

**Table ES-1
Complete Exposure Pathway Summary**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

	C/I ^{Tot} Soil _{Comb} (mg/kg)	Res ^{Tot} Soil _{Comb} (mg/kg)	^{GW} Soil _{Ing} (mg/kg)	^{SW-GW} Soil (mg/kg)	^{Air} Soil _{Inh-VP}	^{Sed} Soil	^{Eco} Soil	^{SW} SW (mg/L)	Sed (mg/kg)	^{SW} GW (mg/L)	^{Sed} GW (mg/L)	^{GW} GW _{Ing} (mg/L)
East Mountain	X				X	X						
East Property		X	X				X					X
Plant Entrance	X									X	X	X
South Terrace Arroyo	X		X	X						X	X	X
Pond 1 Arroyo	X		X	X						X	X	X
Pond 5/6 Arroyo	X		X	X	X					X	X	X
Acid Plant Arroyo	X		X	X	X					X	X	X
PBA	X		X	X		X				X	X	X
La Calavera	X											X
Floodplain	X									X	X	X

- Notes:**
- ^{GW}GW_{Ing} = Direct ingestion of COCs in groundwater
 - ^{SW}GW = Migration of COCs in groundwater to surface water
 - ^{Sed}GW = Migration of COCs in groundwater to sediment
 - ^{Tot}Soil_{Comb} = Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate for both commercial/industrial (C/I) and
 - ^{GW}Soil_{Ing} = Leaching of COCs from soil to groundwater
 - ^{SW-GW}Soil = Leaching of COCs from soil to groundwater then discharging to surface water
 - ^{Air}Soil_{Inh-VP} = Inhalation of COCs adsorbed to fine particulate in wind-blown dust
 - ^{Sed}Soil = Entrainment of particles with COCs adsorbed and migration to fresh water sediments
 - Sed = Direct contact with COCs in sediment
 - ^{SW}SW = Direct contact with or ingestion of COCs in surface water
 - mg/kg = milligrams per kilogram
 - mg/L = milligrams per liter

Table ES-2
Summary of Soil, Groundwater, and Surface Water PCLs

Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site

	C/I TotSoil _{Comb} (mg/kg)	Res TotSoil _{Comb} (mg/kg)	GWSoil _{Ing} (mg/kg)	SW-GW _{Soil} (mg/kg)	AirSoil _{Inh-VP}	SW _{SW} PCL (Total)	SW _{GW} (mg/L)	Sed _{GW} (mg/L)	GW _{GW_{Ing}} (mg/L)
Antimony	310	15	2.7	110	NE	0.006	0.294	0.30	0.006
Arsenic	320	46	6.2	130	4,500	0.01	0.42	0.84	0.02
Barium	120,000	8,100	1,200	43,000	NE	2	82	2,056	2
Cadmium	850	51	220	2,900	11,000	0.0016	0.067	0.20	0.005
Chromium	75,000	27,000	1,000,000	1,000,000	72,000	0.1	4.2	0.1	0.1
Cobalt	270	21	9.9	9.9	2,200	0.007	0.287	1.11	0.007
Copper	39,000	550	520	890	NE	0.07	2.9	2.25	1.3
Iron	NE	NE	NE	NE	NE	NE	NE	NE	0.704
Lead	1,600	500	90	2,300	NE	0.0131	0.39	8.02	0.015
Mercury	20	8.5	4	16	22	0.0013	0.055	0.024	0.002
Molybdenum	4,500	160	73	73	NE	0.122	5	89	0.122
Nickel	8,600	840	29,000	250,000	110,000	0.32	13.1	2.24	0.49
Selenium	4,900	310	1.1	4.8	NE	0.005	0.21	0.83	0.05
Thallium	NE	NE	NE	NE	NE	0.00012	0.005	NE	0.002
Zinc	250,000	9,900	120,000	95,000	NE	1.05	44	18	7.3
PCBs	7.1	1.1	5.3	NE	47	NE	NE	NE	NE
Fluoride	NE	NE	NE	NE	NE	4	168	NE	8.3
Nitrate	NE	NE	NE	NE	NE	10	420	NE	10
Nitrite	NE	NE	NE	NE	NE	1	42	NE	1

Notes:

GW_{GW_{Ing}} = groundwater PCL

SW_{GW} = groundwater-to-surface water

Sed_{GW} = groundwater-to-sediment

TotSoil_{Comb} = Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate for both commercial/industrial (C/I) and Residential (Res) scenarios. Res scenario also includes ingestion of COCs taken up in home-grown fruits vegetable routes of exposure

GW_{Soil_{Ing}} = Leaching of COCs from soil to groundwater

SW-GW_{Soil} = Leaching from soil to groundwater then discharging to surface water

AirSoil_{Inh-VP} = Inhalation of COCs adsorbed to fine particulate in wind-blown dust

mg/kg = milligrams per kilogram

mg/L = milligrams per liter

NE = Not established

**Table ES-3
Protective Concentration Level and Response Action Summary by Assessment Area**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

Assessment Areas	TRRP PCLs / Pathways	Response Action
East Mountain	a. ^{Tot} Soil _{Comb} - C/I Direct Contact w/Soil	a. Institutional Control/Statistical Compliance
	b. ^{Air} Soil _{INH-VP} - Res Off-site Inhalation Fugative Dust	b. PCL Compliance
	c. ^{Sed} Soil Entrainment Soil in Stormwater	c. Stormwater BMPs
East Property	a. ^{Tot} Soil _{Comb} - Res Direct Contact w/Soil	a. Removal / Institutional Control (Eco, C/I)
	b. ^{GW} Soil _{ING} Leaching from Soil to Groundwater	b. PMZ / Institutional Controls
	c. ^{Eco} Soil Direct Contact with Soil	c. Removal / Risk Assessment / Statistical Compliance
	d. ^{GW} GW _{ing} Ingestion of Groundwater	d. PMZ / Institutional Controls
Plant Entrance	a. ^{Tot} Soil _{Comb} - CI Direct Contact w/Soil	a. Removal / Institutional Controls
	d. ^{GW} GW _{ING} Ingestion of Groundwater	d. PMZ / Waste Control Unit / Institutional Controls
	c. ^{SW} GW Groundwater Discharge to Surface Water	c. Capping / Drainage Improvement / PCL Compliance
	e. ^{SW} GW Groundwater Discharge to Surface Water	d. Capping / Drainage Improvement / PCL Compliance
South Terrace Pond 1 Pond 5/6 Acid Plant	a. ^{Tot} Soil _{Comb} - CI Direct Contact w/Soil	a. Capping / Institutional Controls
	b. ^{GW} Soil _{ING} Leaching from Soil to Groundwater	b. PMZ / Waste Control Unit / Institutional Controls
	c. ^{SW-GW} Soil Soil to GW then Discharge to SW	c. Capping / Technical Demonstration
	d. ^{GW} GW _{ING} Ingestion of Groundwater	d. PMZ / Waste Control Unit / Institutional Controls
	e. ^{SW} GW Groundwater Discharge to Surface Water	e. Capping / Drainage Improvement / Gradient Control
	f. ^{Sed} GW Groundwater Discharge to Sediment	f. Capping / Drainage Improvement / PCL Compliance
PBA	a. ^{Tot} Soil _{Comb} - C/I Direct Contact w/Soil	a. Capping / Institutional Controls
	b. ^{GW} Soil _{ING} Leaching from Soil to Groundwater	b. PMZ / Waste Control Unit / Institutional Controls
	c. ^{Sed} Soil Entrainment Soil in Stormwater	c. Removal / Liner / Institutional Controls / BMPs
	d. ^{SW-GW} Soil Soil to GW then Discharge to SW	d. Capping / PRBs
	e. ^{GW} GW _{ING} Ingestion of Groundwater	e. PMZ / Institutional Controls
	f. ^{SW} GW Groundwater Discharge to Surface Water	f. PRBs / Gradient Control
	g. ^{Sed} GW Groundwater Discharge to Sediment	g. PRBs / PCL Compliance
LC AA	a. ^{Tot} Soil _{Comb} - C/I Direct Contact w/Soil	a. Removals
	b. ^{GW} GW _{ING} Ingestion of Groundwater	b. PCL Compliance
Floodplain	a. ^{Tot} Soil _{Comb} - C/I Direct Contact w/Soil	a. Removals
	b. ^{GW} GW _{ING} Ingestion of Groundwater	b. PMZ / Institutional Controls
	c. ^{SW} GW Groundwater Discharge to Surface Water	c. PRBs / Statistical Compliance
	d. ^{Sed} GW Groundwater Discharge to Sediment	d. PRBs / Statistical Compliance

Notes:

^{GW}GW_{ing} = Direct ingestion of COCs in groundwater

^{SW}GW = Migration of COCs in groundwater to surface water

^{Sed}GW = Migration of COCs in groundwater to sediment

^{Tot}Soil_{Comb} = Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate for both commercial/industrial (C/I) and Residential (Res) scenarios. Res scenario also includes ingestion of COCs taken up in home-grown fruits

^{GW}Soil_{ing} = Leaching of COCs from soil to groundwater

^{SW-GW}Soil = Leaching of COCs from soil to groundwater then discharging to surface water

^{Air}Soil_{inh-VP} = Inhalation of COCs adsorbed to fine particulate in wind-blown dust

^{Sed}Soil = Entrainment of particles with COCs adsorbed and migration to fresh water sediments

C/I = Commercial/Industrial land use

Res = Residential Land use

BMP = Best Management Practice

PMZ = Plume Management Zone

PRB = Permeable Reactive Barrier

Table 2-1
Range of COC Concentrations in Sediment Samples from Individual Monitoring Locations
on the Rio Grande, 1999 through 2003

Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site

Sample Location ID	Arsenic	Cadmium	Copper	Lead	Selenium	Zinc
SEP-9	10U - 44	1U - 21	10U - 190	10U - 295	10U	32 - 332
SEP-10	10U - 50	2 - 12	10U - 190	10U - 120	10U	10U - 150
SEP-11	10U - 46	1U - 10	10U - 100	10U - 140	10U	10U - 95
SEP-2	10U - 33	1U - 12	11 - 160	10U - 73	10U - 12	10U - 93
SEP-12	10U - 27	1U - 15	10U - 270	10U - 160	10U	10U - 100
SEP-13	10U - 33	1U - 15	27 - 520	12 - 380	10U	10U - 307
SEP-4	10U - 30	1U - 18	18 - 230	11 - 170	10U	10U - 210
TCEQ Benchmark	9.79	0.99	31.8	35.6	2	121

Notes:

1. All results are shown in milligram constituents of concern (COC) per kilogram sample (mg/kg).
2. Benchmark concentrations were taken from TCEQ guidance for Ecological Risk Assessment (RG-263, January 2014).
3. **Bold** values are above benchmark respective concentrations.

Table 2-2

Range of COC Concentrations in Sediment Samples from Individual Monitoring Locations
on the Rio Grande, 2004 through 2007

Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site

Sample Location ID	Arsenic	Cadmium	Copper	Lead	Selenium	Zinc
SEP-9	1.2 – 12	0.5U – 5U	1.9 – 72	0.736U - 72	0.077U - 5U	32 - 332
SEP-10	0.228U – 12	0.668U - 12	2U - 23.8	0.736U - 13	0.077U - 5U	9.6 – 38.2
SEP-11	2.2 – 13	0.5U - 2	14.3 – 80.1	0.736U – 29.8	0.077U – 1.31U	12 – 66
SEP-2	1.6 – 44.9	0.5U - 2	6.74 - 233	5U – 270	1.31U – 6.9	7.7 – 196
SEP-12	1.22 – 13	0.5U - 2	11.2 - 108	1.1 – 49.2	0.077U – 5U	22.9 – 49.2
SEP-13	0.228U – 11	0.223 – 3.1	27.4 - 140	19 - 120	0.077U – 5U	35.3 – 120
SEP-4	0.228U – 14.9	0.471U - 3	18 – 150	0.736 - 131	0.077U – 1.3	33 – 95.2
TCEQ Benchmark	9.79	0.99	31.8	35.6	2	121

Notes:

1. All results are shown in milligram constituents of concern (COC) per kilogram sample (mg/kg).
2. Benchmark concentrations were taken from TCEQ guidance for Ecological Risk Assessment (RG-263, January 2014).
3. **Bold** values are above benchmark respective concentrations.

Table 2-3
Range of COC Concentrations in Sediment Samples from Individual Monitoring Locations
on the Rio Grande, 2008 through 2009

Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site

Sample Location ID	Arsenic	Cadmium	Copper	Lead	Selenium	Zinc
SEP-9	0.557U – 3.64	0.226 – 0.419	4.06 – 13.4	1.9 – 3.53	0.624U – 1.56	13.3 – 33
SEP-10	0.557U – 2.68	0.125 – 0.551	1.73 – 17.1	0.528U – 4.72	0.624U – 1.31U	9.22 – 29.5
SEP-11	0.557U – 2.82	0.365 – 0.493	6.92 – 17.4	0.528U – 8.92	0.624U – 1.56U	21.3 – 28.9
SEP-2	3.26 – 15.7	0.336 – 4.58	9.61 – 76.5	0.528U – 65.6	0.624U – 1.56U	20.8 – 63.3
SEP-12	0.557U – 9.19	0.356 – 0.525	7.55 – 27.8	0.528U – 20	0.624U – 1.56U	22.5 – 103
SEP-13	1.21 – 7.24	0.45 – 1.05	12.6 – 45.6	6.12 – 26.2	0.624U – 1.31U	26 – 110
SEP-4	1.57 – 6.82	0.436U – 1.45	12.9 – 29.7	0.528 – 15.5	0.624U – 1.56U	29.8 – 280
TCEQ Benchmark	9.79	0.99	31.8	35.6	2	121

Notes:

1. All results are shown in milligram constituents of concern (COC) per kilogram sample (mg/kg).
2. Benchmark concentrations were taken from TCEQ guidance for Ecological Risk Assessment (RG-263, January 2014).
3. **Bold** values are above benchmark respective concentrations.

**Table 2-4
Groundwater Conditions and Flow Estimates**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

Arroyo	K (feet/day)	Gradient (ft/ft)	Width (feet)	Saturated Thickness (feet)	Groundwater Flow (cfs)
PBA	116	0.012	120	20	0.039
Acid Plant	4.0	0.022	100	23	0.0023
Pond 5/6	10	0.017	200	15	0.0059
Pond 1	5.4	0.006	150	22	0.0012
South Terrace	2.1	0.006	180	15	0.00039
Plant Entrance	5.0	0.006	450	22	0.0034
Total Groundwater Flux					0.052

Acronyms and Abbreviations:

cfs = cubic feet per second

ft/ft = feet per foot

PBA = Parker Brothers Arroyo

**Table 2-5
Groundwater Quality in Background Monitoring Wells**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

Analyte	Unit	EP-86	EP-95	EP-129
pH (field)	Standard	7.7 - 8.6	7.55 - 8.7	7.28
Total Dissolved Solids (TDS)	mg/L	1,626 - 1,823	966 - 2,610	2,110 - 2,410
Arsenic (As)	mg/L	<0.002 - 0.03	<0.0026 - 0.0256	0.0019 - 0.014
Cadmium (Cd)	mg/L	<0.0003 - 0.002	<0.00085 - 0.002	<0.00085 - 0.002
Iron (Fe)	mg/L	<0.1 - 0.7	<0.01 - 1.2	<0.101 - 1.87
Lead (Pb)	mg/L	<0.00073 - 0.006	<0.00073 - 0.00543	<0.00326 - 0.00654
Selenium (Se)	mg/L	<0.00508 - 0.04	0.0066 - 0.04	0.0259 - 0.03

Note:

mg/L = milligrams chemical per liter of water

**Table 2-6
COCs and AOIs in Soil, Groundwater, and Surface Water**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

Media	COCs	Additional COCs (Supplemental RI; Malcolm Pirne, 2014)
Soil	<i>Metals (8 analytes):</i> Arsenic, cadmium, chromium, copper, iron, lead, selenium, zinc	<p><i>Metals (7 analytes)^[a]:</i> Antimony, barium, cobalt, mercury, molybdenum, nickel, silver</p> <p><i>VOCs (20 analytes):</i> Tetrachloroethylene, trichloroethylene, methylene chloride, 1,1,1-trichloroethane, 1,1,2-trichloroethane, carbon tetrachloride, chlorobenzene, ortho-dichlorobenzene, trichlorofluoromethane, 1,1,2-trichloro-1,2,2-trifluoroethane, dichlorodifluoromethane, xylenes, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, and methanol</p> <p><i>SVOCs (1 analyte):</i> Hexachlorocyclopentadiene</p> <p><i>Total petroleum hydrocarbon (TPH)</i></p> <p><i>Polychlorinated biphenyls (PCBs)</i></p> <p><i>Pesticides (3 analytes):</i> chlordane, endrin, methyl parathion</p>
Groundwater and Surface Water ^[b]	<p><i>Metals (8 analytes):</i> Arsenic, cadmium, chromium, copper, iron, lead, selenium, zinc</p> <p><i>Water Quality Parameters (1 analyte):</i> total dissolved solids (TDS)</p> <p><i>Field Parameters: (2 analytes):</i> Specific conductivity, pH</p>	<p><i>Metals (7 analytes):</i> Aluminum, barium, cobalt, mercury, molybdenum, nickel, thallium</p> <p><i>Water Quality Parameters (14 analytes):</i> Alkalinity, aluminum, calcium, chloride, fluoride, magnesium, manganese, nitrate/nitrite, potassium, sodium, sulfate, sulfide, total organic carbon (TOC), total suspended solids (TSS)</p> <p><i>Field Parameters (5 analytes):</i> Temperatures, dissolved oxygen (DO), oxidation-reduction potential (ORP), turbidity, ferrous iron</p>

Footnotes:

[a] Hexavalent chromium was also included in this suite for the Parker Brothers Arroyo and Acid Plant Assessment Area

[b] Both total and dissolved fractions, where appropriate, were analyzed for surface water and groundwater samples

Additional COCs include metals that were added to the COCs list as part of the Supplemental Remedial Investigation (RI) report (Malcolm Pirnie, 2014).

**Table 2-7
Water Well Survey Summary**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

Well no. / designation	Well owner's name of record	Distance from affected property (feet)	Screened interval/open interval (feet)	Cemented interval (feet)	Completion type	Total depth	Date drilled	Producing formation	Current water use ^[a]	Current status ^[b]	Data source ^[c]
Downgradient Wells											
Cross-gradient Wells											
Upgradient Wells											
4912902	US Geological Society – American Dam	880	Unknown	Unknown	Unknown-flush mount	42	12/19/2007	Rio Grande Alluvium	Government	Active - monitoring dam water levels	Electrol-dialysis (EDR) - Texas Water well Report / Visual Inspection
4912606	Southwestern Portland	4800	Unknown	Unknown	Unknown - not present	140	3/3/1975	Mesilla Bolson	Dom	Ind	EDR - Texas Water well Report / Visual Inspection
4912607	Southwestern Portland	4800	Unknown	Unknown	Unknown - not present	240	3/3/1975	Mesilla Bolson	Dom	Ind	EDR - Texas Water well Report / Visual Inspection
4912901	UTEP	3800	None	None	None	394	7/13/1980	Mesilla Bolson	Ab	Ab	EDR - Texas Water well Report / Visual Inspection

Footnotes:

[a] Current water use: Dom - domestic; PS - public supply/municipal; Ind - industrial; Comm - commercial; Irr - irrigation; Liv - livestock

[b] Current status: Act - active; Ab - abandoned/not in use; SB - standby/backup; P&A - plugged and abandoned

[c] Indicate the specific primary source of well information.

**Table 3-1
Exposure Pathways for COCs in Environmental Media at East Mountain AA**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

Exposure Pathway	Surface Soil	Subsurface Soil	Groundwater
TotSoil _{Comb}	X	NA	NA
AirSoil _{Inh-VP}	X		
AirSoil _{Inh-V}	NA		
GW _{Soil} _{Ing}			
SW-GW _{Soil}			
GW _{GW} _{Ing}	NA	NA	
Air _{GW} _{Inh-V}			
SW _{GW}			
Sed _{GW}			
Eco _{Soil}			NA
Sed _{Soil}	X	NA	

Notes:

1. Gray shading indicates potentially complete exposure pathway for a given media.
2. "X" indicates exposure pathway selected for protective concentration level development.

TotSoil _{Comb}	Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate, and ingestion of COCs taken up in home-grown fruits vegetable routes of exposure
AirSoil _{Inh-VP}	Inhalation of COCs adsorbed to fine particulate in wind-blown dust
AirSoil _{Inh-V}	Inhalation of volatile COCs from soil release by vapor emissions.
GW _{Soil} _{Ing}	Leaching of COCs from soil to groundwater
SW-GW _{Soil}	Leaching from soil to groundwater then discharging to surface water
GW _{GW} _{Ing}	Groundwater ingestion
Air _{GW} _{Inh-V}	Inhalation of volatile COCs from groundwater after volatilization at the groundwater capillary fringe, migrating vertically through soil gas, and emitting into the breathing zone
SW _{GW}	Discharge of COCs in groundwater to surface water bodies
Sed _{GW}	Discharge of COCs in groundwater to sediment
Eco _{Soil}	Direct exposure of ecological receptors to COCs in soil and food chain
Sed _{Soil}	Conveyance of COCs adsorbed to fine particles entrained in storm water runoff

**Table 3-2
Exposure Pathways for COCs in Environmental Media at East Property AA**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

Exposure Pathway	Surface Soil	Subsurface Soil	Groundwater
TotSoil _{Comb}	X	NA	NA
AirSoil _{Inh-VP}			
AirSoil _{Inh-V}	NA		
GWSoil _{Ing}	X	X	
SW-GWSoil			
GWGW _{Ing}	NA	NA	X
AirGW _{Inh-V}			
SWG _W			
SedGW			
EcoSoil	X*	X*	NA
SedSoil		NA	

Notes:

1. Gray shading indicates potentially complete exposure pathway for a given media.
2. "X" indicates exposure pathway selected for protective concentration level development.

* EcoSoil Protective Concentration Levels (PCLs) only apply to soil in the South Arroyo

TotSoil _{Comb}	Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate, and ingestion of COCs taken up in home-grown fruits vegetable routes of exposure
AirSoil _{Inh-VP}	Inhalation of COCs adsorbed to fine particulate in wind-blown dust
AirSoil _{Inh-V}	Inhalation of volatile COCs from soil release by vapor emissions.
GWSoil _{Ing}	Leaching of COCs from soil to groundwater
SW-GWSoil	Leaching from soil to groundwater then discharging to surface water
GWGW _{Ing}	Groundwater ingestion
AirGW _{Inh-V}	Inhalation of volatile COCs from groundwater after volatilization at the groundwater capillary fringe, migrating vertically through soil gas, and emitting into the breathing zone
SWG _W	Discharge of COCs in groundwater to surface water bodies
SedGW	Discharge of COCs in groundwater to sediment
EcoSoil	Direct exposure of ecological receptors to COCs in soil and food chain
SedSoil	Conveyance of COCs adsorbed to fine particles entrained in storm water runoff

Table 3-3
Exposure Pathways for COCs in Environmental Media at Plant Entrance Arroyo AA
Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site

Exposure Pathway	Surface Soil	Subsurface Soil	Groundwater
TotSoil _{Comb}	X	NA	NA
AirSoil _{Inh-VP}			
AirSoil _{Inh-V}	NA		
GWSoil _{Ing}			
SW-GWSoil			
GWGW _{Ing}	NA	NA	X
AirGW _{Inh-V}			
SWG _W			X
SedGW			X
EcoSoil			NA
SedSoil		NA	

Notes:

1. Gray shading indicates potentially complete exposure pathway for a given media.
2. "X" indicates exposure pathway selected for protective concentration level development.

TotSoil _{Comb}	Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate, and ingestion of COCs taken up in home-grown fruits vegetable routes of exposure
AirSoil _{Inh-VP}	Inhalation of COCs adsorbed to fine particulate in wind-blown dust
AirSoil _{Inh-V}	Inhalation of volatile COCs from soil release by vapor emissions.
GWSoil _{Ing}	Leaching of COCs from soil to groundwater
SW-GWSoil	Leaching from soil to groundwater then discharging to surface water
GWGW _{Ing}	Groundwater ingestion
AirGW _{Inh-V}	Inhalation of volatile COCs from groundwater after volatilization at the groundwater capillary fringe, migrating vertically through soil gas, and emitting into the breathing zone
SWG _W	Discharge of COCs in groundwater to surface water bodies
SedGW	Discharge of COCs in groundwater to sediment
EcoSoil	Direct exposure of ecological receptors to COCs in soil and food chain
SedSoil	Conveyance of COCs adsorbed to fine particles entrained in storm water run-off

**Table 3-4
Exposure Pathways for COCs in Environmental Media at Plant Site AAs**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

Exposure Pathway	Surface Soil	Subsurface Soil	Groundwater
^{Tot} Soil _{Comb}	X	NA	NA
^{Air} Soil _{Inh-VP}		NA	NA
^{Air} Soil _{Inh-V}	NA	X	NA
^{GW} Soil _{Ing}	X	X	NA
^{SW-GW} Soil	X	X	NA
^{GW} GW _{Ing}			X
^{Air} GW _{Inh-V}	NA	NA	
^{SW} GW			X
^{Sed} GW			X
^{Eco} Soil			NA
^{Sed} Soil		NA	

Notes:

1. Gray shading indicates potentially complete exposure pathway for a given media.
2. "X" indicates exposure pathway selected for protective concentration level development.

^{Tot} Soil _{Comb}	Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate, and ingestion of COCs taken up in home-grown fruits vegetable routes of exposure
^{Air} Soil _{Inh-VP}	Inhalation of COCs adsorbed to fine particulate in wind-blown dust
^{Air} Soil _{Inh-V}	Inhalation of volatile COCs from soil release by vapor emissions.
^{GW} Soil _{Ing}	Leaching of COCs from soil to groundwater
^{SW-GW} Soil	Leaching from soil to groundwater then discharging to surface water
^{GW} GW _{Ing}	Groundwater ingestion
^{Air} GW _{Inh-V}	Inhalation of volatile COCs from groundwater after volatilization at the groundwater capillary fringe, migrating vertically through soil gas, and emitting into the breathing zone
^{SW} GW	Discharge of COCs in groundwater to surface water bodies
^{Sed} GW	Discharge of COCs in groundwater to sediment
^{Eco} Soil	Direct exposure of ecological receptors to COCs in soil and food chain
^{Sed} Soil	Conveyance of COCs adsorbed to fine particles entrained in storm water run-off

Table 3-5
Exposure Pathways for COCs in Environmental Media at Parker Brothers Arroyo AA
Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site

Exposure Pathway	Surface Soil	Subsurface Soil	Groundwater
^{Tot} Soil _{Comb}	X	NA	NA
^{Air} Soil _{Inh-VP}			
^{Air} Soil _{Inh-V}	NA		
^{GW} Soil _{Ing}	X	X	
^{SW-GW} Soil	X	X	
^{GW} GW _{Ing}	NA	NA	X
^{Air} GW _{Inh-V}			
^{SW} GW			X
^{Sed} GW			X
^{Eco} Soil			NA
^{Sed} Soil	X	NA	

Notes:

1. Gray shading indicates potentially complete exposure pathway for a given media.
2. "X" indicates exposure pathway selected for protective concentration level development.

^{Tot} Soil _{Comb}	Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate, and ingestion of COCs taken up in home-grown fruits vegetable routes of exposure
^{Air} Soil _{Inh-VP}	Inhalation of COCs adsorbed to fine particulate in wind-blown dust
^{Air} Soil _{Inh-V}	Inhalation of volatile COCs from soil release by vapor emissions.
^{GW} Soil _{Ing}	Leaching of COCs from soil to groundwater
^{SW-GW} Soil	Leaching from soil to groundwater then discharging to surface water
^{GW} GW _{Ing}	Groundwater ingestion
^{Air} GW _{Inh-V}	Inhalation of volatile COCs from groundwater after volatilization at the groundwater capillary fringe, migrating vertically through soil gas, and emitting into the breathing zone
^{SW} GW	Discharge of COCs in groundwater to surface water bodies
^{Sed} GW	Discharge of COCs in groundwater to sediment
^{Eco} Soil	Direct exposure of ecological receptors to COCs in soil and food chain
^{Sed} Soil	Conveyance of COCs adsorbed to fine particles entrained in storm water run-off

**Table 3-6
Exposure Pathways for COCs in Environmental Media at La Calavera AA**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

Exposure Pathway	Surface Soil	Subsurface Soil	Groundwater
^{Tot} Soil _{Comb}	X	NA	NA
^{Air} Soil _{Inh-VP}			
^{Air} Soil _{Inh-V}	NA		
^{GW} Soil _{Ing}			
^{SW-GW} Soil			
^{GW} GW _{Ing}	NA	NA	X
^{Air} GW _{Inh-V}			
^{SW} GW			
^{Sed} GW			
^{Eco} Soil			
^{Sed} Soil		NA	NA

Notes:

1. Gray shading indicates potentially complete exposure pathway for a given media.
2. "X" indicates exposure pathway selected for protective concentration level development.

^{Tot} Soil _{Comb}	Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate, and ingestion of COCs taken up in home-grown fruits vegetable routes of exposure
^{Air} Soil _{Inh-VP}	Inhalation of COCs adsorbed to fine particulate in wind-blown dust
^{Air} Soil _{Inh-V}	Inhalation of volatile COCs from soil release by vapor emissions.
^{GW} Soil _{Ing}	Leaching of COCs from soil to groundwater
^{SW-GW} Soil	Leaching from soil to groundwater then discharging to surface water
^{GW} GW _{Ing}	Groundwater ingestion
^{Air} GW _{Inh-V}	Inhalation of volatile COCs from groundwater after volatilization at the groundwater capillary fringe, migrating vertically through soil gas, and emitting into the breathing zone
^{SW} GW	Discharge of COCs in groundwater to surface water bodies
^{Sed} GW	Discharge of COCs in groundwater to sediment
^{Eco} Soil	Direct exposure of ecological receptors to COCs in soil and food chain
^{Sed} Soil	Conveyance of COCs adsorbed to fine particles entrained in storm water run-off

**Table 3-7
Exposure Pathways for COCs in Environmental Media at Floodplain AA**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

Exposure Pathway	Surface Soil	Subsurface Soil	Groundwater
TotSoil _{Comb}	X	NA	NA
AirSoil _{Inh-VP}			
AirSoil _{Inh-V}	NA		
GWSoil _{Ing}			
SW-GWSoil			
GWGW _{Ing}	NA	NA	X
AirGW _{Inh-V}			
SWG _W			X
SedGW			X
EcoSoil			NA
SedSoil		NA	

Notes:

1. Gray shading indicates potentially complete exposure pathway for a given media.
2. "X" indicates exposure pathway selected for protective concentration level development.

TotSoil _{Comb}	Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate, and ingestion of COCs taken up in home-grown fruits vegetable routes of exposure
AirSoil _{Inh-VP}	Inhalation of COCs adsorbed to fine particulate in wind-blown dust
AirSoil _{Inh-V}	Inhalation of volatile COCs from soil release by vapor emissions.
GWSoil _{Ing}	Leaching of COCs from soil to groundwater
SW-GWSoil	Leaching from soil to groundwater then discharging to surface water
GWGW _{Ing}	Groundwater ingestion
AirGW _{Inh-V}	Inhalation of volatile COCs from groundwater after volatilization at the groundwater capillary fringe, migrating vertically through soil gas, and emitting into the breathing zone
SWG _W	Discharge of COCs in groundwater to surface water bodies
SedGW	Discharge of COCs in groundwater to sediment
EcoSoil	Direct exposure of ecological receptors to COCs in soil and food chain
SedSoil	Conveyance of COCs adsorbed to fine particles entrained in storm water run-off

**Table 3-8
Complete Exposure Pathway Summary**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

	C/I TotSoil_{Comb} (mg/kg)	Res TotSoil_{Comb} (mg/kg)	GW_{Soil}Ing (mg/kg)	SW-GW_{Soil} (mg/kg)	Air_{Soil}Inh-VP	Sed_{Soil}	Eco_{Soil}	SW_{SW} (mg/L)	Sed (mg/kg)	SW_{GW} (mg/L)	Sed_{GW} (mg/L)	GW_{GW}Ing (mg/L)
East Mountain	X				X	X						
East Property		X	X				X					X
Plant Entrance	X									X	X	X
South Terrace Arroyo	X		X	X						X	X	X
Pond 1 Arroyo	X		X	X						X	X	X
Pond 5/6 Arroyo	X		X	X	X					X	X	X
Acid Plant Arroyo	X		X	X	X					X	X	X
PBA	X		X	X		X				X	X	X
La Calavera	X											X
Floodplain	X									X	X	X

Notes:

GW_{Ing} = Direct ingestion of COCs in groundwater

SW_{GW} = Migration of COCs in groundwater to surface water

Sed_{GW} = Migration of COCs in groundwater to sediment

Tot_{Soil}_{Comb} = Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate for both commercial/industrial (C/I) and

GW_{Soil}Ing = Leaching of COCs from soil to groundwater

SW-GW_{Soil} = Leaching of COCs from soil to groundwater then discharging to surface water

Air_{Soil}Inh-VP = Inhalation of COCs adsorbed to fine particulate in wind-blown dust

Sed_{Soil} = Entrainment of particles with COCs adsorbed and migration to fresh water sediments

Sed = Direct contact with COCs in sediment

SW_{SW} = Direct contact with or ingestion of COCs in surface water

mg/kg = milligrams per kilogram

mg/L = milligrams per liter

Table 4-1
Statistical Summary for Background Levels of COCs in Groundwater
Based on Water Quality Data from Monitoring Wells EP-86, EP-95, and EP-129 (2003 – 2013)
Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site

Groundwater					
	Number of Samples	Average Concentration (mg/L)	Standard Deviation (mg/L)	t_{0.95} value	95% UPL Concentration (mg/L)
Arsenic	44	0.009	0.0065	1.684	0.02
Barium	9	0.025	0.00611	1.833	0.037
Chromium	22	0.0045	0.00652	1.717	0.016
Copper	24	0.013	0.02699	1.711	0.06
Fluoride	16	3.44	2.69984	1.746	8.3
Iron	38	0.183	0.30583	1.684	0.704
Molybdenum	9	0.04	0.01515	1.833	0.069
Selenium	45	0.02	0.00928	1.684	0.035
Zinc	35	0.023	0.03579	1.684	0.084

Notes:

1. The upper predicted limit (UPL) was calculated at a 95% confidence limit for a one-tail test. This table summarizes average and UPL concentrations metals in groundwater samples.

mg/L = milligrams per liter

**Table 4-2
Summary of Groundwater PCL (^{GW}GW) Development**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

	Maximum Contaminant Level (MCL)	Tier 1 ^{GW}GW_{Ing}	Background 95% UPL	Selected ^{GW}GW PCL
Antimony	0.006	0.006	NA	0.006
Arsenic	0.01	0.01	0.02	0.02
Barium	2	2	0.037	2
Cadmium	0.005	0.005	NA	0.005
Chromium	0.1	0.1	0.016	0.1
Cobalt	NE	0.007	NA	0.007
Copper	1.3	1.3	0.06	1.3
Iron	NE	NE	0.704	0.704
Lead	0.015	0.015	NA	0.015
Mercury	0.002	0.002	NA	0.002
Molybdenum	NE	0.122	0.069	0.122
Nickel	NE	0.49	NA	0.49
Selenium	0.05	0.05	0.035	0.05
Thallium	0.002	0.002	NA	0.002
Zinc	NE	7.3	0.084	7.3
Fluoride	4	4	8.3	8.3
Nitrate	10	10	NA	10
Nitrite	1	1	NA	1

Notes:

1. Results are shown in milligrams per liter (mg/L).
2. Groundwater Protective Concentration Levels (PCLs) were derived by taking the higher of the Tier 1 ^{GW}GW_{Ing} PCLs and the calculated background concentrations.

^{GW}GW = groundwater PCL

^{GW}GW_{Ing} = Groundwater ingestion

NA = Not applicable

NE = Not established

UPL = upper predicted limit

Table 4-3
Summary of Groundwater-to-Surface Water PCL (^{SW}GW) Development
Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site

	^{SW} SW PCL	Dilution Factor	^{SW} GW PCL	Background 95% UPL	Selected ^{SW} GW PCL
Antimony	0.006	0.02381	0.252	NA	0.252
Arsenic	0.01	0.02381	0.420	0.02	0.42
Barium	2	0.02381	84	0.037	84
Cadmium	0.0016	0.02381	0.067	NA	0.067
Chromium	0.1	0.02381	4.2	0.016	4.2
Cobalt	0.007	0.02381	0.294	NA	0.294
Copper	0.07	0.02381	2.94	0.06	2.94
Iron	NE	0.02381	NE	0.704	NE
Lead	0.009	0.02381	0.378	NA	0.387
Mercury	0.0013	0.02381	0.055	NA	0.055
Molybdenum	0.122	0.02381	5.1	0.069	5.1
Nickel	0.32	0.02381	13.4	NA	13.4
Selenium	0.005	0.02381	0.210	0.035	0.21
Thallium	0.00012	0.02381	0.005	NA	0.005
Zinc	1.05	0.02381	44	0.084	44
Fluoride	4	0.02381	168	8.3	168
Nitrate	10	0.02381	420	NA	420
Nitrite	1	0.02381	42	NA	42

Notes:

1. Results are shown in milligrams per liter (mg/L).

^{GW}GW_{ing} = Groundwater ingestion

NA = Not applicable

NE = Not established

PCL = Protective Concentration Level

^{SW}GW = groundwater-to-surface water PCL

^{SW}SW = surface water PCL

UPL = upper predicted limit

Table 4-4
Summary of Groundwater-to-Sediment PCL (^{Sed}GW) Development

Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site

	Sed PCL (mg/kg)	Kd [30 TAC 350.73(f)]	K_{sed-w}	Selected ^{Sed}GW PCL (mg/L)
Antimony	13.5	45	0.022	0.30
Arsenic	21.4	25	0.039	0.84
Barium	23,000	11	0.089	2,056
Cadmium	3.0	15	0.065	0.20
Chromium	77	1,202	0.001	0.1
Cobalt	50	45	0.022	1.11
Copper	90	40	0.025	2.25
Iron	NE	NE	NE	NE
Lead	82	10	0.098	8.0
Mercury	0.62	25	0.039	0.024
Molybdenum	1800	20	0.050	89
Nickel	36	16	0.062	2.24
Selenium	2	2.2	0.415	0.83
Thallium	NE	NE	NE	NE
Zinc	290	16	0.062	18.0

Notes:

1. Results are shown in milligrams per liter (mg/L).

^{Sed}GW = Groundwater to Sediment PCL

NA = Not applicable

NE = Not established

Kd = Partitioning coefficients published in 30 TAC 350.73(f)

K_{sed-w} = Sediment-groundwater partitioning coefficient

PCL = Protective Concentration Level

**Table 4-5
Summary of PCL Development for Residential Soils**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

	SAI-Res / Tier 2	TotSoil _{Comb}	AirSoil _{Inh-VP}	Tier 1 GWSoil _{Ing}	Tier 2 GWSoil _{Ing}	Texas State Background	Selected GWSoil _{Ing} PCL	Selected TotSoil _{Comb} PCL
Antimony	72	15	NE	2.7	2.7	1	2.7	15
Arsenic	20	46	2,700	2.5	6.2	5.9	6.2	46
Barium	26,000	8,100	NE	220	1,200	300	1,200	8,100
Cadmium	240	52	6,500	0.75	220	NE	220	51
Chromium	59,000	27,000	70,000	1,200	1,000,000	30	1,000,000	27,000
Cobalt	15,000	21	1,300	3.3	NC	7	7	21
Copper	10,000	550	NE	520	520	15	520	550
Iron	NE	NE	NE	NE	NC	15,000	NE	NE
Lead ^[a]	500	500	NE	1.5	35/90	15	90	500
Mercury ^[b]	0.11	8.5	16	0.0039	4	0.04	4	8.5
Molybdenum	1,100	160	NE	25	NC	NE	25	160
Nickel	1,900	840	68,000	79	9,300	10	9,300	840
Selenium	1,300	310	NE	1.1	1.1	0.3	1.1	310
Zinc	59,000	9,900	NE	1,200	39,000	30	39,000	9,900

Footnotes:

[a] PCL for lead in sand of the East Property is 35 mg/kg, while PCL for lead in loam of Plant Site is 90 mg/kg.

[b] Mercury PCLs for TotSoil_{Comb}, AirSoil_{Inh-VP}, and Tier 2 GWSoil_{Ing} are based on calculations using site-specific soil pH of 8.0.

Notes:

1. Results are shown in milligrams per kilogram (mg/kg).

AirSoil_{Inh-VP} = Inhalation of COCs adsorbed to fine particulate in wind-blown dust

GWSoil_{Ing} = Leaching of COCs from soil to groundwater

NC = Not calculated

NE = Not established

PCL = Protective Concentration Level

SAI-Res = Soil/air ingestion standard for residential use (Texas Risk Reduction Standard 3)

TotSoil_{Comb} = Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate, and ingestion of COCs taken up in home-grown fruits vegetable routes of exposure

**Table 4-6
Summary of PCL Development for Commercial/Industrial Soils**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

	SAI-Ind / Tier 2	TotSoilComb	AirSoilInh-VP	GWSoilIng	Tier 2 GWSoilIng	Texas State Background	Selected GWSoilIng PCL	Selected TotSoilComb PCL
Antimony	490	310	NE	2.7	2.7	1	2.7	310
Arsenic	200	320	4,500	2.5	6.2	5.9	6.2	320
Barium	170,000	120,000	NE	220	1,200	300	1,200	120,000
Cadmium	1,500	850	11,000	0.75	220	NE	220	850
Chromium	350,000	75,000	72,000	1,200	1,000,000	30	1,000,000	75,000
Cobalt	100,000	270	2,200	9.9	NC	7	9.9	270
Copper	74,000	39,000	NE	520	520	15	520	39,000
Iron	NE	NE	NE	NE	NC	15,000	NE	NE
Lead [a]	1,000	1,600	NE	1.5	90	15	90	1,600
Mercury [b]	0.15	20	22	0.0039	4	0.04	4	20
Molybdenum	8,100	4,500	NE	73	NC	NE	73	4,500
Nickel	12,000	8,600	110,000	230	29,000	10	29,000	8,600
Selenium	9,300	4,900	NE	1.1	1.1	0.3	1.1	4,900
Zinc	410,000	250,000	NE	3,500	120,000	30	120,000	250,000
PCBs	10	7.7	47	5.3	NC	NE	5.3	7.7

Footnotes:

[a] PCL for lead in sand of the East Property is 35 mg/kg, while PCL for lead in loam of Plant Site is 90 mg/kg.

[b] Mercury PCLs for TotSoilComb, AirSoilInh-VP, and Tier 2 GWSoilIng are based on calculations using site-specific soil pH of 8.0.

Notes:

1. Results are shown in milligrams per kilogram (mg/kg).

AirSoilInh-VP = Inhalation of COCs adsorbed to fine particulate in wind-blown dust

GWSoilIng = Leaching of COCs from soil to groundwater

NC = Not calculated

NE = Not established

PCL = Protective Concentration Level

SAI-Ind = Soil/air ingestion standard for industrial use (Texas Risk Reduction Standard 2)

SAI-Res = Soil/air ingestion standard for residential use (Texas Risk Reduction Standard 2)

TotSoilComb = Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate, and ingestion of COCs taken up in home-grown fruits vegetable routes of exposure

**Table 4-7
Summary of PCL Development for Transport of COCs from Soil to Groundwater, Discharging to Surface Water**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

	Tier 1 ^{GW}Soil_{Ing}	Tier 2 ^{GW}Soil_{Ing}	Tier 2 ^{SW-GW}Soil	Texas State Background	Selected ^{SW-GW}Soil PCL
Antimony	2.7	2.7	56	1	56
Arsenic	2.5	6.2	131	5.9	131
Barium	220	1,200	44,000	300	44,000
Cadmium	0.75	220	2,900	NE	2,900
Chromium	1,200	1,000,000	1,000,000*	30	1,000,000
Cobalt	9.9	NC	NC	7	NC
Copper	520	520	900*	15	900
Iron	NE	NC	NC	15,000	NE
Lead	1.5	90	2,300	15	2,300
Mercury	0.0039	4	48*	0.04	48
Molybdenum	73	NC	NC	NE	NC
Nickel	230	29,000	255,000	10	255,000
Selenium	1.1	1.1	4.8	0.3	4.8
Zinc	3,500	120,000	95,000*	30	95,000

Notes:

1. Results are shown in milligrams per kilogram (mg/kg).

* - PCLs for chromium, copper, mercury, and zinc are based on groundwater-to-sediment (^{Sed}GW) pathway.

^{GW}Soil_{Ing} = Leaching of COCs from soil to groundwater

NC = Not calculated

NE = Not established

PCL = Protective Concentration Level

^{SW-GW}Soil = Leaching from soil to groundwater then discharging to surface water

^{Tot}Soil_{Comb} = Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate, and ingestion of COCs taken up in home-grown fruits vegetable routes of exposure

**Table 4-8
Summary of PCL Development for COCs in Surface Water of the Rio Grande**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

	MCL / Tier 1 ^{GW}GW	Secondary MCL	Freshwater Acute Criteria (Total)	Freshwater Chronic Criteria (Total)	Water and Fish (Total)	Fish Only (Total)	^{SW}SW PCL (Total)
Antimony	0.006	NE	NE	0.16	0.006	1.071	0.006
Arsenic	0.01	NE	0.72	0.32	0.021	NE	0.01
Barium	2	NE	NE	16	NE	NE	2
Cadmium	0.005	NE	0.073	0.0016	0.018	NE	0.0016
Chromium	0.1	NE	5.99	1	NE	NE	0.1
Cobalt	0.007	NE	45	1.5	NE	NE	0.007
Copper	1.3	1	0.11	0.07	NE	NE	0.07
Iron	NE	0.3	NE	1	NE	NE	NE
Lead	0.015	NE	1.04	0.039	0.009	0.024	0.009
Mercury	0.002	NE	0.0024	0.0013	NE	NE	0.0013
Molybdenum	0.122	NE	60	2	NE	NE	0.122
Nickel	0.49	NE	2.87	0.32	0.97	3.33	0.32
Selenium	0.05	NE	0.02	0.005	0.05	NE	0.005
Thallium	0.002	NE	NE	0.004	0.00012	NE	0.00012
Zinc	7.3	5	1.05	1.06	NE	NE	1.05
Fluoride	4	2	NE	NE	4	NE	4
Nitrate	10	NE	NE	NE	10	NE	10
Nitrite	1	NE	NE	NE	NE	NE	1

Notes:

1. Results are shown in milligrams per liter (mg/L).

^{GW}GW = groundwater PCL

MCL= Maximum Contaminant Level

NC = Not calculated

NE = Not established

PCL = Protective Concentration Level

^{SW}SW = surface water PCL

**Table 4-9
Summary of PCL Development for COCs in Sediment in the Rio Grande**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

	Freshwater Sediment Benchmark	Freshwater Secondary Effect Levels	Sediment Ecological PCLs - EcoSed	Human Health-based Sediment PCLs - TotSedComb	Selected Sediment PCL
Antimony	2	25	13.5	83	13.5
Arsenic	9.79	33	21.4	110	21.4
Barium	NE	NE	NE	23,000	23,000
Cadmium	0.99	4.98	3	1,100	3
Chromium	43.4	111	77	36,000	77
Cobalt	50	NE	50	32,000	50
Copper	31.6	149	90	21,000	90
Iron	20,000	40,000	30,000	NE	30,000
Lead	35.8	128	82	500	82
Mercury	0.18	1.06	0.62	34	0.62
Molybdenum	NE	NE	NE	1,800	1,800
Nickel	22.7	48.6	36	1,400	36
Selenium	2	NE	2	3,700	2
Zinc	121	459	290	76,000	290

Notes:

1. Results are shown in milligrams per kilogram (mg/kg).

EcoSed = Direct exposure of ecological receptors to COCs in sediment and food chain

NE = Not established

PCL = Protective Concentration Level

TotSedComb = Direct contact with COCs in sediment by total combined direct contact, assuming incidental ingestion and dermal absorption as potentially complete routes of exposure

Table 4-10
Soil PCLs for East Mountain AA

Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site

	^{Tot} Soil _{Comb} (mg/kg)	^{Air} Soil _{Inh-VP} (mg/kg)
Antimony	310	NE
Arsenic	320	2,700
Barium	120,000	NE
Cadmium	850	6,500
Chromium	75,000	70,000
Cobalt	270	1,300
Copper	39,000	NE
Iron	NE	NE
Lead	1,600	NE
Mercury	20	16
Molybdenum	4,500	NE
Nickel	8,600	68,000
Selenium	4,900	NE
Zinc	250,000	NE

Notes:

1. Results are shown in milligrams per kilogram (mg/kg).

^{Air}Soil_{Inh-VP} = Inhalation of COCs adsorbed to fine particulate in wind-blown dust

NC = Not calculated

NE = Not established

^{Tot}Soil_{Comb} = Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate, and ingestion of COCs taken up in home-grown fruits vegetable routes of exposure

Table 4-11
Soil and Groundwater PCLs for East Property AA

Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site

	^{GW} Soil _{Ing} (mg/kg)	^{Tot} Soil _{Comb} (mg/kg)	^{GW} GW _{Ing} (mg/L)
Antimony	2.7	15	0.006
Arsenic	6.2	46	0.02
Barium	1,200	8,100	2
Cadmium	220	51	0.005
Chromium	1,000,000	27,000	0.1
Cobalt	7	21	0.007
Copper	520	550	1.3
Iron	NE	NE	0.704
Lead	90	500	0.015
Mercury	4	8.5	0.002
Molybdenum	25	160	0.122
Nickel	9,300	840	0.49
Selenium	1.1	310	0.05
Thallium	NE	NE	0.002
Zinc	39,000	9,900	7.3
Fluoride	NE	NE	8.3
Nitrate	NE	NE	10
Nitrite	NE	NE	1

Notes:

^{GW}GW_{Ing} = Groundwater ingestion

^{GW}Soil_{Ing} = Leaching of COCs from soil to groundwater

mg/kg = milligrams per kilogram

mg/L = milligrams per liter

NE = Not established

^{Tot}Soil_{Comb} = Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate, and ingestion of COCs taken up in home-grown fruits vegetable routes of exposure

Table 4-12
Ecological Soil PCLs (^{Eco}Soil) for South Arroyo of East Property AA

Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site

	Surface Soil (0 to 0.5 ft bgs)	Subsurface Soil (0.5 to 5 ft bgs)
Arsenic	81	774
Cadmium	13	310
Copper	520	1,265
Lead	325	6,405
Zinc	345	15,372

Notes:

1. Results are shown in milligrams per kilogram (mg/kg).

^{Eco}Soil = Direct exposure of ecological receptors to COCs in soil and food chain

ft bgs = feet below ground surface

PCL = Protective Concentration Level

Table 4-13
Soil and Groundwater PCLs for Plant Entrance Arroyo AA

Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site

	^{Tot} Soil _{Comb} (mg/kg)	^{SW} GW (mg/L)	^{Sed} GW (mg/L)	^{GW} GW _{Ing} (mg/L)
Antimony	310	0.252	0.30	0.006
Arsenic	320	0.42	0.84	0.02
Barium	120,000	84	2,056	2
Cadmium	850	0.067	0.20	0.005
Chromium	75,000	4.2	0.1	0.1
Cobalt	270	0.294	1.11	0.007
Copper	39,000	2.94	2.25	1.3
Iron	NE	NE	NE	0.704
Lead	1,600	0.387	8.02	0.015
Mercury	20	0.055	0.024	0.002
Molybdenum	4,500	5.1	89	0.122
Nickel	8,600	13.4	2.24	0.49
Selenium	4,900	0.21	0.83	0.05
Thallium	NE	0.005	NE	0.002
Zinc	250,000	44	18.05	7.3
Fluoride	NE	168	NE	8.3
Nitrate	NE	420	NE	10
Nitrite	NE	42	NE	1

Notes:

^{GW}GW_{Ing} = Groundwater ingestion

^{GW}Soil_{Ing} = Leaching of COCs from soil to groundwater

mg/kg = milligrams per kilogram

mg/L = milligrams per liter

NE = Not established

^{SW}GW = groundwater-to-surface water PCL

^{Sed}GW = groundwater-to-sediment

^{SW-GW}Soil = Leaching from soil to groundwater then discharging to surface water

^{Tot}Soil_{Comb} = Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate, and ingestion of COCs taken up in home-grown fruits vegetable routes of exposure

Table 4-14
Soil and Groundwater PCLs for South Terrace Arroyo and Pond 1 Arroyo AAs

Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site

	^{Tot} Soil _{Comb} (mg/kg)	^{SW-GW} Soil (mg/kg)	^{SW} GW (mg/L)	^{Sed} GW (mg/L)	^{GW} Soil _{Ing} PCL	^{GW} GW _{Ing} (mg/L)
Antimony	310	56	0.252	0.30	2.7	0.006
Arsenic	320	131	0.42	0.84	6.2	0.02
Barium	120,000	44,000	84	2,056	1,200	2
Cadmium	850	2,900	0.067	0.20	220	0.005
Chromium	75,000	1,000,000	4.2	0.1	1,000,000	0.1
Cobalt	270	NE	0.294	1.11	9.9	0.007
Copper	39,000	900	2.94	2.25	520	1.3
Iron	NE	NE	NE	NE	NE	0.704
Lead	1,600	2,300	0.387	8.02	90	0.015
Mercury	20	48	0.055	0.024	4	0.002
Molybdenum	4,500	NE	5.1	89	73	0.122
Nickel	8,600	255,000	13.4	2.24	29,000	0.49
Selenium	4,900	4.8	0.21	0.83	1.1	0.05
Thallium	NE	NE	0.005	NE	NE	0.002
Zinc	250,000	95,000	44	18.05	120,000	7.3
Fluoride	NE	NE	168	NE	NE	8.3
Nitrate	NE	NE	420	NE	NE	10
Nitrite	NE	NE	42	NE	NE	1

Notes:

^{GW}GW_{Ing} = Groundwater ingestion

^{GW}Soil_{Ing} = Leaching of COCs from soil to groundwater

mg/kg = milligrams per kilogram

mg/L = milligrams per liter

NE = Not established

^{SW}GW = groundwater-to-surface water PCL

^{Sed}GW = groundwater-to-sediment

^{SW-GW}Soil = Leaching from soil to groundwater then discharging to surface water

^{Tot}Soil_{Comb} = Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate, and ingestion of COCs taken up in home-grown fruits vegetable routes of exposure

Table 4-15
Soil and Groundwater PCLs for Acid Plant and Pond 5/6 Arroyo AAs

Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site

	^{Tot} Soil _{Comb} (mg/kg)	^{Air} Soil _{Inh-VP}	^{SW-GW} Soil (mg/kg)	^{SW} GW (mg/L)	^{Sed} GW (mg/L)	^{GW} Soil _{Ing} (mg/kg)	^{GW} GW _{Ing} (mg/L)
Antimony	310	NE	56	0.252	0.30	2.7	0.006
Arsenic	320	4,500	131	0.42	0.84	6.2	0.02
Barium	120,000	NE	44,000	84	2,056	1,200	2
Cadmium	850	11,000	2,900	0.067	0.20	220	0.005
Chromium	75,000	72,000	1,000,000	4.2	0.1	1,000,000	0.1
Cobalt	270	2,200	NE	0.294	1.11	9.9	0.007
Copper	39,000	NE	900	2.94	2.25	520	1.3
Iron	NE	NE	NE	NE	NE	NE	0.704
Lead	1,600	NE	2,300	0.387	8.02	90	0.015
Mercury	20	22	48	0.055	0.024	4	0.002
Molybdenum	4,500	NE	NC	5.1	89	73	0.122
Nickel	8,600	110,000	255,000	13.4	2.24	29,000	0.49
Selenium	4,900	NE	4.8	0.21	0.83	1.1	0.05
Thallium	NE	NE	NE	0.005	NE	NE	0.002
Zinc	250,000	NE	95,000	44	18.05	120,000	7.3
PCBs	7.7	47	NE	168	NE	5.3	NE
Fluoride	NE	NE	NE	420	NE	NE	8.3
Nitrate	NE	NE	NE	42	NE	NE	10
Nitrite	NE	NE	NE	0	NE	NE	1

Notes:

^{Air}Soil_{Inh-VP} = Inhalation of COCs adsorbed to fine particulate in wind-blown dust

^{GW}GW_{Ing} = Groundwater ingestion

^{GW}Soil_{Ing} = Leaching of COCs from soil to groundwater

mg/kg = milligrams per kilogram

mg/L = milligrams per liter

NE = Not established

^{SW}GW = groundwater-to-surface water

^{Sed}GW = groundwater-to-sediment

^{SW-GW}Soil = Leaching from soil to groundwater then discharging to surface water

^{Tot}Soil_{Comb} = Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate, and ingestion of COCs taken up in home-grown fruits vegetable routes of exposure

Table 4-16
Soil and Groundwater PCLs for Parker Brothers Arroyo AA

Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site

	^{Tot} Soil _{Comb} (mg/kg)	^{SW-GW} Soil (mg/kg)	^{SW} GW (mg/L)	^{Sed} GW (mg/L)	^{GW} Soil _{Ing} (mg/kg)	^{GW} GW _{Ing} (mg/L)
Antimony	310	56	0.252	0.30	2.7	0.006
Arsenic	320	131	0.42	0.84	6.2	0.02
Barium	120,000	44,000	84	2,056	1,200	2
Cadmium	850	2,900	0.067	0.20	220	0.005
Chromium	75,000	1,000,000	4.2	0.1	1,000,000	0.1
Cobalt	270	NE	0.294	1.11	9.9	0.007
Copper	39,000	900	2.94	2.25	520	1.3
Iron	NE	NE	NE	NE	NE	0.704
Lead	1,600	2,300	0.387	8.02	90	0.015
Mercury	20	48	0.055	0.024	4	0.002
Molybdenum	4,500	NC	5.1	89	73	0.122
Nickel	8,600	255,000	13.4	2.24	29,000	0.49
Selenium	4,900	4.8	0.21	0.83	1.1	0.05
Thallium	NE	NE	0.005	NE	NE	0.002
Zinc	250,000	95,000	44	18.05	120,000	7.3
Fluoride	NE	NE	168	NE	NE	8.3
Nitrate	NE	NE	420	NE	NE	10
Nitrite	NE	NE	42	NE	NE	1

Notes:

^{GW}GW_{Ing} = Groundwater ingestion

^{GW}Soil_{Ing} = Leaching of COCs from soil to groundwater

mg/kg = milligrams per kilogram

mg/L = milligrams per liter

NE = Not established

^{SW}GW = groundwater-to-surface water

^{Sed}GW = groundwater-to-sediment

^{SW-GW}Soil = Leaching from soil to groundwater then discharging to surface water

^{Tot}Soil_{Comb} = Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate, and ingestion of COCs taken up in home-grown fruits vegetable routes of exposure

Table 4-17
Soil and Groundwater PCLs for La Calavera AA

Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site

	^{Tot} Soil _{Comb} (mg/kg)	^{GW} GW _{Ing} (mg/L)
Antimony	15	0.006
Arsenic	46	0.02
Barium	8,100	2
Cadmium	51	0.005
Chromium	27,000	0.1
Cobalt	21	0.007
Copper	550	1.3
Iron	NE	0.704
Lead	500	0.015
Mercury	8.5	0.002
Molybdenum	160	0.122
Nickel	840	0.49
Selenium	310	0.05
Thallium	NE	0.002
Zinc	9,900	7.3
Fluoride	NE	8.3
Nitrate	NE	10
Nitrite	NE	1

Notes:

^{GW}GW_{Ing} = Groundwater ingestion

mg/kg = milligrams per kilogram

mg/L = milligrams per liter

NE = Not established

^{Tot}Soil_{Comb} = Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate, and ingestion of COCs taken up in home-grown fruits vegetable routes of exposure

**Table 4-18
Soil and Groundwater PCLs for Floodplain AA**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

	^{Tot} Soil _{Comb} (mg/kg)	^{sw} GW (mg/L)	^{Sed} GW (mg/L)	^{GW} GW (mg/L)
Antimony	310	0.252	0.30	0.006
Arsenic	320	0.42	0.84	0.02
Barium	120,000	84	2056.08	2
Cadmium	850	0.067	0.20	0.005
Chromium	75,000	4.2	0.06	0.1
Cobalt	270	0.294	1.11	0.007
Copper	39,000	2.94	2.25	1.3
Iron	NE	NE	NE	0.704
Lead	1,600	0.387	8.02	0.015
Mercury	20	0.055	0.024	0.002
Molybdenum	4,500	5.1	89.22	0.122
Nickel	8,600	13.4	2.24	0.49
Selenium	4,900	0.21	0.83	0.05
Thallium	NE	0.005	NE	0.002
Zinc	250,000	44	18.05	7.3
Fluoride	NE	168	NE	8.3
Nitrate	NE	420	NE	10
Nitrite	NE	42	NE	1

Notes:

^{GW}GW = groundwater PCL

mg/kg = milligrams per kilogram

mg/L = milligrams per liter

NE = Not established

^{sw}GW = groundwater-to-surface water

^{Sed}GW = groundwater-to-sediment

^{Tot}Soil_{Comb} = Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate, and ingestion of COCs taken up in home-grown fruits vegetable routes of exposure

**Table 4-19
Summary of Soil, Groundwater, and Surface Water PCLs**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

	C/I TotSoilComb (mg/kg)	Res TotSoilComb (mg/kg)	GWSoilIng (mg/kg)	SW-GWSoil (mg/kg)	AirSoilInh-VP	SWSW PCL (Total)	SWGWSW (mg/L)	SedGW (mg/L)	GWGWIng (mg/L)
Antimony	310	15	2.7	56	NE	0.006	0.294	0.30	0.006
Arsenic	320	46	6.2	130	4,500	0.01	0.42	0.84	0.02
Barium	120,000	8,100	1,200	43,000	NE	2	82	2,056	2
Cadmium	850	51	220	2,900	11,000	0.0016	0.067	0.20	0.005
Chromium	75,000	27,000	1,000,000	1,000,000	72,000	0.1	4.2	0.1	0.1
Cobalt	270	21	9.9	NE	2,200	0.007	0.287	1.11	0.007
Copper	39,000	550	520	890	NE	0.07	2.9	2.25	1.3
Iron	NE	NE	NE	NE	NE	NE	NE	NE	0.704
Lead	1,600	500	90	2,300	NE	0.0131	0.39	8.02	0.015
Mercury	20	8.5	4	48	22	0.0013	0.055	0.024	0.002
Molybdenum	4,500	160	73	73	NE	0.122	5	89	0.122
Nickel	8,600	840	29,000	250,000	110,000	0.32	13.4	2.24	0.49
Selenium	4,900	310	1.1	4.8	NE	0.005	0.21	0.83	0.05
Thallium	NE	NE	NE	NE	NE	0.00012	0.005	NE	0.002
Zinc	250,000	9,900	120,000	95,000	NE	1.05	44	18	7.3
PCBs	7.1	1.1	5.3	NE	47	NE	NE	NE	NE
Fluoride	NE	NE	NE	NE	NE	4	168	NE	8.3
Nitrate	NE	NE	NE	NE	NE	10	420	NE	10
Nitrite	NE	NE	NE	NE	NE	1	42	NE	1

Notes:

^{GW}GW_{Ing} = groundwater PCL

^{SW}GW = groundwater-to-surface water

^{Sed}GW = groundwater-to-sediment

^{Tot}Soil_{Comb} = Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate for both commercial/industrial (C/I) and Residential (Res) scenarios. Res scenario also includes ingestion of COCs taken up in home-grown fruits vegetable routes of exposure

^{GW}Soil_{Ing} = Leaching of COCs from soil to groundwater

^{SW-GW}Soil = Leaching from soil to groundwater then discharging to surface water

^{Air}Soil_{Inh-VP} = Inhalation of COCs adsorbed to fine particulate in wind-blown dust

mg/kg = milligrams per kilogram

mg/L = milligrams per liter

NE = Not established

**Table 5-1
COCs in Groundwater Exceeding Relevant Screening Standards**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

Assessment Area	Screening Standard	Identified COCs ^[a]
East Property	MCL/GW-Ind	Antimony; Arsenic; Cadmium; Lead; Fluoride
East Mountain	MCL/GW-Ind	NA
Parker Brothers Arroyo	MCL/GW-Ind	Antimony; Arsenic; Cadmium; Cobalt; Lead; Molybdenum; Selenium; Thallium; Zinc; Fluoride; Nitrate
Plant Entrance Arroyo	MCL/GW-Ind	Arsenic ^[b]
South Terrace Arroyo	MCL/GW-Ind	Arsenic; Cadmium; Thallium; Selenium; Nitrate
Acid Plant Arroyo	MCL/GW-Ind	Antimony; Arsenic; Cadmium; Chromium; Cobalt; Lead; Mercury; Nickel; Molybdenum; Selenium; Thallium; Zinc; Fluoride; Nitrate
Pond 1 Arroyo	MCL/GW-Ind	Arsenic; Thallium; Selenium; Nitrate
Ponds 5 and 6 Arroyo	MCL/GW-Ind	Antimony; Arsenic; Cadmium; Copper; Lead; Mercury; Molybdenum; Selenium; Thallium; Fluoride; Nitrate
La Calvera	MCL/GW-Ind	None
Floodplain	MCL/GW-Ind	Antimony; Arsenic; Chromium; Molybdenum; Selenium; Thallium; Fluoride; Nitrate

Footnotes:

[a] Analytes exceeded the Relevant Screening Standard.

[b] No groundwater monitoring locations exist in the Plant Arroyo AA, however, data from nearby monitoring locations suggest arsenic may be present above the screening standards.

Acronyms and Abbreviations:

AA = Assessment Area

GW-Ind = Commercial/Industrial Standard for Groundwater

MCL = Maximum Contaminant Level, USEPA National Primary Drinking Water Standard

NA = Not applicable. No alluvial aquifer exists in this AA.

**Table 5-2
Protective Concentration Level and Response Action Summary by Assessment Area**

**Conceptual Site Model, Pathway Evaluation, and Protective Concentration Level Report
Former ASARCO Smelter Site**

Assessment Areas	TRRP PCLs/Pathways	Response Action	
East Mountain	a. ^{Tot} Soil _{Comb} - C/I	Direct Contact w/Soil	a. Institutional Control/Statistical Compliance
	b. ^{Air} Soil _{INH-VP} - Res	Off-site Inhalation Fugative Dust	b. PCL Compliance
	c. ^{Sed} Soil	Entrainment Soil in Stormwater	c. Stormwater BMPs
East Property	a. ^{Tot} Soil _{Comb} - Res	Direct Contact w/Soil	a. Removal / Institutional Control (Eco, C/I)
	b. ^{GW} Soil _{ING}	Leaching from Soil to Groundwater	b. PMZ / Institutional Controls
	c. ^{Eco} Soil	Direct Contact with Soil	c. Removal / Risk Assessment / Statistical Compliance
	d. ^{GW} GW _{ING}	Ingestion of Groundwater	d. PMZ / Institutional Controls
Plant Entrance	a. ^{Tot} Soil _{Comb} - CI	Direct Contact w/Soil	a. Removal / Institutional Controls
	d. ^{GW} GW _{ING}	Ingestion of Groundwater	d. PMZ / Waste Control Unit / Institutional Controls
	c. ^{SW} GW	Groundwater Discharge to Surface Water	c. Capping / Drainage Improvement / PCL Compliance
	d. ^{SW} GW	Groundwater Discharge to Surface Water	d. Capping / Drainage Improvement / PCL Compliance
South Terrace Pond 1 Pond 5/6 Acid Plant	a. ^{Tot} Soil _{Comb} - CI	Direct Contact w/Soil	a. Capping / Institutional Controls
	b. ^{GW} Soil _{ING}	Leaching from Soil to Groundwater	b. PMZ / Waste Control Unit / Institutional Controls
	c. ^{SW-GW} Soil	Soil to GW then Discharge to SW	c. Capping / Technical Demonstration
	d. ^{GW} GW _{ING}	Ingestion of Groundwater	d. PMZ / Waste Control Unit / Institutional Controls
	e. ^{SW} GW	Groundwater Discharge to Surface Water	e. Capping / Drainage Improvement / Gradient Control
	f. ^{Sed} GW	Groundwater Discharge to Sediment	f. Capping / Drainage Improvement / PCL Compliance
PBA	a. ^{Tot} Soil _{Comb} - C/I	Direct Contact w/Soil	a. Capping / Institutional Controls
	b. ^{GW} Soil _{ING}	Leaching from Soil to Groundwater	b. PMZ / Waste Control Unit / Institutional Controls
	c. ^{Sed} Soil	Entrainment Soil in Stormwater	c. Removal / Liner / Institutional Controls / BMPs
	d. ^{SW-GW} Soil	Soil to GW then Discharge to SW	d. Capping / PRBs
	e. ^{GW} GW _{ING}	Ingestion of Groundwater	e. PMZ / Institutional Controls
	f. ^{SW} GW	Groundwater Discharge to Surface Water	f. PRBs / Gradient Control
	g. ^{Sed} GW	Groundwater Discharge to Sediment	g. PRBs / PCL Compliance
La Calavera	a. ^{Tot} Soil _{Comb} - C/I	Direct Contact w/Soil	a. Removals
	b. ^{GW} GW _{ING}	Ingestion of Groundwater	b. PCL Compliance
Floodplain	a. ^{Tot} Soil _{Comb} - C/I	Direct Contact w/Soil	a. Removals
	b. ^{GW} GW _{ING}	Ingestion of Groundwater	b. PMZ / Institutional Controls
	c. ^{SW} GW	Groundwater Discharge to Surface Water	c. PRBs / Statistical Compliance
	d. ^{Sed} GW	Groundwater Discharge to Sediment	d. PRBs / Statistical Compliance

Notes:

^{GW}GW_{ING} = Direct ingestion of COCs in groundwater

^{SW}GW = Migration of COCs in groundwater to surface water

^{Sed}GW = Migration of COCs in groundwater to sediment

^{Tot}Soil_{Comb} = Direct contact with COCs in surface soil by total combined dermal absorption, incidental soil ingestion, inhalation of vapors or particulate for both commercial/industrial (C/I) and Residential (Res) scenarios. Res scenario also includes ingestion of COCs taken up in home-grown fruits vegetable routes of exposure

^{GW}Soil_{ING} = Leaching of COCs from soil to groundwater

^{SW-GW}Soil = Leaching of COCs from soil to groundwater then discharging to surface water

^{Air}Soil_{INH-VP} = Inhalation of COCs adsorbed to fine particulate in wind-blown dust

^{Sed}Soil = Entrainment of particles with COCs adsorbed and migration to fresh water sediments

C/I = Commercial/Industrial land use

Res = Residential Land use

BMP = Best Management Practice

PMZ = Plume Management Zone

PRB = Permeable Reactive Barrier