Mr. Ken Wangerud  
Remedial Project Manager  
U.S. EPA Region VIII  
999 18th Street, Suite 500  
Denver, CO  80202-2405

Subject: Smelter Site Reconnaissance Report for Smelter Site Investigation Work Plan  
California Gulch Site, Leadville, CO  
Project No. 22909E (T2310)

Dear Mr. Wangerud:

In response to EPA's request, ASARCO has prepared the enclosed Smelter Site Reconnaissance Report. Smelter Site Reconnaissance was one part of work conducted under the Smelter Site Investigation Work Plan, California Gulch Site, Leadville, Colorado, August 1991 (Smelter Work Plan). In order to provide EPA with information concerning smelter-related wastes and building materials observed at former historic smelter sites, this report has been prepared in advance of the Smelter Site Remedial Investigation Report. This report will be included as a section in the Smelter Site Remedial Investigation Report.

This report, which presents a site-by-site reconnaissance summary of the seventeen historic locations of smelting facilities identified during the historic literature review, focuses on smelter-related wastes and building materials observed at some of the historic sites. Information on slag has been forwarded to the Denver and Rio Grande Railroad Co.

Fifteen of the seventeen sites were observed and described by Woodward-Clyde Consultants (WCC) personnel and EPA auditors; however, two locations of small
smelters that operated for less than one year were not visited due to access restrictions. The description for each site includes location, years in operation, observed remaining smelter building materials or structures, and comments on the nature and location of observed smelter-related waste.

If you have any questions, call me at (303) 279-2645.

Sincerely,

Glenn L. Anderson
Environmental Superintendent

Enclosure

(4 copies sent)

2c: Mr. Russ Allen; Colorado Department of Health
Ms. Mary Capdeville; Colorado Dept. of Law
Mr. Jeff Lewis; ASARCO
Ms. Janet Campbell; Roy F. Weston, Inc.

1c: Mr. Ron Eddy; Sherman & Howard
Mr. Earl Madsen; Bradley, Campbell, Carney & Madsen
Mr. Dave Baker; Resurrection Mining
Mr. M.G. Lee; ASARCO, Leadville, Colorado
Mr. Larry Drew; HECLA
Ms. Kathleen Snead; Denver & Rio Grande Western
Ms. Betsy Temkin; Ballard, Spahr, Andrews, & Ingersoll
Ms. Charlotte Nietzel; Holme Robert & Owens
Mr. John F. Shepherd; Holland and Hart
Mr. Sherman J. Worthington; Water, Waste & Land, Inc.
Dr. Jonathan S. Callender; Adrian Brown Consultants
Mr. Jim Walsh; James P. Walsh & Associates
Ms. Anne Viegel; Monison-Knudsen Environmental

File
SMELTER SITE
RECONNAISSANCE
CALIFORNIA GULCH SITE
LEADVILLE, COLORADO

Prepared for
ASARCO, Incorporated
Leadville, Colorado
April 1992

Woodward-Clyde
Woodward-Clyde Consultants
4582 South Ulster Street,
Stanford Place 3, Suite 1000
Denver, Colorado 80237

22909E-T2310
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 INTRODUCTION</td>
<td>1-1</td>
</tr>
<tr>
<td>2.0 FIELD SITE RECONNAISSANCE</td>
<td></td>
</tr>
<tr>
<td>2.1 MALTA SMELTER</td>
<td>2-1</td>
</tr>
<tr>
<td>2.2 LIZZIE SMELTER</td>
<td>2-1</td>
</tr>
<tr>
<td>2.3 CALIFORNIA SMELTER</td>
<td>2-2</td>
</tr>
<tr>
<td>2.4 WESTERN ZINC</td>
<td>2-2</td>
</tr>
<tr>
<td>2.5 ARKANSAS VALLEY SMELTER</td>
<td>2-2</td>
</tr>
<tr>
<td>2.6 AMERICAN SMELTER</td>
<td>2-3</td>
</tr>
<tr>
<td>2.7 LA PLATA SMELTER</td>
<td>2-3</td>
</tr>
<tr>
<td>2.8 GRANT/UNION SMELTER</td>
<td>2-3</td>
</tr>
<tr>
<td>2.9 LEADVILLE SMELTER</td>
<td>2-4</td>
</tr>
<tr>
<td>2.10 HARRISON REDUCTION WORKS</td>
<td>2-4</td>
</tr>
<tr>
<td>2.11 ADELAIDE SMELTER</td>
<td>2-4</td>
</tr>
<tr>
<td>2.12 LITTLE CHIEF SMELTER</td>
<td>2-5</td>
</tr>
<tr>
<td>2.13 OHIO AND MISSOURI SMELTER</td>
<td>2-5</td>
</tr>
<tr>
<td>2.14 CUMMINGS AND FINN SMELTER</td>
<td>2-5</td>
</tr>
<tr>
<td>2.15 GAGE-HAGAMAN SMELTER</td>
<td>2-5</td>
</tr>
<tr>
<td>2.16 THE RAYMOND, SHERMAN AND MCKAY SMELTER</td>
<td>2-6</td>
</tr>
<tr>
<td>2.17 ELGIN SMELTER</td>
<td>2-6</td>
</tr>
<tr>
<td>3.0 SITE RECONNAISSANCE SUMMARY</td>
<td>3-1</td>
</tr>
</tbody>
</table>
TABLE OF CONTENTS (Concluded)

LIST OF FIGURES

FIGURE 2-1  SMELTER SITE INVESTIGATION HISTORIC SMELTER LOCATIONS
FIGURE 2-2  MALTA SMELTER, BRICKS AND MORTAR
FIGURE 2-3  WESTERN ZINC, DUST AND BRICKS
FIGURE 2-4  ARKANSAS VALLEY SMELTER, ROASTING OVENS AND BRICKS
FIGURE 2-5  ARKANSAS VALLEY SMELTER, BINS AND POSSIBLE DUST AREA
FIGURE 2-6  AMERICAN SMELTER, VIEW ALONG FURNACE LOCATIONS
FIGURE 2-7  LA PLATA SMELTER, FOUNDATION MATERIAL
FIGURE 2-8  HARRISON REDUCTION WORKS, SLAG
FIGURE 2-9  ELGIN SMELTER, AREA OF DUST BINS AND OBSERVED DUST
The objectives of the smelter site reconnaissance were (1) to locate in the field the smelter sites identified in Task 1 of the Smelter Work Plan California Gulch Site Leadville, Colorado dated August 1991, and (2) to document areas of observed smelter waste visually apparent at each site. This task (Task 2) involved visual inspection only. No subsurface probing or sampling was conducted.

On August 26, 27, and 28 a Woodward-Clyde Consultants (WCC) field team performed field reconnaissance to locate the above mentioned sites. The location of smelter sites and evidence of wastes associated with bag houses, dust chambers, sludge pits, waste rock piles, and pits from the smelter operation were noted. Building material debris and other evidence that structures previously existed at each smelter site were noted. Slag was observed at historic smelter locations and other locations throughout the area. In some cases, it was apparent that the slag was associated with a particular historic smelter location, but this association was not clear in many cases.

Pictures were taken of each site in order to provide additional documentation. Photographs depicting smelter-related wastes included in this report will be presented in the final smelters remedial investigation (RI) report.
2.0 FIELD SITE RECONNAISSANCE

The field site reconnaissance used information from the historical literature review to guide efforts to locate historic smelter sites in Leadville. Fifteen sites out of a possible seventeen sites were visited. Two sites (Gage-Hagaman Smelter and Raymond, Sherman and McKay Smelter) were not visited due to access restrictions. The historic information used to establish that there were seventeen sites will be found in the historic literature section of the Smelter Site Remedial Investigation Report. The Smelter Site Investigation Historic Smelter Locations map (Figure 2-1) shows the location of each smelter site.

WCC personnel and EPA auditors visited each smelter site for which access was granted. A second confirmation visit was made to eleven of the sites, and included two cultural resource specialists as part of the observation team to assist in site documentation. Details for each smelter site are discussed below.

2.1 MALTA SMELTER

The Malta Smelter was located near the mouth of California Gulch. The smelter operated discontinuously during the period from 1875 to 1880. Three tiers in the soil were found corresponding to the three levels on which the Malta smelter facility was constructed. Little evidence of this facility remains. Some fire bricks were observed near a pit (Figure 2-2). Bricks and minor amounts of slag were also located immediately east of the site.

2.2 LIZZIE SMELTER

Historical records indicated that the Lizzie Smelter was located near the Malta Smelter in Malta. The smelter operated periodically from 1876 to 1879. Little evidence of the smelter’s existence remains except for two pits observed east of the old school house. Building materials including mortar and a few bricks were found in and near the pits.
The area appears to have been frequently disturbed and was littered with recent trash. With the exception of building material (a few bricks), no smelter-related waste was observed at this location.

2.3 CALIFORNIA SMELTER

The California Smelter was located south of the Arkansas Valley smelter. The former location of the California Smelter appears, based on historical records, to be buried under the slag pile now to the west of the Arkansas Valley Smelter. No waste or building material related to the California Smelter could be identified.

2.4 WESTERN ZINC

Western Zinc was located near the crossing of the Denver and Rio Grande Railroad and the Colorado Midland Railroad. The reverberatory furnaces were in operation periodically during the period from 1914 to 1926. Building materials including the foundations and many bricks from the reverberatory furnaces were located, with four or more types of fire bricks identified. A coating was noted to be present on the fire bricks. The locations of ore bins or dust bins were observed at this site. Columnar-shaped pieces of consolidated dust were found north of the bin areas with the impression of bag material imprinted in the hardened dust, and one piece of the consolidated dust still had bag material attached. Figure 2-3 shows dust and bricks at the Western Zinc site. This material was identified to be sampled.

2.5 ARKANSAS VALLEY SMELTER

The Arkansas Valley Smelter remains are located in lower California Gulch west of the Leadville city limits. This smelter was in operation at varying production levels discontinuously from 1879 to 1960. Much of the smelter structure still exists. The location of bag houses, dust chambers, roasting ovens, and vault buildings were compared with historic site maps and were noted. The waste and building materials noted at the site includes dust, bricks, and slag. There is evidence that the site has been extensively reworked after the smelter shut down. Therefore, it was not possible to
define exact boundaries for locations of the various kinds of waste. Figure 2-4 shows roasting ovens and bricks. Figure 2-5 shows bins and a possible dust area.

2.6 AMERICAN SMELTER

The American Smelter was located on the northern bank of California Gulch near the La Plata Smelter. This smelting facility was in operation periodically during the period from 1879 to 1893. Furnace areas were located. Evidence of waste and building materials associated with the furnaces was noted. Bricks and possible dust areas were found, and the slag pile was located. Figure 2-6 is a view (east) showing the location of the American furnaces. No specific areas were identified for dust sampling.

2.7 LA PLATA SMELTER

The La Plata Smelter was located on Elm Street just west of the Leadville city limits. The smelter was in operation periodically from 1878 to 1900. Concrete with residue on it, which may have been a remnant of a foundation or part of a furnace, was found (Figure 2-7). Cemented slag may have been used as foundation materials. In an area where a historic floorplan of the facility indicated the dust capture area may have existed, a fine-grained material (possibly dust) was noted. However, the fine-grained material was mixed with soils and could not, on visual inspection, be identified as smelter-related dust. The roads adjacent to the site are paved with slag. Bricks were observed in the bottom of a pit. Substantial recent garbage, including paper, rusted metal, and glass, was evident. It was difficult to visually ascertain with certainty the location of dust at the La Plata site, given the recent garbage and the amount of time that has elapsed since the smelter was closed.

2.8 GRANT/UNION SMELTER

The Grant/Union Smelter was located on the northern bank of California Gulch west of Leiter Avenue. The smelter was in operation periodically from 1879 to 1900. Slag was the only waste material observed at this site. Slag information was forwarded to the Denver and Rio Grande Railroad Co. for their slag program. There was slight evidence of old foundations in California Gulch. A new building is present on the site and other
evidence of recent construction and reworking of the area was observed. As a result of these activities which occurred subsequent to the close of the Grant/Union smelter, original waste locations are not evident. Other than slag, no waste related to the Grant/Union Smelter could be identified.

2.9 LEADVILLE SMELTER

The Leadville Smelter was located just west of the Leadville city limits on Elm Street. The smelter operated periodically from 1877 to 1880. No visible evidence of this smelter or associated structures exists. On the basis of the historic description of the site location, the former smelter location appears to currently be occupied by houses and a football field. Some pieces of slag were observed along the road in a vacant area.

2.10 HARRISON REDUCTION WORKS

The Harrison Reduction Works was located on the corner of Harrison and Elm Streets. The smelter operated periodically from 1877 to 1893. Wastes that were associated with this facility were noted during the site visit. Slag piles as shown in Figure 2-8 were located. Also, possible locations of furnaces were observed along with dust bins and associated fine, dusty material. Adjacent to the furnace locations, ash or dust piles and small slag piles were observed. Extensive reworking of the area subsequent to closure of the facility has made it unclear whether the features and wastes observed are in their original positions, or whether the dust and slag have been scattered and mixed around the site. Slag information was forwarded to the Denver and Rio Grande Railroad Co. for their slag program.

2.11 ADELAIDE SMELTER

The Adelaide Smelter was located at the head of Stray Horse Gulch on Iron Hill near the Adelaide Mine. This smelter began operation in January 1879 and terminated operation in August 1879. Brick walls, possibly associated with the smelter foundations, and pits were noted. Minor amounts of slag were observed at this site. Field evidence did not clearly establish this as the smelter location because it is also possible that,
subsequent to closing and dismantling the smelter, the site may have been buried beneath mine waste from the Adelaide Mine.

2.12 LITTLE CHIEF SMELTER

The Little Chief Smelter was located on Fryer Hill immediately above the Little Chief Mine. The smelter operated from July 1879 to early 1880. Little evidence remains of the smelter. No fire bricks remain. The historic records indicate that the foundation was sinking, so the smelter was torn down. Small slag piles were observed in the location believed to be where the blast furnaces had been located. The most obvious waste associated with this site is slag. Other types of waste or building materials were not clearly evident.

2.13 OHIO AND MISSOURI SMELTER

The Ohio and Missouri Smelter was located in Big Evans Gulch. The smelter was operated intermittently from June 1879 to December 1880. Little evidence of the existence of a smelter was observed. An angular group of rocks, which may have been a furnace site, was observed on the northeast end of the area. Slag and two small pits containing small amounts of brick building material debris were noted.

2.14 CUMMINGS AND FINN SMELTER

The Cummings and Finn Smelter was located in Big Evans Gulch. This was a small smelting operation, operated periodically from July 1879 to 1885. Only slag remains as evidence of this smelter's existence at this site.

2.15 GAGE-HAGAMAN SMELTER

The Gage-Hagaman Smelter was located in Big Evans Gulch and operated from May 1879 to December 1880. The location of this smelter is on private property, with no access permitted; therefore, this site was not visited. From a distance, no evidence of the smelter could be seen. With concurrence of EPA auditors, and given that the smelter was of similar capacity to the Cummings and Finn Smelter and operated for a
brief period of time, it was decided to use historical information to map the site location for purposes of modeling historic smelter emissions.

2.16 THE RAYMOND, SHERMAN AND MCKAY SMELTER

The Raymond, Sherman and McKay Smelter was located in Big Evans Gulch. The smelter was in operation from July 1879 to December 1879. This smelter was also on private property with no access permitted. As with the Gage-Hagaman smelter, the site reconnaissance used information from the historical literature review to locate this site. Given that the smelter was of similar size to Cummings and Finn and operated for a very brief period of time, it is assumed that it generated little waste that would still be evident 112 years after closure of the facility. With concurrence of EPA auditors, it was decided to use historical information to map the facility for modeling purposes.

2.17 ELGIN SMELTER

The Elgin Smelter was located on Big Evans Gulch. The smelter was in operation periodically from 1879 to 1903. Several features associated with the smelter facility and smelter waste were noted at this site. Red bricks and fire bricks, which were building materials associated with foundations and furnaces, were observed. The area of the furnaces was noted. The lower foundation area is likely to have been the location for the engines and pumps. Thick rock walls associated with the gas house location were observed at the end of the furnace area. The area shown on historic plans to be the location of the dust bins was observed (Figure 2-9), and in that area, dust with bag material was observed and photographed. Fine-grained, water-cooled slag material was observed at both ends of the site.
Color Photo(s)

The following photos contain color that does not appear in the scanned images.
To view the actual images please contact the Superfund Record Center at (303) 312-6473.
Figure 2-2. Malta Smelter, bricks and mortar

Figure 2-3. Western Zinc, dust and bricks
Figure 2-4. Arkansas Valley Smelter, roasting ovens and bricks

Figure 2-5. Arkansas Valley Smelter, bins and possible dust area.
Figure 2-6. American Smelter, view along furnace locations

Figure 2-7. La Plata Smelter, foundation material
Figure 2-8. Harrison Reduction Works slag

Figure 2-9. Elgin Smelter, area of dust bins and observed dust.
The reconnaissance of seventeen smelter sites in California Gulch, Leadville, Colorado was conducted by WCC personnel and EPA auditors following a historical review of each site. Attempts were made to visit all of the seventeen smelter locations. Fifteen sites were visited. Two of the sites were not visited due to restricted access. The following smelter sites were observed to have some form of smelter-related waste and/or building materials.

- Malta Smelter - bricks, minor amounts of slag
- Lizzie Smelter - a few bricks
- Western Zinc - fire bricks, hardened dust
- Arkansas Valley Smelter - dust, bricks, slag
- American Smelter - dust, bricks slag
- La Plata Smelter - bricks, slag, possible dust
- Grant/Union Smelter - slag
- Harrison Reduction Works - slag, possible dust
- Adelaide Smelter - minor amounts of slag
- Little Chief Smelter - minor amounts of slag
- Ohio and Missouri Smelter - slag, bricks
- Cummings and Finn Smelter - slag
- Elgin Smelter - dust, bricks, slag

Several of the sites had little or no remaining physical evidence, except for minor amounts of slag, due to their small size, short-lived operations, subsequent activities in the areas in question, and the number of years that has elapsed since they last processed ore.