

Review of the Lava Cap Mine NPL Superfund Site

G. Fred Lee, PhD, PE, DEE

G. Fred Lee & Associates

El Macero, CA

Phone: 530-753-9630 email: gfredlee@aol.com

www.gfredlee.com

- Background Characteristics of Lava Cap Mine Site (LCMSS)
- Listing of Site on US EPA NPL List
- US EPA Approach to Site Investigation & Remediation
- Major Issues That Need to Be Defined

Presented at CA Abandoned Mine Lands Forum, May 2003

G. Fred Lee's Involvement in Lava Cap Site Remedial Investigation/Feasibility Study, RI/FS

- 43 yrs Periodic Involvement in Issues of Investigation & Remediation of Mine Waste Sites

Acid Mine Drainage ♦ Heavy Metals ♦ Radium/Radon/Uranium
♦ Arsenic ♦ Taconite Tailings (Iron Ore) ♦ Sand & Gravel ♦
Phosphate ♦ Reuse of Mined Areas

- SYRCL (South Yuba River Citizens' League)
Representing Public of Area

- Applied for US EPA Technical Assistance Grant (TAG) from US EPA Region 9. Approved by US EPA Fall 2000
- TAGs are part of US Superfund legislation to help the public located in the area of a federal Superfund site to participate in the review of site investigation & remediation

G. Fred Lee's Involvement in Lava Cap Site (cont'd)

■ SYRCL

- Congress made provisions to provide each site with \$50,000 over 3 yrs to participate in site RI/FS, Record of Decision (ROD) for site remediation and post-ROD activities. TAG is renewable.
- SYRL advertised position of TAG support Technical Advisor. G. Fred Lee was selected in June 2001 to advise SYRCL/public potentially impacted by Lava Cap Mine Superfund site.
- Developed series of reports on US EPA documents pertinent to site RI/FS.

Available at www.gfredlee.com

G. Fred Lee's Involvement in Lava Cap Site (cont'd)

- Presented Review Paper,

“Occurrence of Public Health and Environmental Hazards and Potential Remediation of Arsenic-Containing Soils, Sediments, Surface Water and Groundwater at the Lava Cap Mine NPL Superfund Site in Nevada County, California,” Proc. 5th International Conference on Arsenic Exposure and Health Effects, Society for Environmental Geochemistry and Health, San Diego, CA, July (2002) (in press)

Preprint Available in Hazardous Chemicals Superfund section of website: www.gfredlee.com

Review Included in This Presentation

Lava Cap Mine Superfund Site Nevada County, California

US Environmental Protection Agency
Region 9 – San Francisco

Project Manager ➤ David Seter

Community Involvement Coordinator ➤ Don Dodge

Site Contractor ➤ CH2MHill, Inc.

Team Subcontractors:

URS Greiner Woodward Clyde Federal Services, Inc.

E2 Consulting Engineers, Inc.

Public Representative ➤ South Yuba River Citizen League (SYRCL)

Janet Cohen, Executive Director

US EPA Technical Assistance Grant Advisor ➤ G. Fred Lee, PhD, DEE

G. Fred Lee & Associates, El Macero, CA

[ALL MAPS, DRAWINGS & TABLES PUBLISHED BY CH2MHILL]

Purpose of Remedial Investigation & Feasibility Study

- Assess Contamination Associated with Lava Cap Mine Superfund Site
- Develop Remediation Alternatives for Arsenic-Contaminated Soil, Sediment, Surface Water & Groundwater

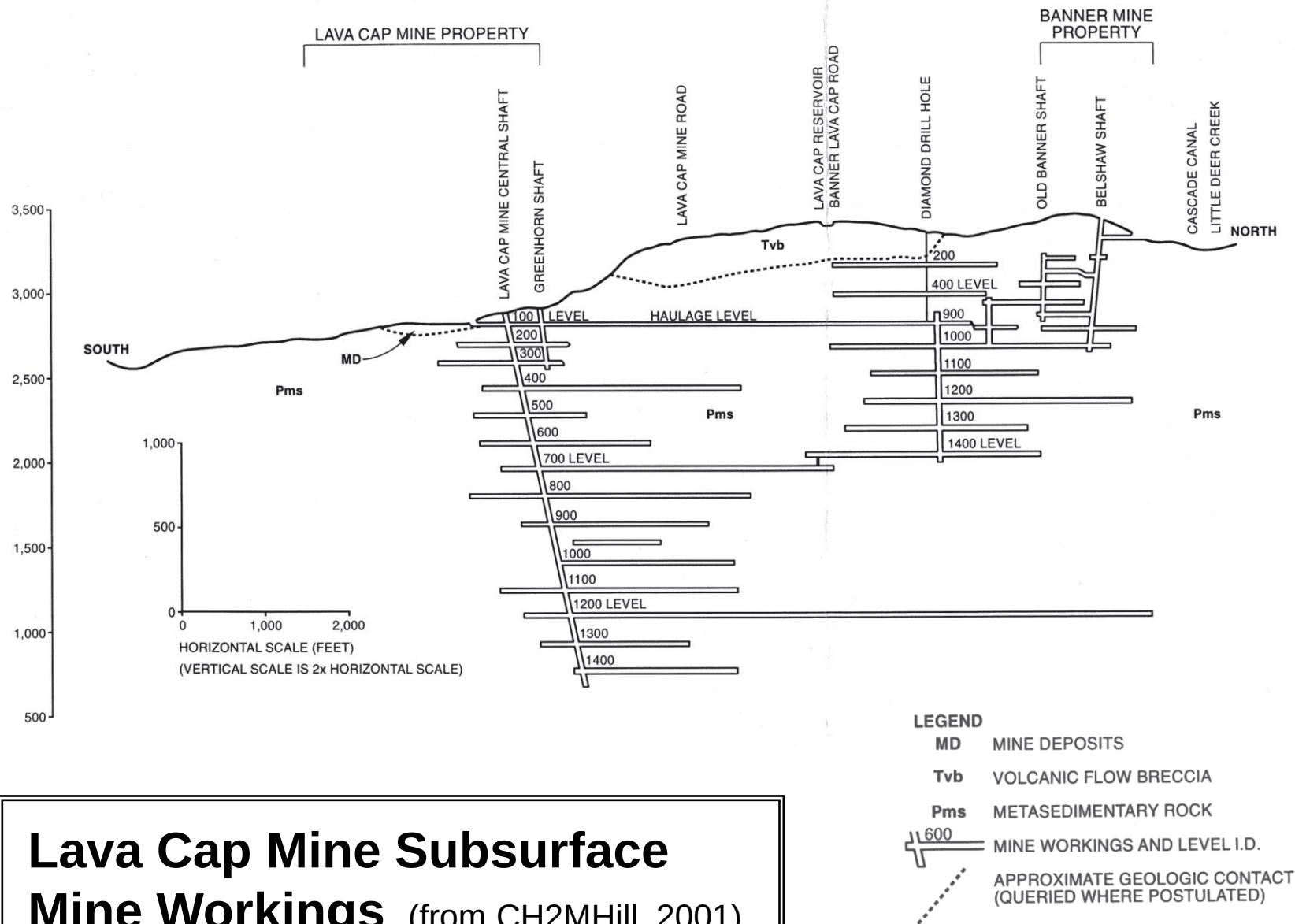
Characteristics of Lava Cap Mine Site

■ Location

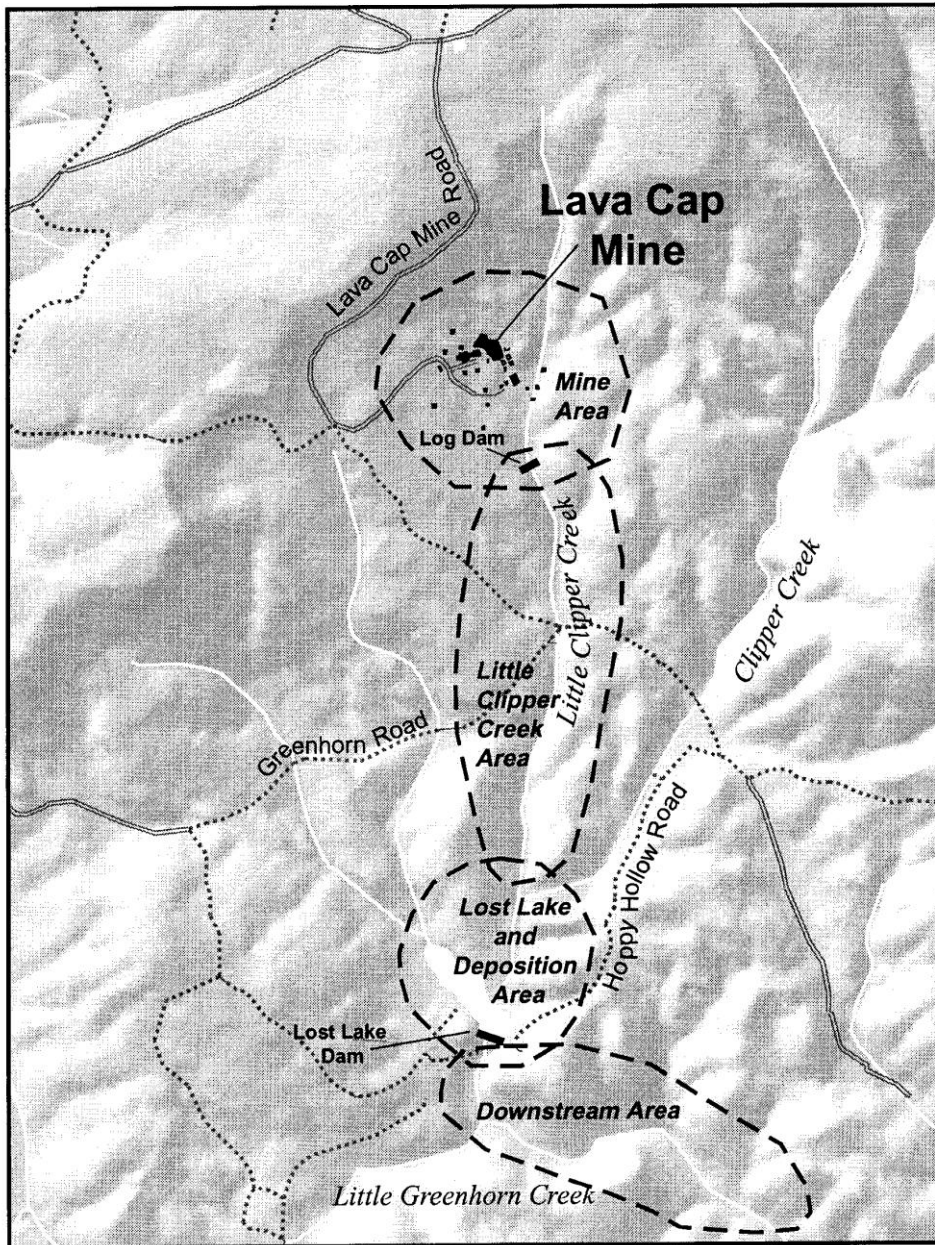
- Occupies approx. 30 acres about 5 mi from Nevada City, CA
- Forested Area with Low-Density Residential Development in Area of Potential Impact

■ History

- Gold & Silver Shaft-Mine Started in 1861
- Operated On & Off until 1943
- Ore Minerals: Pyrite, Arsenopyrite, Galena
- Ore Crushed, Ground with Floatation or Cyanide &/or Amalgamation Ore Processing



Lava Cap Mine Subsurface Mine Workings (from CH2MHill, 2001)



Lava Cap Mine Areas

Background

- Finely Divided Tailings (Waste Ore) with Elevated Arsenic Generated & Stored:
 - 150,000 yd³ Tailings in 5-ac Lost Lake behind 50-ft High Dam
 - 167,000 yd³ Tailings in 30-ft-High Log Dam
- **January 1997** Upper Half of Log Dam Collapsed & Released >10,000 yd³ Tailings to Little Clipper Creek & Lost Lake
- **October 1997** US EPA Initiated “Removal Action” to Prevent Further Release of Tailings
- **February 1999** Lava Cap Mine Added as NPL Superfund Site
 - US EPA Lead Agency in Site Investigation & Remediation
 - No Responsible Party Identified to Fund Clean-up
 - Funding Provided by US EPA

Public Health & Environmental Problems

◀ Studies Still Being Conducted ▶

- **Surface Soils, Water & Sediments** Contaminated by Arsenic from Ore in Tailings
 - Some Soils Contain 34,000 mg/kg As
 - Threat to Human Health (Body Contact, Dust) Aquatic Life, Wildlife
- **Groundwater**
 - Complex Hydrogeology – Fractured Rock Aquifer System - Difficult to Trace Groundwater Flow Path
 - Area Residents Use Groundwater for Water Supply
 - Groundwaters near Mine Site Contaminated with As from Tailings – 100 to 500 µg/L
 - Some Groundwaters of Area Contain Naturally Elevated As

Risk Assessment

- Based on “*Guidance for Conducting Remedial Investigation & Feasibility Study*” under CERCLA (1998)
- Goal to Reduce
 - Lifetime Excessive Cancer Risk to 10^{-4} to 10^{-6}
 - Non-Cancer Risk to Background
- As Primary Human & Ecological Risk Driver
 - Ecological Risk – As Plus:
Sb, Cd, Cu, CN^- , Pb, Hg, Ag, Zn

Volume of Tailings

Location	Volume (yd ³)
Mine Site Processing Area	50,000
Waste Rock	120,000
Deposition Area	350,000
Lost Lake	150,000



LAVA CAP MINE SUPERFUND SITE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY • REGION IX • NOVEMBER 2001

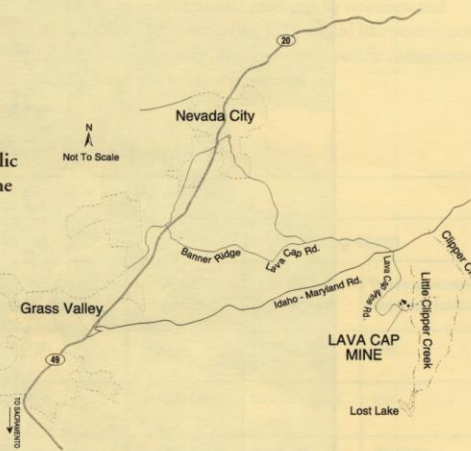
EPA Studies Cleanup Options, Seeks Public Input

After studying the degree of contamination resulting from the 1997 tailings spill from the Lava Cap Mine Superfund site (the Site), EPA has concluded that the Site presents unacceptable risks to human health and the environment. (See EPA's November 2001 Lava Cap Mine fact sheet, "Arsenic poses unacceptable risk to human health".) This fact sheet discusses the range of options EPA is considering for cleaning up contamination from the Site.

Development of Cleanup Options

EPA is beginning to study options for cleaning up the Lava Cap Mine site to reduce risks to human health and the environment. In developing cleanup options, EPA considers a number of factors including feasibility, cost, and community acceptance. **At its upcoming public meetings (see below), EPA would like to hear from the community near the site regarding some of the broad options we are considering.**

For cleanup purposes, EPA has divided the Site into several areas, including the mine property, Little Clipper Creek downstream of the mine, the Lost Lake area, and Clipper and Little Greenhorn creeks downstream of Lost Lake (see map on page 2). The exposed soils and sediments in all these areas contain elevated levels of arsenic and various metals, and all include surface water that can disturb and transport soils and sediments.



Community Meetings

EPA, in cooperation with the Banner Mountain and Greenhorn Road homeowners associations, recipients of a technical assistance grant from EPA for monitoring the work at the Lava Cap Mine site, will hold two public meetings to discuss the results of site studies to date and the plans for future work, and to consult with the community on cleanup options. EPA will make the same presentation at both meetings.

- **Tuesday, November 13, 2001**
7:00 to 9:00 pm
Nevada County Board of Realtors
336 Crown Point Circle
Grass Valley
- **Wednesday, November 14, 2001**
2:30 to 4:30 pm
Nevada County Library
980 Helling Way
Nevada City

Remediation Issues

- **Clean-Up Objective Not Yet Established**
 - ARARs (Applicable or Relevant & Appropriate Requirements) Being Evaluated
- **Drinking Water MCL Issues**
 - Recently Adopted 10µg/L Drinking Water MCL
 - Applicable to Waste-Derived As?
 - Should Use Risk-Based Clean-Up for Drinking Water Contaminated by Tailings
- **What Is the Appropriate Degree of Protection for Public Health & Environment?**
 - Will the Money Be Available to Pay for This Level of Protection?
 - Bush Administration Cuts in Superfund Budget

Preliminary Cost Estimates

by CH2MHill (2002)

Area	Cost* (million US \$)	Area	Cost* (million US \$)
Mine Buildings/Tailings & Waste Rock Pile	12	Lost Lake & Deposition Area	
Excavation & On-Site Disposal	13	Drain Lake & Cap Sediment	8.5
Excavation & Off-Site Disposal	15	Excavation & On-Site Disposal	19
Little Clipper Creek, Clipper Creek		Excavation & Off-Site Disposal with Removal of Dam	83
Capping & Channelization	1.9	Downstream of Lost Lake, Clipper Creek & Little Greenhouse Creek	
Excavation & On-Site Disposal	0.65	Excavation & On-Site Disposal	0.38
Excavation & Off-Site Disposal	0.8	Excavation & Off-Site Disposal	0.44
*Initial Cost + 50 Years Limited Monitoring & Maintenance	Total Excavation & On-Site Disposal		34
	Total Excavation & Off-Site Disposal		100

Summary of Residential and Industrial “Superfund” Soil As Clean-Up Goals by Target Risk Level

Target Risk Level	Residential Clean-up Goals			Industrial Clean-up Goals		
	Range (mg/kg)	Mean* (mg/kg)	n	Range (mg/kg)	Mean* (mg/kg)	n
1×10^{-6}	0.37 – 305	17	18	8 - 219	44	9
1×10^{-5}	30 – 250	68	5	21 - 500	65	11
1×10^{-4}	100 - 230	152	2	200 - 336	272	3

* The geometric mean was used as it best represented the central tendency of the data sets.
Source: Davis, A., Sherwin, D., Ditmars, R., and Hoenke, K., “An Analysis of Soil Arsenic Records of Decision,” Environ. Sci. Technol. **35**:2401-2406 (2001) [as corrected **35**:4396].

Arsenic Drinking Water MCL Issues

- OEHHA Recent Announcement of Risk-Based Drinking Water MCL Goal
- At US EPA Drinking Water MCL of 10 $\mu\text{g/L}$ NRC Estimates:
 - 23 in 10,000 Bladder Cancers
 - 18 in 10,000 Lung Cancers
- OEHHA Proposes Public Health Goal of 0.004 $\mu\text{g/L}$

DRAFT

For Review Only

Public Health Goal for Arsenic in Drinking Water

Prepared by

**Pesticide and Environmental Toxicology Section
Office of Environmental Health Hazard Assessment
California Environmental Protection Agency**

March 2003

Remedial Alternatives Being Considered

- **“No Action”** – Consideration Required by CERCLA
 - Not Feasible
- **Institutional Controls** – Restrict Access
 - Unreliable – Area Too Open
- **Containment**
 - Capping of Existing As-Polluted Tailings Areas
 - Excavation of Tailings & Tailings-Contaminated Areas
 - Area Disposal in New Landfill
 - Out-of-Area Disposal Involves Trucking
 - Treatment of Soils to Immobilize As
 - None Promising

Long-Term Protection Issues

- **Capping with RCRA Landfill Cap & Containment in Landfill (Clay/Plastic-Sheeting-Composite Lined Landfill)**
 - Will Eventually Fail to Prevent As-Containing Leachate from Polluting Groundwater
 - Only Delays Further Groundwater Pollution & Possible Surface Water Pollution
 - Cannot Reliably Monitor Leakage of Liner
- **Landfills Can Be Developed to Provide Greater Possibility of *ad infinitum* Containment**
 - Doubles the Cost
 - Need Long-Term Funding for Monitoring & Maintenance
 - Unreliable Funding under RCRA
 - Need to Develop Dedicated Trust of Sufficient Magnitude to Address All Plausible Worst-Case Scenario Failures



For Additional Information



■ **US EPA URL**

<http://yosemite.epa.gov/r9/sfund/overview.nsf/1732d58ebf3fa5cb882568170079a102/0910a102/09>

■ **SYRCL**

<http://www.syrcl.org/majorissues/majorissues-arsenic.asp>

For Further Information, Contact

■ **G. Fred Lee & Associates**

gfredlee.com, www.gfredlee.com