection. Erosion control measures such as coir fiber mats will also be placed as needed on disturbed slopes prone to erosion including regraded areas of the Western Mine Waste Slope and areas where mine waste has been excavated on the Eastern Mine Waste Slope.

Please see Providence Mine Erosion Control and Revegetation Plan for details.

6 VISUAL INSPECTION

Visual inspection of the erosion control measures and revegetation success will be conducted during implementation and then by trained volunteers in conjunction with monthly water quality monitoring in perpetuity and periodic storm sampling for the life of the project. Concerns with erosion control and native revegetation will be reported to Sierra Streams Institute geologist and ecologist for action as indicated. A qualified engineer will check the integrity of the gabion wall and waste rock pile every six months for 10 years.

7 LONG TERM MONITORING

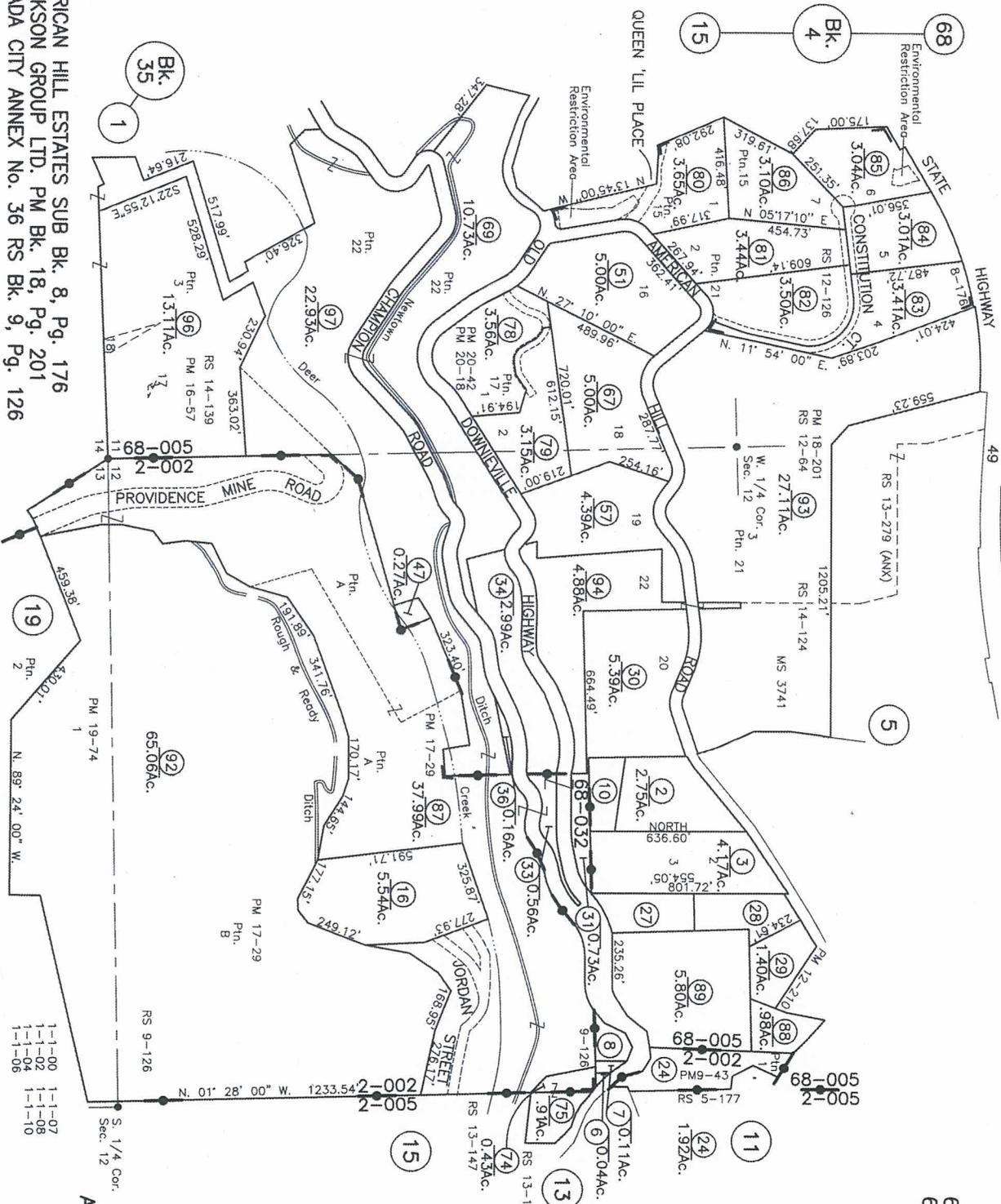
Please see Providence Mine Monitoring Plan for details.

PTN. SEC'S 11, 12 & 13, T. 16 N., R. 8 E., M.D.B. & M.

Tax Area Code

5-10

- 2-002
- 2-005
- 68-005
- 68-032



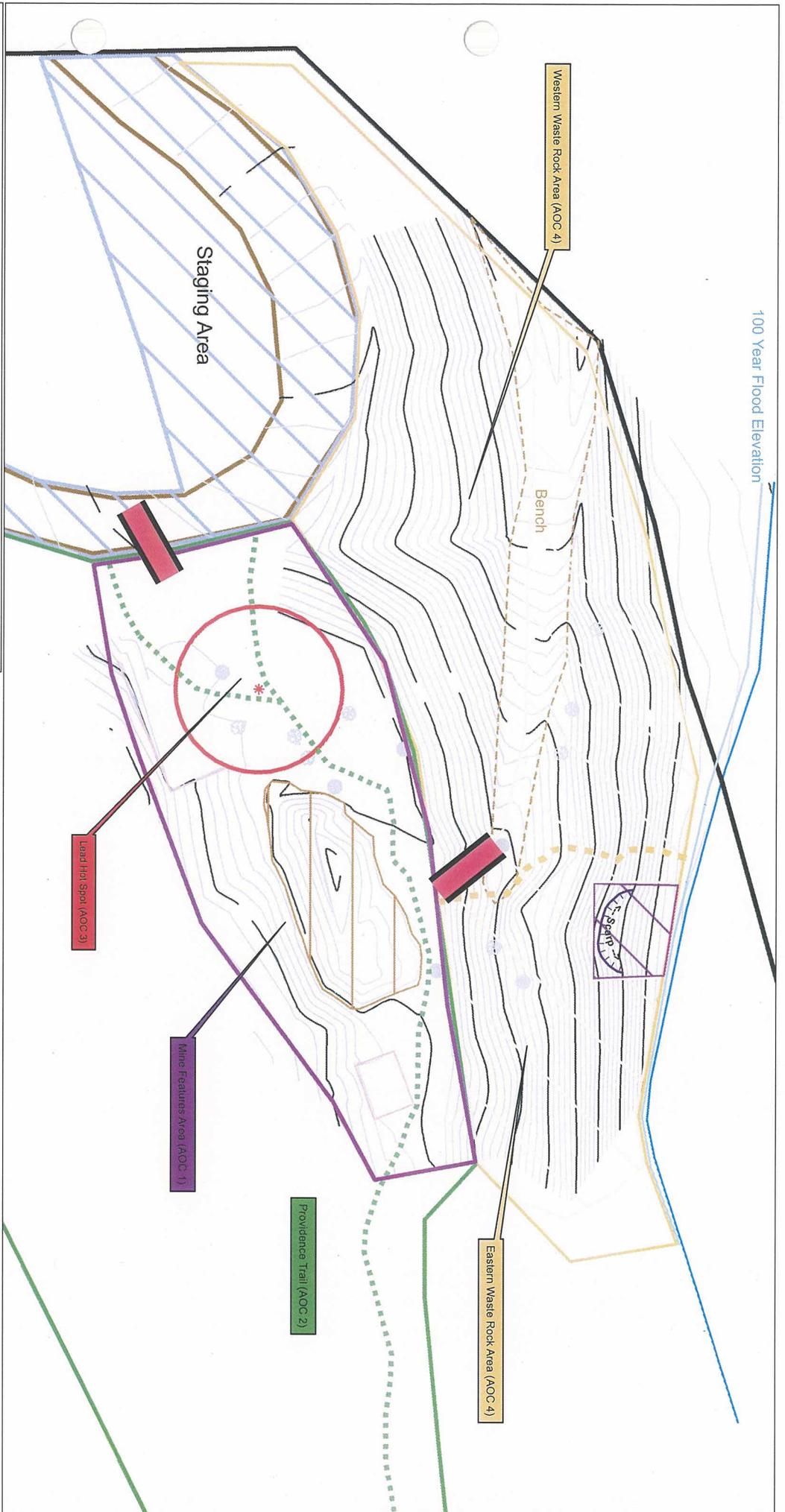
ASSESSOR'S PARCEL MAP
 This map was prepared for assessment purposes only. No liability is assumed for errors or omissions. The assessor is not responsible for parcels not shown or for parcels with local lot-split or building site ordinances.

Assessor's Map Bk. 5-Pg. 10
 County of Nevada, Calif.
 1999
 LAST UPDATE 1-13-11
 NW 10/99



AMERICAN HILL ESTATES SUB Bk. 8, Pg. 176
 ERICKSON GROUP LTD. PM Bk. 18, Pg. 201
 NEVADA CITY ANNEX No. 36 RS Bk. 9, Pg. 126

100 Year Flood Elevation

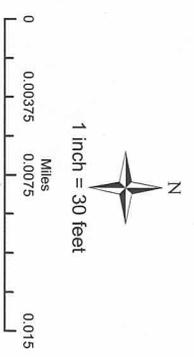


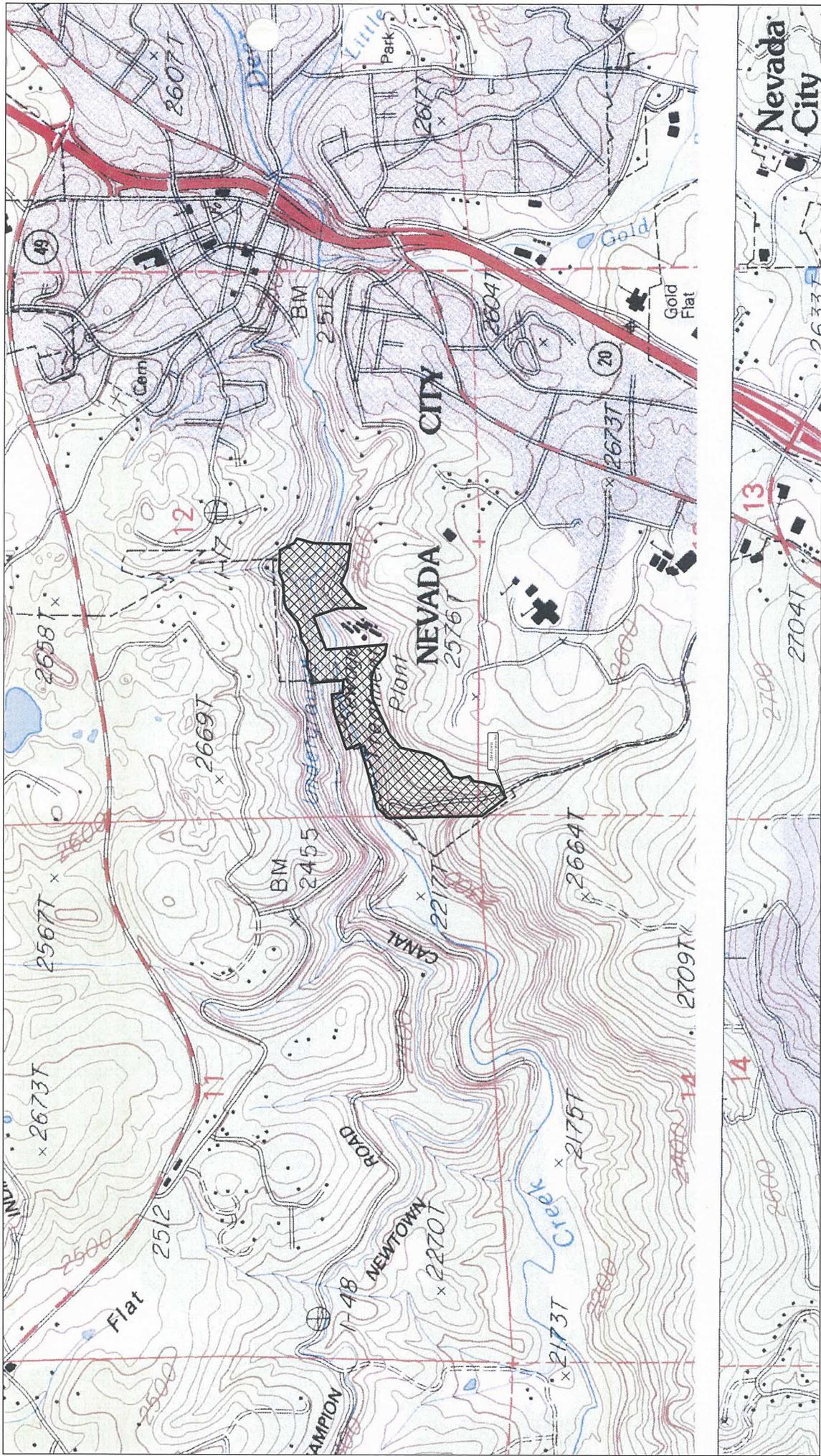
Legend

	Deer Creek (May 2013)		Slope Regrading Area
	Property Line		Landslide Repair Area - TBD by ongoing engineering study
	Providence Mine Road		Fill Placement Area with Soil Cover
	Rock Walls		Mine Features Area (AOC 1) - Limited excavation and soil placement
	Temporary/Access Ramps		Providence Trail (AOC 2) - No disturbance except limited aggregate placement in AOC 1
	Top Scarp		Hot Spot (AOC 3)
	Western/Eastern Waste Rock Divide		Waste Rock Area (AOC 4) - Excavation and Backfill Area
	Bench		Waste Rock Area (AOC 4) - Excavation and on-site placement in AOC 1
	Staging Area		

Sierra Streams Institute
Brownfields Cleanup - Providence Mine
Figure 7 - Grading Map

APN: 05-100-87
 Nevada City Quadrangle
 T16N; R9E; Sec 11, 12, 13





1 inch = 833 feet



Sierra Streams Institute
 Brownfields Cleanup - Providence Mine
 Figure 1: Site Location Map

Nevada City Quadrangle
 T16N; R9E; Sec 11, 12, 13

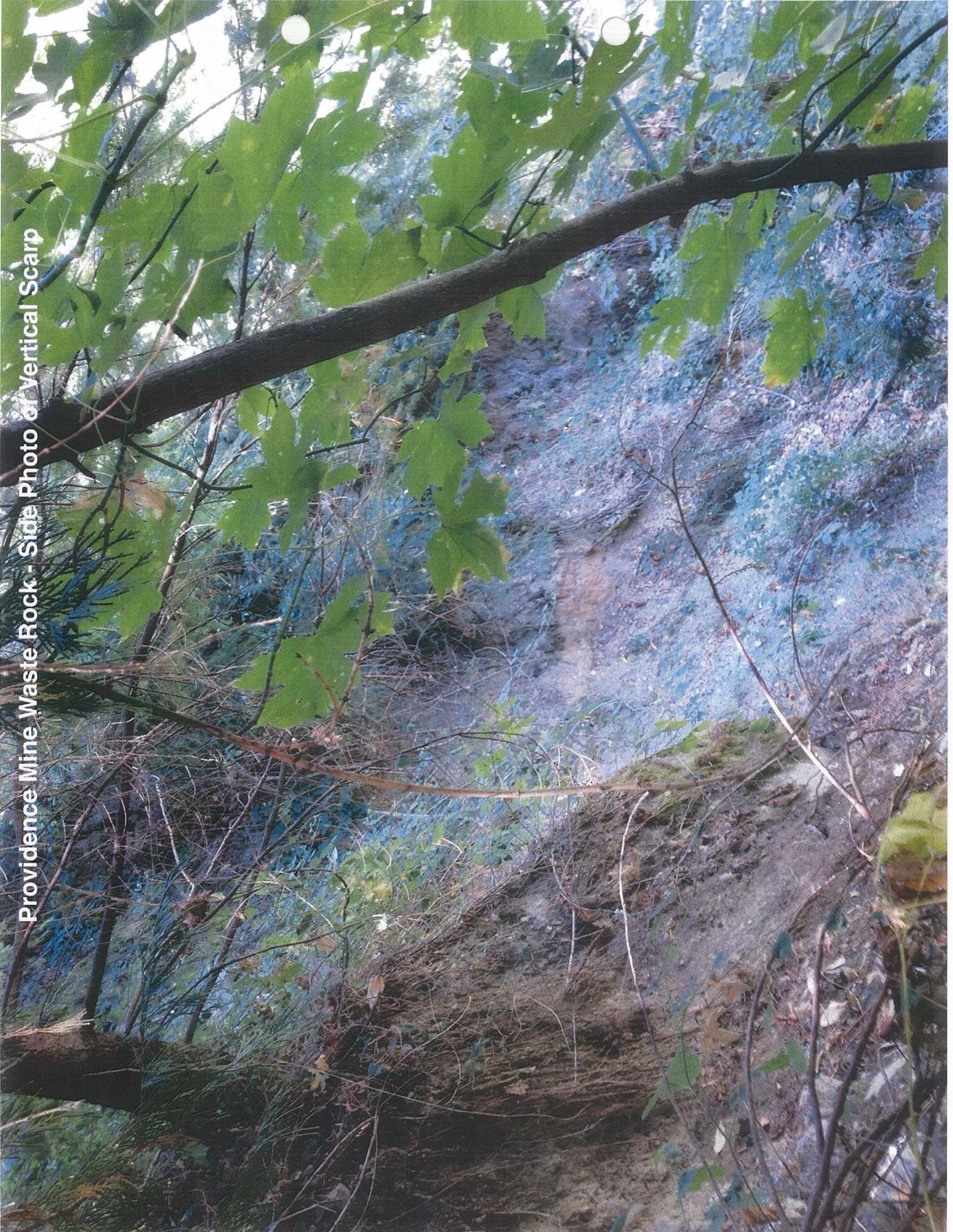
Legend

 Nevada City Environs Property



Providence Mine Waste Rock - Looking downslope to Deer Creek

Providence Mine Waste Rock - Side Photo of Vertical Scarp





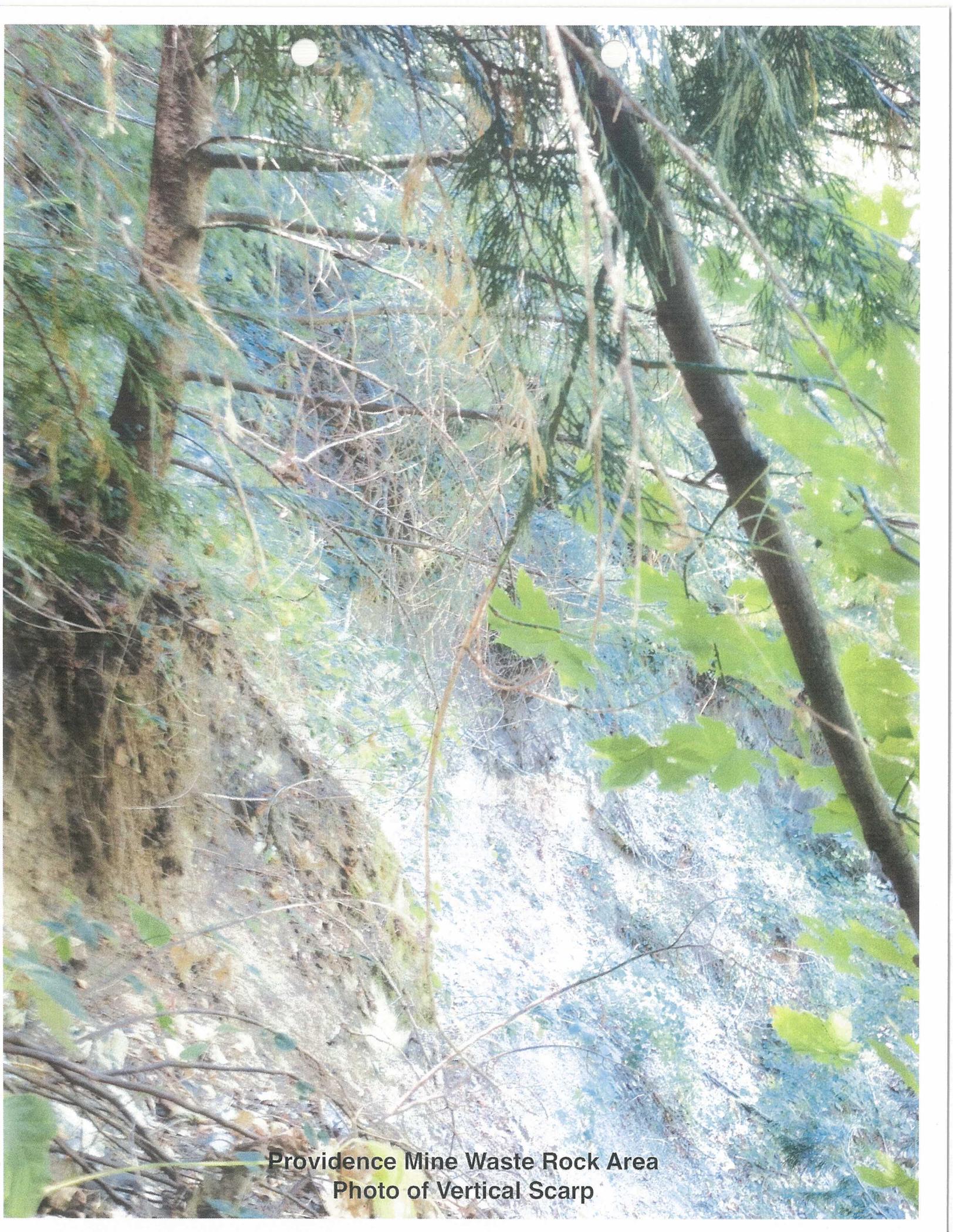
Providence Mine Waste Rock - Looking Upslope from the Vertical Scarp

Providence Mine Site, - View of Shaft and Fill Placement Area





**Providence Mine Waste Rock Area
Accessing the Site via the steep, eroding waste rock slope**



**Providence Mine Waste Rock Area
Photo of Vertical Scarp**

Mine Features Area and Trail

Hot Spot

Trai Access
Point

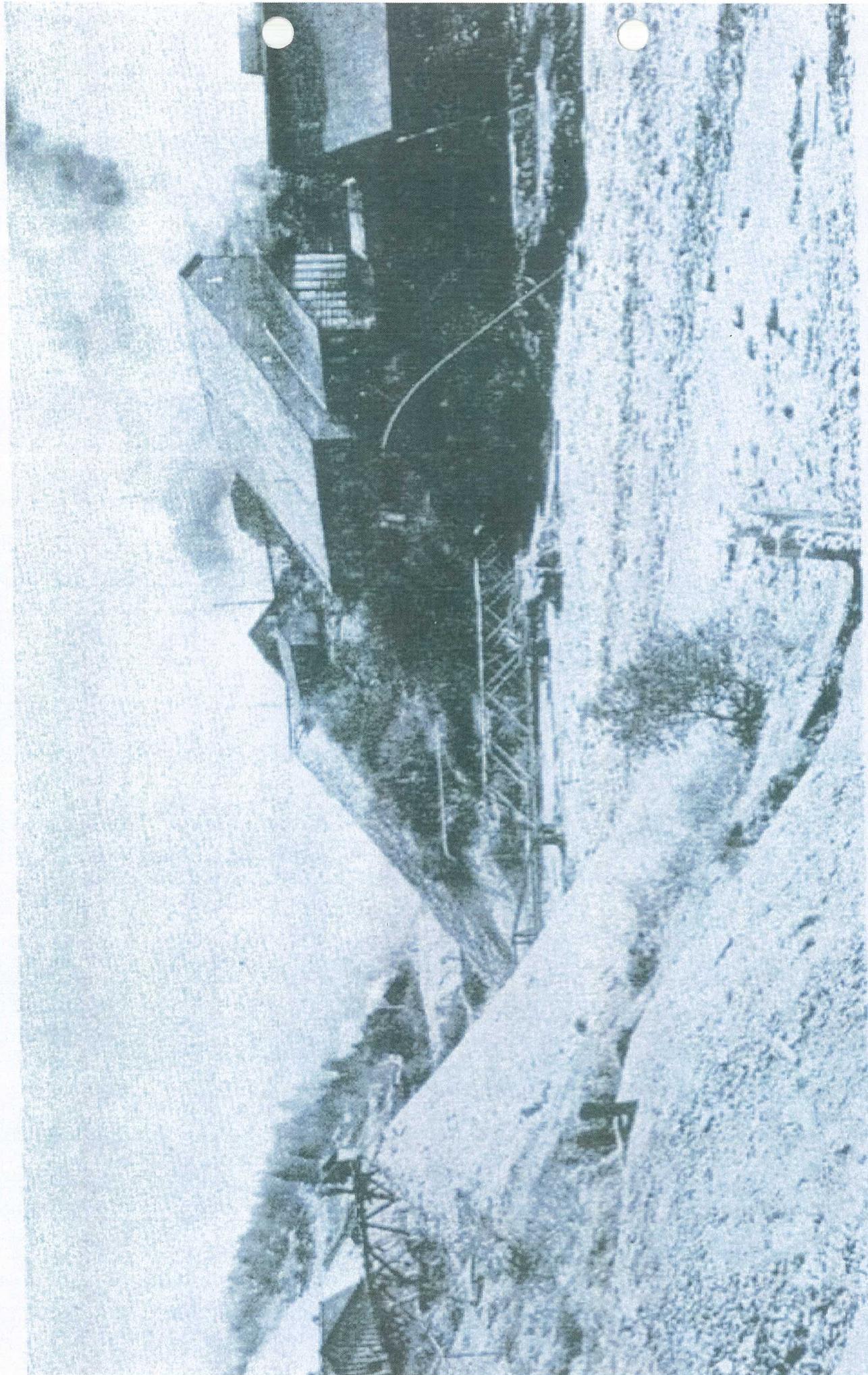
Western
Waste

Rock
Area

Deer Creek

Providence Mine Rd





Independence Mine, Nevada City District. This 1893 view of the mine, in Nevada County, looks southeast. The Champ left, Deer Creek in the foreground.

Mine Features Area, Trail, Hot Spot

Providence Mine Rd

Waste Rock Area

Deer Creek





Providence Mine Waste Rock Area - Downslope view to Deer Creek from the top of the vertical scarp



City of Nevada City

October 14, 2013

Ms. Joanne Hild
Executive Director
Sierra Streams Institute
431 Uren Street Suite C
Nevada City, CA 95959

Dear Joanne,

On behalf of the city of Nevada City, I am pleased to affirm our support for the ongoing effort to clean up the Providence Mine abandoned mine site.

In 2010, Sierra Streams Institute entered into a subgrant agreement with the City of Nevada City for the purpose of implementing the US EPA Brownfields-funded cleanup of the Providence Mine site. This grant is funding the cleanup of the mine features area and the western portion of the waste rock area. With further funding from Sierra Nevada Conservancy, it will be possible to complete the cleanup and stabilization of the extremely steep and erosion-prone eastern portion of the waste rock area along Deer Creek, as well as plug and fill the mine shaft.

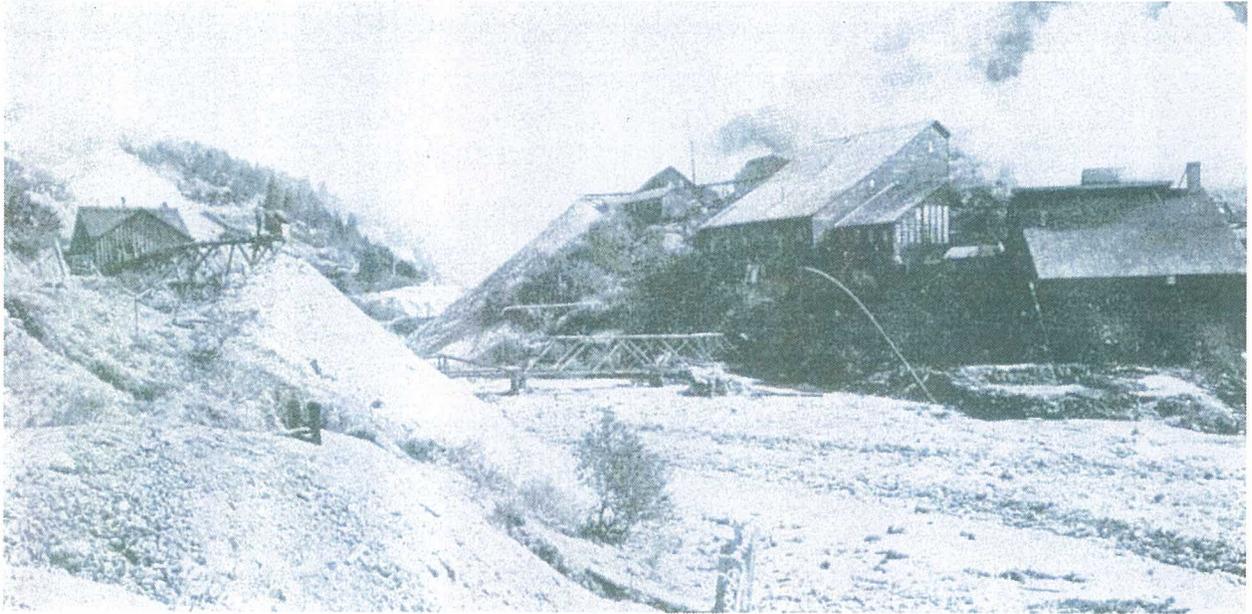
The City of Nevada City purchased the property in which Providence Mine is located in 1983 with the intention of preserving it as recreational open space. With the completion of the abandoned mine land cleanup, the recreational values of the property will be restored, while protecting the habitat in the Deer Creek watershed.

Thank you for pursuing funding to enhance Nevada City's open spaces, and we look forward to a successful application for funding this important project that will protect Nevada City and the Deer Creek watershed.

Sincerely,

David Brennan
City Manager

MONITORING PLAN
for
PROVIDENCE MINE SITE
APN 05-100-87
Nevada City, California



Providence Mine in Nevada City, 1893, looking southeast. Champion Mine is at left, Deer Creek is in the foreground

Prepared by:

Sierra Streams Institute
431 Uren Street, Suite C
Nevada City, California 95959

October, 2013.

This Monitoring Plan for Providence Mine Site was developed by Sierra Streams Institute to ensure the long-term effectiveness of the proposed remediation of Providence Mine in Nevada City, California. The purpose of monitoring is to measure the overall health of the stream, specifically ensuring that the restoration is preventing erosion into the creek, including contamination by sediment, heavy metals, and nutrients. Monitoring will occur before, during and after implementation to confirm long term effectiveness and to provide comparison with pre-project conditions.

Outline of monitoring activities and parameters:

Monthly Water Quality Monitoring:

- Dissolved oxygen
- Specific conductivity
- pH
- Turbidity
- Water temperature
- Bacteria
- Nutrients including nitrates and phosphates
- Visual observation of BMPs and erosion control measures

Twice Yearly Biological Sampling:

- Benthic macroinvertebrates
- Algae

Visual Observation

- Erosion control measures
- Vegetation
- Gabion wall integrity

Heavy Metal Sampling:

- Total Suspended Solids
- Mercury
- Lead
- Cadmium
- Arsenic
- Visual observation of BMPs and erosion control measures

Vegetation Monitoring

- Visual assessment of vegetation twice yearly (spring and fall)

1 SURFACE WATER QUALITY

Surface water quality monitoring will follow standard methods outlined in the "Citizen Water Monitoring Quality Assurance Project Plan for the Yuba Watershed Monitoring Committee" (2008), available at: <http://www.friendsofdeercreek.org/documents-1/DeerCreekQAPP.pdf>. Specific parameters are dissolved oxygen content, specific conductivity, pH, turbidity, water temperature, bacteria and nutrients including nitrates and phosphates.

Water quality monitoring of Deer Creek will occur on a monthly basis before, during, and after project implementation activities, upstream and downstream of the project site. Monitoring will be conducted by trained citizen volunteers and Sierra Streams Institute staff. Upstream monitoring will occur at SSI monitoring site 4, located upstream of Providence Mine and established in 2000 for the purpose of obtaining baseline data to assist in determining watershed changes over time. This is one of 18 sites throughout the watershed established to assess watershed health. Site 4 will serve as a control site, unimpacted by Providence Mine. A new monitoring site 4b will be established immediately downstream of Providence Mine to monitor disturbance during implementation and to validate long term effectiveness of the restoration as measured in water quality improvement.

In addition to site 4b, Sierra Streams Institute has monthly water quality monitoring data since November 2000 for site 5, located approximately 5 miles downstream of Providence Mine.

Erosion control measures and BMPs in place during and after project implementation will ensure that there are no project-related impacts to the stream.

2 BENTHIC MACROINVERTEBRATES

Biological monitoring parameters will allow for confirmation of project effectiveness, by comparing data upstream and downstream of the project site before and after the implementation. It is not anticipated that the project will have any impact on macroinvertebrate composition, because erosion control measures will keep all soil from entering creek.

Benthic macroinvertebrate monitoring will follow standard methods outlined by the Surface Water Ambient Monitoring Program (SWAMP) in the "Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California" (2007), available at:

http://swamp.mpsl.mlml.calstate.edu/wp-content/uploads/2009/04/swamp_sop_bioassessment_collection_020107.pdf

Macroinvertebrates In the field: Benthic macroinvertebrate sampling will occur at the 150m SWAMP reaches at sites 4b and 4c upstream and downstream respectively of Providence Mine, before and after project construction activities. Sampling will take place once in June and October each year and will continue as part of Sierra Streams Institute's twice yearly macroinvertebrate sampling program in perpetuity.

Macroinvertebrates In the lab: Samples will be hand sorted and identified to family or order.

Data Analysis: Metrics and statistical analyses will be calculated based on the family identification.

3 ALGAE

Algae monitoring will be completed in conjunction with benthic macroinvertebrate sampling (see 2 above). Algae monitoring will follow standard methods outlined by the SWAMP in "Standard Operating Procedures for Collecting Stream Algae Samples and Associated Physical Habitat and Chemical Data for Ambient Bioassessments in California" (Fetscher et al., 2009), available at: http://swamp.mpsl.mlml.calstate.edu/wp-content/uploads/2010/06/SWAMP_SOP_Algae_Field_Collection_050110.pdf

4 VISUAL OBSERVATION

Visual observations during project implementation activities will document the presence or absence of soil migrating past the proposed wall location. Photos will be taken to document pre and post project conditions. Visual observations will be conducted during project implementation and in conjunction with monthly water quality monitoring (see 1 above). The project geologist and ecologist will train citizen monitors to evaluate the integrity of erosion control measures and verify the successful establishment of native plantings. In the event of erosion concerns or failure of native plants to become established, monitors will report to the relevant staff at Sierra Streams for a formal evaluation by the staff restoration ecologist and/or geologist. Further visual observations will be conducted in conjunction with storm sampling to evaluate the effectiveness of BMPs and erosion control measures.

5 HEAVY METAL SAMPLING

Additional water quality monitoring will be conducted upstream and downstream of the project site during three major storm events each year, including the "first flush" (first

major storm after the dry season) for the two year life of the project. In addition to the water quality parameters noted above in 1, we will also analyze storm water samples for Total Suspended Solids and a panel of heavy metals (constituents of concern lead, cadmium and arsenic as well as mercury). Storm sampling upstream and downstream of the project site will allow us to evaluate whether Providence Mine is contributing to water quality impacts and loading of heavy metals, as well as to gauge the extent of erosion resulting from high flow events.

In addition to storm sampling and visual observations of erosion on the project site, soil and sediment samples will be analyzed for the target heavy metals before and after project construction activities, to determine if heavy metal contaminants are migrating from the project site, indicating a need for additional erosion control measures.

6 VEGETATION MONITORING

Project areas that are disturbed during mine waste remediation activities will be revegetated following installation of erosion control measures. Revegetation of targeted areas will ensure longevity of soil stabilization methods, reduce threat of erosion into Deer Creek, and improve habitat health.

Following project implementation, twice yearly assessments each spring and fall will monitor the success of revegetation efforts. Surveys will specifically investigate vegetation establishment, survival, recruitment, and percent vegetative cover. Installed erosion control measures will be examined to assess efficacy and longevity, while potential erosion areas of concern will be monitored closely. Repeated monitoring will ensure long-term effectiveness of mine waste and erosion mitigation efforts

7 NAME AND CONTACT INFORMATION FOR SUPERVISING PERSONNEL

Justin Wood, River Scientist
Sierra Streams Institute
431 Uren Street, Suite C
Nevada City, CA 95959
530-265-6090 x204
justin@sierrastreamsinstitute.org

Joanne Hild, Executive Director
Sierra Streams Institute
431 Uren Street, Suite C
Nevada City, CA 95959
530-265-6090 x200
joanne@sierrastreamsinstitute.org

Kyle Leach, Geologist
Sierra Streams Institute
431 Uren Street, Suite C
Nevada City, CA 95959
530-265-6090 x203
Kyle@sierrastreamsinstitute.org



Providence Mine Remediation Project Erosion Control and Revegetation

Project Implementation

Existing slopes within the project area drop steeply down to the banks of Deer Creek. Mine waste and contaminated soils throughout the site are distributed across these erosion-prone hillsides. The Providence Mine Remediation Project will address these threats to water quality and human health through removal of existing exposure pathways. Careful project implementation will ensure that contaminated soils and mine waste are removed from potential human contact and erosion is mitigated throughout the site. As specified in the Draft Removal Action Workplan for Providence Mine Site (August 2013) the proposed mine waste and erosion remediation actions are as follows:

1. Excavation of mine waste from eastern mine waste slope and deposition into shaft depression
2. Contaminated sediment excavation from debris fan at toe of active landslide and deposition into shaft depression
3. Installation of cover soil over mine waste placed within shaft depression
4. Installation of earth retaining structure at base of landslide area to prevent sediment transport into Deer Creek, a wire-basket rock Gabion wall or concrete retaining wall will be constructed above the 100-year flood elevation
5. Installation of shotcrete-facing on near-vertical scarp of landslide
6. Implementation of erosion control and revegetation measures throughout project area

Erosion Control Techniques

In order to ensure that the Providence Mine Remediation Project effectively mitigates existing erosion concerns and reduces future risk of slope instability, the following practices* will be implemented:

1. Installation of Rolled Erosion Control Product (coir netting, Type B or C), anchored with incrementally-spaced wooden stakes. Netting will be installed using standard top-trench methodology and horizontal layering to ensure maximum efficacy.
2. If deemed necessary to ensure long-term soil stabilization, installation of welded wire mesh (2 x 6") onto coir netting, affixed with soil anchors.
3. Placement of coir fiber rolls onto installed soil stability measures to minimize sediment transport and slow water flow throughout exposed slopes. Coir rolls will be anchored with wooden stakes according to slope stabilization standards (10 foot spacing for 2:1



Providence Mine Remediation Project Erosion Control and Revegetation

slopes, 15 foot spacing for 4:1 slopes).

4. Following installation of erosion control measures, hydroseed exposed slopes with a mixture of native grass seed, fiber, and tackifier. Grass seed should include fast-growing annual native grasses, and competitive perennial native bunchgrasses.

* Erosion control techniques are suggested for slopes 2:1 (H:V) or flatter. Near-vertical landslide scarp will be treated with shotcrete-facing in conjunction with Gabion wall construction.

Revegetation Techniques

Project areas that are disturbed during mine waste remediation activities will be revegetated following installation of erosion control measures. Revegetation of targeted areas will ensure longevity of soil stabilization methods, reduce threat of erosion into Deer Creek, and improve habitat health. Native plant revegetation will be implemented according to the following guidelines:

1. Revegetation efforts will utilize chosen native plant palette. Selected species will be tested for successful on-site establishment and vigor during phytoremediation pilot studies.
2. Hydroseeding on slopes with installed erosion-control measures will feature mix of native grass seed. Species will be selected for fast-growing and fast-rooting growth properties.
3. Hydroseeding plant palette will include a mix of annual grass species (selected to quickly establish cover) and deep-rooting perennial grass species (selected for slope longevity).
4. On slopes 2:1 or less, rooted shrub vegetation (plugs) will be installed following placement of coir netting. These areas will be additionally treated with a light seeding of fast-growing grass and forb species, ensuring a diverse below-ground rooting network for maximal slope stability.

Erosion Control and Revegetation Monitoring

Following project implementation, repeated assessments will monitor the success of revegetation efforts. Surveys will specifically investigate vegetation establishment, survival, recruitment, and percent vegetative cover. Installed erosion control measures will be examined to assess efficacy and longevity, while potential erosion areas of concern will be monitored closely. Repeated monitoring will ensure long-term effectiveness of mine waste and erosion mitigation efforts.



Providence Mine Remediation Project
Erosion Control and Revegetation

Revegetation Plant Palette

<i>Species</i>	Common name	Growth type	Wetland indicator status	Habitat	Habitat notes	Additional notes
<i>Achillea millefolium</i>	yarrow	Perennial herb	FACU	Meadows	Full sun / moist soil	Dry upland area; flowering
<i>Artemisia douglasiana</i>	California mugwort / Douglas sagewort	Perennial herb	FAC	-	Shade / moist soil	Rhizomatous Open to shady areas, often in drainages
<i>Bromus carinatus</i>	California brome	Annual grass	-	Pine forest, woodland, grassland	-	Valued for ease of establishment in revegetation projects
<i>Chamaebatia foliolosa</i>	mountain misery / bearlover	Shrub	-	-	Well-drained, sun, shade	Flowers in July, seed requires cold stratification: 28-84 days
<i>Elymus glaucus</i>	blue wildrye	Perennial herb / bunchgrass	FACU	-	Shade tolerant	Good for streambank restoration, excellent for reseeding in disturbed forests
<i>Elymus triticoides</i>	alkali rye, creeping wildrye, beardless wild rye	Perennial herb / bunchgrass	FAC	Pine forest, woodland, grassland	-	Primarily used in streambank and riparian stabilization
<i>Festuca rubra</i>	red fescue	Perennial herb / bunchgrass	FAC	-	Shade tolerant	Excellent soil-binder, used extensively for stabilizing slopes, banks, cuts, and fills. Vigorous growth during phytoremediation pilot study.



Providence Mine Remediation Project
Erosion Control and Revegetation

Species	Common name	Growth type	Wetland indicator status	Habitat	Habitat notes	Additional notes
<i>Lonicera hispidula</i>	pink honeysuckle	Vine or shrub	FACU	Streambanks / slopes	Full sun / dry slope or riparian environ	Bank stabilizing, Canyons, streambanks, woodland
<i>Muhlenbergia rigens</i>	deer grass	Perennial herb / bunchgrass	FACW	Wetland – riparian	Full sun / moist soil	Stabilizing bunchgrass; mid-slope and upland area Valuable soil-stabilizer with extensive root system
<i>Stipa pulchra</i>	purple needle grass	Perennial herb / bunchgrass	-	slopes	-	Highly valued as an erosion-control bunchgrass Long-living, able to establish coarse-root systems in poor soil conditions. Successfully established during onsite pilot phytoremediation study.
<i>Symphoricarpos mollis</i>	trailing / creeping snowberry	Shrub	-	-	-	Sprawling, branches often rooting

Note: Hydroseeding applications will include grass species listed in bold font