APPENDIX A
ASARCO EAST HELENA FACILITY
OPERATIONAL SUMMARY

This appendix provides a description of the former smelter operations, and a tabulated summary of completed remedial activities. This information supplements the Facility and Project background information provided in Section 1.0 of the text.

HISTORIC FACILITY OPERATIONS

The East Helena Plant was a custom lead smelter that recovered lead and other metals from ore, ore concentrates and secondary materials using pyrometallurgical processes. The smelter operations consisted of:

1. receiving feed stocks via railcar or truck;
2. various stages of mixing, blending and proportioning;
3. producing a roast (sinter);
4. smelting; and
5. final shipment of product to off-site locations.

As part of the process of smelting lead ores, several commercial byproducts of lead production were produced, including sulfuric acid and matte and copper enriched speiss. Slag was produced as a byproduct of the smelting process. Process and fugitive air emissions were captured by state-of-the-art air control devices including baghouses, electrostatic precipitators, and dust enclosures.

The following discussion of former smelter operations is taken largely from the 1999 Current Conditions/Release Assessment (CC/RA) Report for the East Helena Facility.

Administrative Buildings and Infrastructure

Administrative Buildings that supported the operation, administration and production operations were located on the northwest corner of the facility. Administration buildings and infrastructure include: the administrative office building, employee changehouse, medical office, powerhouse, and maintenance buildings. The administrative office building was demolished and the area capped as part of 2006 demolition activities.

Maintenance Buildings including the paint shop, welding shop, various storage buildings, and locomotive repair shop are located in close proximity to the administration office buildings. Maintenance buildings also include a machine shop, blacksmith shop, carpentry shop, and warehouse located within the main Plant facility area southeast of the blast furnace, some of which have been removed.

Materials Handling

The first steps in material handling involved the unloading, sampling, storage, crushing, blending, mixing, and proportioning of incoming feed material. The outside ore storage area was used to store certain fluxes, fuels, and byproducts used in or produced by the smelting process. All fluxes and secondary materials were stored on a concrete pad with the exception of limerock, coke, and silica-based material.

Sediments dredged from the Lower Lake area were also stored on this concrete pad and covered with an impermeable geotextile fabric. Historically, excavated soils generated from on-site construction activities were stored off the concrete pad in the ore storage area. The thawhouse was used to thaw frozen feed materials, typically contained in solid bottom railcars, prior to unloading the material in the concentrate storage and handling building (CSHB). The direct smelt building (DSB), located in the central portion of the plant, was used to store feed materials that could be direct charged to the blast furnace.

Materials Processing

Sintering consisted of roasting a mixture of moistened concentrates, flux, and fuel on a bed of traveling grates to reduce the sulfur content in the unprocessed ore concentrate and produce a

porous agglomerated material (sinter) acceptable for the blast furnace smelting process. The former sinter plant (demolished in 2006) was located south of the CSHB on the west side of the facility.

Sinter produced during the sintering operation was combined with coke and other direct charge materials and placed in a charge car which was hoisted by cable to the top of the blast furnace. The blast furnace, formerly located in the center of the plant site and demolished in 2008, was a water-jacketed rectangular column in which the charge was smelted.

Lead bullion produced at the blast furnace operation was transported to the dross plant, formerly located north of the blast furnace and demolished in 2007, for further processing. At the dross plant, the lead bullion was cooled causing a copper bearing material, called dross, to separate and float to the surface. The dross was skimmed off the lead bullion and transported to the reverberatory furnace (demolished in 2007). At the reverberatory furnace, the dross was further refined by separating the copper bearing materials, called matte and speiss, from the entrained lead.

Slag was generated as a byproduct of the blast furnace operation. The slag was stored in the northeast corner of the plant site forming the existing slag pile in this area.

Process and Ventilation Gas Control

Process and ventilation gas control involved several different pieces of equipment. The strong process gas generated in the sintering process was controlled by an electrostatic precipitator, open and packed scrubbers, and a mist precipitator prior to being directed to the sulfuric acid plant (demolished in 2008). Weak ventilation gases were controlled by the high efficiency baghouse (demolished in 2008) prior to being exhausted to the Sinter Plant stack (demolished in 2009). In some instances, both process and ventilation gas were controlled by high efficiency baghouses. Strong gases from the sinter plant were drawn through an electrostatic precipitator which removed 99% of the particulate. Scrubbers and mist precipitators aided in the removal of the remaining particulates to produce an optically clear gas.

Surface Water Features Used in Plant Operations

Upper Lake receives flow from a diversion on Prickly Pear Creek immediately south of the plant site. Upper Lake provided plant make-up water and currently supplies irrigation water to Wilson Ditch on a seasonal basis. There were no discharges to Upper Lake from Plant site facilities.

Lower Lake, with a storage capacity of approximately 22 million gallons since sediment dredging (completed in 1996), is a man-made pond formed in the 1940's by cutting off the northern portion of Upper Lake with a earthen berm. Prior to 1990, Lower Lake served as a storage/recirculation pond for plant process waters. In 1990, two one-million gallon steel storage tanks and associated concrete secondary liner were constructed to replace Lower Lake in the process water circuit. Sludges and sediments were dredged from Lower Lake in the mid 1990s and ultimately placed in the Phase I CAMU cell.

FACILITY REMEDIATION ACTIVITIES

In September 1984, the U.S. Environmental Protection Agency (EPA) listed the East Helena Facility on the National Priorities List (NPL) pursuant to Section 105 of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). In December 1990 (and subsequent dates for amendments), a Consent Decree executed by ASARCO, EPA, and the United States Department of Justice was entered into for the East Helena Facility. This Consent Decree addresses remediation of the Process Ponds operable unit and requires Asarco to perform the work specified in the Record of Decision, issued in November 1989, and the Comprehensive Remedial Design and Remedial Action Work Plan for the Process Ponds operable unit.

From 1984 through 1997, Remedial Actions conducted on the plant-site consisted of either voluntary actions initiated by Asarco or actions implemented as part of CERCLA activities (Table A-1). Remedial activities during this period included, but were not limited to:

- Replacing the former Lower Lake process pond with two one-million gallon process water storage tanks;
- Sealing of a concrete pad used for temporary storage of sediments to be dredged from Lower Lake;
- Dredging of Lower Lake sediments;
- Construction of process water treatment facilities;
- Removing the acid plant sediment drying pads and underlying soils;
- Construction of storm water collection facilities;
- Smelting a portion of stored sludges and sediments in the smelter process, with the remaining material placed in the Corrective Action Management Unit (CAMU) Phase 1 Cell;
- Removing and replacing the speiss granulation pond and pit with tanks and new processes;
- Constructing the acid plant water reclamation facility; and
- Removal of Thornock Lake sediments.

As part of the Post-RI/FS studies, monitoring of groundwater and/or surface water continues on a quarterly basis at the Asarco facility.

In 1997, EPA initiated a transfer of responsibility for on-going remedial activities at the Asarco East Helena Facility from its CERCLA program to its "corrective action" program under the Resource Conservation and Recovery Act (RCRA). A Consent Decree effective May 5, 1998 between EPA and Asarco (U.S. District Court, 1998) initiated the corrective action process in accordance with the RCRA program. As part of the Consent Decree, Asarco prepared a RCRA Current Conditions/Release Assessment (CC/RA) Report to assess the completeness and quality of the existing data used to define, in whole or in part, the nature and extent of any hazardous waste and hazardous constituent releases, if any, at or migrating from the facility.

Based on its review of the RCRA CC/RA, EPA determined interim measures were to be implemented for groundwater, the acid plant, Lower Lake sediments and other stockpiled soils. In response to the EPA request, a RCRA Interim Measures Work Plan was prepared and implemented between 1999 and 2001, and several IM Work Plan Addenda (IMWPAs) prepared between 2002 and 2009. These IMWPAs address supplemental characterization and interim remedial actions for surface and subsurface soils and groundwater. Recent Interim Measures have focused on source control efforts to eliminate or reduce sources of arsenic and metals to groundwater. Initial source control measures were developed and implemented from 1999 through 2000 in accordance with the IM Work Plan, and included: evaluation of surface runoff patterns; evaluation of runoff containment and conveyances; and evaluation of subsurface soils and groundwater in the speiss handling area, the acid plant area, and in the former acid plant water treatment facility.

Recent source control measures were implemented in 2006 and 2007 in accordance with IMWPA. These actions consisted of construction of slurry walls in the former acid plant sediment drying area, and the former speiss-dross area. The slurry wall areas were subsequently capped to prevent infiltration and to achieve complete isolation of these source

areas, which have been identified as the primary sources of arsenic and metals in groundwater. All remediation actions at the Facility are summarized in Table A-1.

TABLE A-1. SUMMARY OF REMEDIATION-RELATED ACTIVITIES COMPLETED AT THE ASARCO EAST HELENA FACILITY

Date	SURFACE SOILS AND ORE STORAGE AREA	LOWER LAKE	FORMER THORNOCK LAKE	FORMER SPEISS SETTLING POND & GRANULATING PIT	ACID PLANT WATER	ACID PLANT SEDIMENT DRYING AREA	PLANT WATER CIRCUIT	SURFACE WATER
1977 - 1988			October 1986 - Thornock Lake replaced with 93,000 gal. steel tank. 1986 through 1987 - Soil excavated from Thornock Lake Area.	Fall 1988 - Speiss Pond lined with HPDE.		1977 through July 1991 - Acid plant sludge (sediments) sent to sediment drying pad for dewatering.	1988 - Plant water balance study initiated as part of RI/FS.	
1989	Construction of new ore storage building. Shallow soils removed and stored in lower ore storage area, deeper soils consolidated in berm along southeast corner of the storage yard.	October - December 1989 - Bench scale testing for the treatment of Lower Lake water.		Constructed new Speiss settling tank with secondary leak detection to replace Speiss Pond. Soils excavated to 20 ft under portion of former Speiss Pond. 2,500 CY of excavated soil stockpiled in the outside ore storage yard area for future smelting.		1988-89 - Soil samples collected from backhoe pits in area between Upper and Lower Lakes and east of acid plant sediment drying pad.	1989 - Plant water balance study indicates extraneous water gains.	
1990	MAY 1990 - New ore storage building began operation.	1990 - Regular direct discharge of plant water to Lower Lake discontinued following installation of storage tanks. Occasional discharge of excess water from tanks to Lower Lake. January - September 1990 - Pilot scale testing for in-situ treatment of Lower Lake water.				DECEMBER 1990 - Monitoring well DH-29 found buried in acid plant sludge during post RI monitoring.	1990 - Installed two, 1 mgal plant water storage tanks.	
1991		October 1991 - Bottom sediment core samples collected from Lower Lake.	November 1991 - Additional excavation of soils from former Thornock Lake area. 407 CY of excavated soils smelted.	April 1991- Water granulation of Speiss replaced with air granulation.	April 1991 - Eliminated wooden trough fluid transport system and settling dumpsters reducing water losses. Settling pond remained in service.	July 1991 - Acid plant sediments removed from former sediment drying pad between Upper and Lower Lakes. Dried acid plant sludge placed near acid plant water treatment facility.	April 1991 - Additional process water gains occur as a result of remediation activities at acid plant facility. December 1991 - Reduction in plant circuit gains. Repaired and replaced pipes, reduced bleeder valves. New plant water balance study indicates net gain of about 40 GPM.	
1992	November 1992 - Monitoring well DH-8 in lower ore storage yard is damaged.	April 1992 - Additional bottom sediment core samples collected from Lower Lake.		October 1992 - Completed Speiss pond remediation consisting of demolition of remaining pond and adjacent soil removal. Exposed leaking plant water drain line south of Speiss pit during remediation. Drain line temporarily repaired.	November 1992 - Completed acid plant water reclamation facility goes on-line.	November 1992 - Practice of placing acid plants sediments on outside drying pad discontinued following completion of acid plant water reclamation facility.		
1993		April 1993 - Construction of HDS plant started. May 1993 - Acid plant reclaim water is discharged to Lower Lake during interim period prior to HDS plant start-up. August 1993 - Lab testing of Lower Lake sediment dewatering is completed. November 1993 - Large scale dredging and dewatering pilot testing of Lower Lake sediments.		April 1993 - Additional temporary repairs to drain line south of Speiss pit. May 1993 - Placement of new drain lines in Speiss pit Area. Plant water drain line south of Speiss pit permanently repaired. August 1993 - Concrete cap poured over backfill material in former Speiss pond area.	February 1993 - Acid plant settling pond is demolished. May 1993 - Soil excavation and backfill of acid settling pond us completed.	September 1993 - Former acid plant drying pad is sealed.	May 1993 - New plant water drain lines and wet well installed in Speiss pit area.	
1994		January 1994 - HDS water treatment comes on-line. All untreated plant water discharges to Lower Lake cease. May 1994 - Dredging of Lower Lake sediments begins. November 1994 - Winter shutdown of lower lake dredging.				1994 - A belt filter press is set up in former acid plant sediment drying area to dewater dredged Lower Lake sediments. Dewatered sediments are hauled to lower ore storage yard for temporary storage.		
1995		April 1995 - Spring startup of Lower Lake dredging. November 1995 - Winter shutdown of Lower Lake dredging.		June-July 1995 - Construction of new Dross Reverberatory Furnace building and Speiss Granulating pit. July 1995 - Old Speiss pit removed. Soil excavated beneath pit to 17' depth (235 CY removed). August 1995 - Concrete cap placed over backfilled Speiss pit-area.		1995 - Belt filter used to dewater dredged Lower Lake sediments in sediment drying area. Dewatered sediments stockpiled in lower ore storage yard.		
1996		June 1996 - Spring startup of Lower Lake dredging. August 1996 - Lower Lake dredging completed. October 1996 - Start of HDS Treatment Plant optimization improvements. November 1996 - MPDES permit issued for HDS plant discharge.				1996 - Dewatering of dredged Lower Lake sediments is completed. Demobilization of belt filter presses and related equipment from area. August - September 1996 - Shallow bore holes drilled and soil samples collected from beneath former sediment drying pad.		1996 - Switch to use of Upper Lake Water rather than Lower Lake water for dust control.

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1997	October 1997 - Geomembrane cover is installed over stockpiled Lower Lake sediments as a temporary cover.	March 1997 - HDS treatment plant optimization improvements completed. November 1997 - Modified MPDES permit issued for HDS plant discharge with final limits established for Pb, Hg, T1, Sb (limits become effective in 1998 and 1999).			February 1997 - 1200 gallon sulfuric acid spilled at acid plant decolorization building. February 15, 1997 - 20 gallons of scrubber blowdown water discharged from open packed scrubber pray tower. 10 gallons released to the environment. September 1997 - Rebricked scrubber sump at acid plant and installed secondary containment around scrubber complex. November 30, 1997 - Sulfur trioxide emission release.		December 1997 - Water proofing begins on plant water pump house to reduce groundwater inflow.	May-June 1997 - Wilson Ditch is rerouted around plant site. June - December 1997 - Plant stormwater system improvements are constructed.
1998		March 1998 - Zeolite pilot test for thallium removal in HDS effluent completed. Unsuccessful removal. April 1998 - ASARCO contacts MDEQ concerning final MPDES limits. MDEQ grants ASARCO 6 months of feasibility testing for technology to remove T1 and Sb.			January 5, 1998 - 450 gallons of acid plant scrubber/blowdown water. Released in acid plant scrubber area. January 27, 1998 - 500 gallons of sulfuric acid released immediately west of acid plant decolorization building. January 28, 1998 - 300 gallons of sulfuric acid released to soil adjacent to sump. April 21, 1998 - 400 gallons of sulfuric acid released from broken acid plant transfer line. April 21, 1998 - 400 gallons of sulfuric acid released from acid plant transfer line. June 2, 1998 - 100-200 gallons of acid plant scrubber water released from acid plant water treatment area. August 13, 1998 - 1500 gallons of acid plant cooling water released from underground pipe leak. September 23, 1998 - 10 gallons of sulfuric acid released from acid plant decolorization building. October 3, 1998 - 30-50 gallons of sulfuric acid released from acid plant pump tank building. October 8, 1998 - 30 gallons of sulfuric acid released from acid plant tail gas stack base. October 12 - 13, 1998 - 5.1 and 10.4 pounds of arsenic released to Lower Lake from the HDS water treatment plant. November 20, 1998 - 200-300 gallons of sodium bisulfite solution discharged from the acid plant boiler room. December 13, 1998 - 50-75 gallons of sulfuric acid discharged to acid decolorization containment area. No acid was released to the environment. December 29, 1998 - 1000 gallons of sulfuric acid released from broken acid transfer line.		January 1998 - Water-proofing is completed on plant water pumphouse. February 1998 - Loss in plant underground circuit. Pressurized underground piping replaced with above ground system. November 1998 - 10 gallons of plant water released from broken pipe by powerhouse.	
2001						Removed soil stockpile and debris piles and place in CAMU. Cover area between Upper and Lower Lake with 12" clay soil cover, grade and compact.		
2006						Construct slurry wall and temporary cap around acid plant subsurface soils		
2007				Construct slurry wall and temporary cap around speiss-dross plant subsurface soils				
2007 - 2009	Demolition of Plant Site Structures and Facilities							