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Development Document for Effluent Limitations Guidelines and Standards for the

Proposed

Nonferrous Metals

Point Source Category

Phase II

Supplemental Development Document For:

Primary Precious Metals and Mercury

DEVELOPMENT DOCUMENT

for

EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS

for the

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY

PHASE II

Primary Precious Metals and Mercury Supplement

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U.S. Environmental Protection Agency

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

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PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

SECTION I

SUMMARY AND CONCLUSIONS

Pursuant to Sections 301, 304, 306, 307, and 501 of the Clean Water Act and the provisions of the Settlement Agreement in Natural Resources Defense Council v. Train, 8 ERC 2120 (D.D.C. 1976) modified, 12 ERC 1833 (D.D.C. 1979), EPA has collected and analyzed data for plants in the primary precious metals and mercury subcategory. EPA has never proposed or promulgated effluent limitations or standards for this subcategory. This document and the administrative record provide the technical basis for proposing effluent limitations based on best practicable technology (BPT) and best available technology (BAT) for existing direct dischargers, pretreatment standards for new indirect dischargers (PSNS), and standards of performance for new source direct dischargers (NSPS).

The primary precious metals and mercury subcategory is comprised of eight plants. Of the eight plants, one discharges directly to rivers, lakes, or streams; none discharge to publicly owned treatment works (POTW); and seven achieve zero discharge of process wastewater.

EPA first studied the primary precious metals and mercury subcategory to determine whether differences in raw materials, final products, manufacturing processes, equipment, age and size of plants, and water usage, required the development of separate effluent limitations and standards for different segments of the subcategory. This involved a detailed analysis of wastewater discharge and treated effluent characteristics, including (1) the sources and volume of water used, the processes used, and the sources of pollutants and wastewaters in the plant; and (2) the constituents of wastewaters, including toxic pollutants. As a result, 11 subdivisions have been identified for this subcategory that warrant separate effluent limitations. These include:

- Smelter wet air pollution control,
- Silver chloride reduction spent solution,
- Electrolytic cells wet air pollution control,
- Electrolyte preparation wet air pollution control,
- Silver crystal wash water,
- Gold slimes acid wash and water rinse,
- Calciner wet air pollution control,
- Calcine quench water,
- Calciner stack gas contact cooling water,
- Condenser blowdown, and
- Mercury cleaning bath water.

EPA also identified several distinct control and treatment technologies (both in-plant and end-of-pipe) applicable to the primary precious metals and mercury subcategory. The Agency analyzed both historical and newly generated data on the performance of these technologies, including their nonwater quality environmental impacts and air quality, solid waste generation, and energy requirements. EPA also studied various flow reduction techniques reported in the data collection portfolios (dcp) and plant visits.

Engineering costs were prepared for each of the control and treatment options considered for the subcategory. These costs were then used by the Agency to estimate the impact of implementing the various options on the subcategory. For each control and treatment option that the Agency found to be most effective and technically feasible in controlling the discharge of pollutants, we estimated the number of potential closures, number of employees affected, and impact on price. These results are reported in a separate document entitled "The Economic Impact Analysis of Proposed Effluent Limitations Guidelines and Standards for the Nonferrous Smelting and Refining Industry."

After examining the various treatment technologies, the Agency has identified BPT to represent the average of the best existing technology in the nonferrous metals manufacturing industry. Metals removal based on chemical precipitation and sedimentation technology is the basis for the BPT limitations. Oil skimming was selected as the technology basis for oil and grease limitations. To meet the BPT effluent limitations based on this technology, the primary precious metals and mercury subcategory is expected to incur a capital cost of $27,500 and an annual cost of $9,000.

For BAT, the Agency has built upon the BPT technology basis by adding in-process control technologies which include recycle of process water from air pollution control waste streams. Filtration is added as an effluent polishing step to the end-of-pipe treatment scheme. To meet the BAT effluent limitations based on this technology, the primary precious metals and mercury subcategory is estimated to incur a capital cost of $30,000 and an annual cost of $10,000.

NSPS are equivalent to BAT. In selecting NSPS, EPA recognizes that new plants have the opportunity to implement the best and most efficient manufacturing processes and treatment technology. As such, the technology basis of BAT has been determined as the best demonstrated technology.

EPA is not proposing PSES for the primary precious metals and mercury subcategory because there are no indirect dischargers. For PSNS, the Agency selected end-of-pipe treatment and in-process flow reduction control techniques equivalent to NSPS.

The best conventional technology (BCT) replaces BAT for the control of conventional pollutants. BCT is not being proposed because the methodology for BCT has not yet been finalized.

The mass limitations and standards for BPT, BAT, NSPS, and PSNS are presented in Section II.

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

SECTION II

RECOMMENDATIONS

1. EPA has divided the primary precious metals and mercury subcategory into 11 subdivisions for the purpose of effluent limitations and standards. These subdivisions are:

   (a) Smelter wet air pollution control,
   (b) Silver chloride reduction spent solution,
   (c) Electrolytic cells wet air pollution control,
   (d) Electrolyte preparation wet air pollution control,
   (e) Silver crystal wash water,
   (f) Gold slimes acid wash and water rinse,
   (g) Calciner wet air pollution control,
   (h) Calcine quench water,
   (i) Calciner stack gas contact cooling water,
   (j) Condenser blowdown, and
   (k) Mercury cleaning bath water.

2. BPT is proposed based on the performance achievable by the application of chemical precipitation and sedimentation (lime and settle) technology, along with preliminary treatment consisting of oil skimming for selected waste streams. The following BPT effluent limitations are proposed:

BPT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(a) Smelter Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/troy ounce of gold and silver smelted	
Arsenic	27.590	12.280
Lead	5.544	2.640
Mercury	3.300	1.320
Silver	5.412	2.244
Zinc	19.270	8.052
Oil and grease	264.000	158.400
Total suspended solids	541.200	257.400
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(b) Silver Chloride Reduction Spent Solution

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver reduced in solution		
Arsenic	0.836	0.372
Lead	0.168	0.080
Mercury	0.100	0.040
Silver	0.164	0.068
Zinc	0.584	0.244
Oil and grease	8.000	4.800
Total suspended solids	16.400	7.800
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(c) Electrolytic Cells Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold refined electrolytically		
Arsenic	413.800	184.100
Lead	83.160	39.600
Mercury	49.500	19.800
Silver	81.180	33.660
Zinc	289.100	120.800
Oil and grease	3,960.000	2,376.000
Total suspended solids	8,118.000	3,861.000
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(d) Electrolyte Preparation Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver in electrolyte produced		
Arsenic	0.105	0.047
Lead	0.021	0.010
Mercury	0.013	0.005
Silver	0.021	0.009
Zinc	0.073	0.031
Oil and grease	1.000	0.600
Total suspended solids	2.050	0.975
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(e) Silver Crystals Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver crystals washed		
Arsenic	0.606	0.270
Lead	0.122	0.058
Mercury	0.073	0.029
Silver	0.119	0.049
Zinc	0.423	0.177
Oil and grease	5.800	3.480
Total suspended solids	11.890	5.655
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(f) Gold Slimes Acid Wash and Water Rinse

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/troy ounce of gold slimes washed	
Arsenic	8.360	3.720
Lead	1.680	0.800
Mercury	1.000	0.400
Silver	1.640	0.680
Zinc	5.840	2.440
Oil and grease	80.000	48.000
Total suspended solids	164.000	78.000
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(g) Calciner Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of mercury condensed	
Arsenic	388.800	173.000
Lead	78.120	37.200
Mercury	46.500	18.600
Silver	76.260	31.620
Zinc	271.600	113.500
Oil and grease	3,720.000	2,232.000
Total suspended solids	7,626.000	3,627.000
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(h) Calcine Quench Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	36.790	16.370
Lead	7.392	3.520
Mercury	4.400	1.760
Silver	7.216	2.992
Zinc	25.700	10.740
Oil and grease	352.000	211.200
Total suspended solids	721.600	343.200
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(i) Calciner Stack Gas Contact Cooling Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	8.674	3.860
Lead	1.743	0.830
Mercury	1.038	0.415
Silver	1.702	0.706
Zinc	6.059	2.532
Oil and grease	83.000	49.800
Total suspended solids	170.200	80.930
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(j) Condenser Blowdown

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	28.840	12.830
Lead	5.796	2.760
Mercury	3.450	1.380
Silver	5.658	2.346
Zinc	20.150	8.418
Oil and grease	276.000	165.600
Total suspended solids	565.800	269.100
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(k) Mercury Cleaning Bath Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	2.926	1.302
Lead	0.588	0.280
Mercury	0.350	0.140
Silver	0.574	0.238
Zinc	2.044	0.854
Oil and grease	28.000	16.800
Total suspended solids	57.400	27.300
pH	Within the range of 7.5 to 10.0 at all times	

3. BAT is proposed based on the performance achievable by the application of chemical precipitation, sedimentation, and multimedia filtration (lime, settle, and filter) technology and in-process flow reduction methods, along with preliminary treatment consisting of oil skimming for selected waste streams. The following BAT effluent limitations are proposed:

BAT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(a) Smelter Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold and silver smelted		
Arsenic	1.807	0.806
Lead	0.364	0.169
Mercury	0.195	0.078
Silver	0.377	0.156
Zinc	1.326	0.546

BAT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(b) Silver Chloride Reduction Spent Solution

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver reduced in solution		
Arsenic	0.556	0.248
Lead	0.112	0.052
Mercury	0.060	0.024
Silver	0.116	0.048
Zinc	0.408	0.168

BAT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(c) Electrolytic Cells Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold refined electrolytically		
Arsenic	27.520	12.280
Lead	5.544	2.574
Mercury	2.970	1.188
Silver	5.742	2.376
Zinc	20.200	8.316

BAT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(d) Electrolyte Preparation Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver in electrolyte produced		
Arsenic	0.070	0.031
Lead	0.014	0.007
Mercury	0.008	0.003
Silver	0.015	0.006
Zinc	0.051	0.021

BAT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(e) Silver Crystals Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver crystals washed		
Arsenic	0.403	0.180
Lead	0.081	0.038
Mercury	0.044	0.017
Silver	0.084	0.035
Zinc	0.296	0.122

BAT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(f) Gold Slimes Acid Wash and Water Rinse

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold slimes washed		
Arsenic	5.560	2.480
Lead	1.120	0.520
Mercury	0.600	0.240
Silver	1.160	0.480
Zinc	4.080	1.680

BAT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(g) Calciner Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	30.580	13.640
Lead	6.160	2.860
Mercury	3.300	1.320
Silver	6.380	2.640
Zinc	22.440	9.240

BAT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(h) Calcine Quench Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	24.470	10.910
Lead	4.928	2.288
Mercury	2.640	1.056
Silver	5.104	2.112
Zinc	17.950	7.392

BAT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(i) Calciner Stack Gas Contact Cooling Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	5.769	2.573
Lead	1.162	0.540
Mercury	0.623	0.249
Silver	1.204	0.498
Zinc	4.233	1.743

BAT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(j) Condenser Blowdown

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	19.180	8.556
Lead	3.864	1.794
Mercury	2.070	0.828
Silver	4.002	1.656
Zinc	14.080	5.796

BAT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(k) Mercury Cleaning Bath Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	1.946	0.868
Lead	0.392	0.182
Mercury	0.210	0.084
Silver	0.406	0.168
Zinc	1.428	0.588

4. NSPS are proposed based on the performance achievable by the application of chemical precipitation, sedimentation, and multimedia filtration (lime, settle, and filter) technology, and in-process flow reduction control methods, along with preliminary treatment consisting of oil skimming for selected waste streams. The following effluent standards are proposed for new sources:

NSPS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(a) Smelter Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold and silver smelted		
Arsenic	1.807	0.806
Lead	0.364	0.169
Mercury	0.195	0.078
Silver	0.377	0.156
Zinc	1.326	0.546
Oil and grease	13.000	13.000
Total suspended solids	19.500	15.600
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(b) Silver Chloride Reduction Spent Solution

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver reduced in solution		
Arsenic	0.556	0.248
Lead	0.112	0.052
Mercury	0.060	0.024
Silver	0.116	0.048
Zinc	0.408	0.168
Oil and grease	4.000	4.000
Total suspended solids	6.000	4.800
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(c) Electrolytic Cells Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold refined electrolytically		
Arsenic	27.520	12.280
Lead	5.544	2.574
Mercury	2.970	1.188
Silver	5.742	2.376
Zinc	20.200	8.316
Oil and grease	198.000	198.000
Total suspended solids	297.000	237.600
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(d) Electrolyte Preparation Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver in electrolyte produced		
Arsenic	0.070	0.031
Lead	0.014	0.007
Mercury	0.008	0.003
Silver	0.015	0.006
Zinc	0.051	0.021
Oil and grease	0.500	0.500
Total suspended solids	0.750	0.600
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(e) Silver Crystals Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver crystals washed		
Arsenic	0.403	0.180
Lead	0.081	0.038
Mercury	0.044	0.017
Silver	0.084	0.035
Zinc	0.296	0.122
Oil and grease	2.900	2.900
Total suspended solids	4.350	3.480
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(f) Gold Slimes Acid Wash and Water Rinse

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold slimes washed		
Arsenic	5.560	2.480
Lead	1.120	0.520
Mercury	0.600	0.240
Silver	1.160	0.480
Zinc	4.080	1.680
Oil and grease	40.000	40.000
Total suspended solids	60.000	48.000
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(g) Calciner Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	30.580	13.640
Lead	6.160	2.860
Mercury	3.300	1.320
Silver	6.380	2.640
Zinc	22.440	9.240
Oil and grease	220.000	220.000
Total suspended solids	330.000	264.000
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(h) Calcine Quench Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	24.470	10.910
Lead	4.928	2.288
Mercury	2.640	1.056
Silver	5.104	2.112
Zinc	17.950	7.392
Oil and grease	176.000	176.000
Total suspended solids	264.000	211.200
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(i) Calciner Stack Gas Contact Cooling Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	5.769	2.573
Lead	1.162	0.540
Mercury	0.623	0.249
Silver	1.204	0.498
Zinc	4.233	1.743
Oil and grease	41.500	41.500
Total suspended solids	62.250	49.800
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(j) Condenser Blowdown

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	19.180	8.556
Lead	3.864	1.794
Mercury	2.070	0.828
Silver	4.002	1.656
Zinc	14.080	5.796
Oil and grease	138.000	138.000
Total suspended solids	207.000	165.600
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(k) Mercury Cleaning Bath Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	1.946	0.868
Lead	0.392	0.182
Mercury	0.210	0.084
Silver	0.406	0.168
Zinc	1.428	0.588
Oil and grease	14.000	14.000
Total suspended solids	21.000	16.800
pH	Within the range of 7.5 to 10.0 at all times	

5. EPA is not proposing PSES for the primary precious metals and mercury subcategory because there are no indirect dischargers.

6. PSNS are proposed based on the performance achievable by the application of chemical precipitation, sedimentation, and multimedia filtration (lime, settle, and filter) technology, and in-process flow reduction control methods, along with preliminary treatment consisting of oil skimming for selected waste streams. The following pretreatment standards are proposed for new sources:

PSNS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(a) Smelter Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold and silver smelted		
Arsenic	1.807	0.806
Lead	0.364	0.169
Mercury	0.195	0.078
Silver	0.377	0.156
Zinc	1.326	0.546

PSNS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(b) Silver Chloride Reduction Spent Solution

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver reduced in solution		
Arsenic	0.556	0.248
Lead	0.112	0.052
Mercury	0.060	0.024
Silver	0.116	0.048
Zinc	0.408	0.168

PSNS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(c) Electrolytic Cells Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold refined electrolytically		
Arsenic	27.520	12.280
Lead	5.544	2.574
Mercury	2.970	1.188
Silver	5.742	2.376
Zinc	20.200	8.316

PSNS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(d) Electrolyte Preparation Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver in electrolyte produced		
Arsenic	0.070	0.031
Lead	0.014	0.007
Mercury	0.008	0.003
Silver	0.015	0.006
Zinc	0.051	0.021

PSNS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(e) Silver Crystals Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver crystals washed		
Arsenic	0.403	0.180
Lead	0.081	0.038
Mercury	0.044	0.017
Silver	0.084	0.035
Zinc	0.296	0.122

PSNS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(f) Gold Slimes Acid Wash and Water Rinse

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold slimes washed		
Arsenic	5.560	2.480
Lead	1.120	0.520
Mercury	0.600	0.240
Silver	1.160	0.480
Zinc	4.080	1.680

PSNS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(g) Calciner Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	30.580	13.640
Lead	6.160	2.860
Mercury	3.300	1.320
Silver	6.380	2.640
Zinc	22.440	9.240

PSNS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(h) Calcine Quench Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	24.470	10.910
Lead	4.928	2.288
Mercury	2.640	1.056
Silver	5.104	2.112
Zinc	17.950	7.392

PSNS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(i) Calciner Stack Gas Contact Cooling Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	5.769	2.573
Lead	1.162	0.540
Mercury	0.623	0.249
Silver	1.204	0.498
Zinc	4.233	1.743

PSNS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(j) Condenser Blowdown

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	19.180	8.556
Lead	3.864	1.794
Mercury	2.070	0.828
Silver	4.002	1.656
Zinc	14.080	5.796

PSNS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(k) Mercury Cleaning Bath Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	1.946	0.868
Lead	0.392	0.182
Mercury	0.210	0.084
Silver	0.406	0.168
Zinc	1.428	0.588

7. EPA is not proposing BCT for the primary precious metals and mercury subcategory at this time.

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

SECTION III

INDUSTRY PROFILE

This section of the primary precious metals and mercury supplement describes the raw materials and processes used in producing primary precious metals and mercury and presents a profile of the primary precious metals and mercury plants identified in this study. For a discussion of the purpose, authority, and methodology for this study, and a general description of the nonferrous metals manufacturing category, refer to Section III of the General Development Document.

DESCRIPTION OF PRIMARY PRECIOUS METALS PRODUCTION

The production of primary precious metals can be divided into three distinct stages - smelting to produce Dore metal, separation of gold and silver, and gold and silver purification. The processes used in each stage vary with the type and purity of raw material used. The primary precious metals production process is presented schematically in Figure III-1 and described below.

RAW MATERIALS

Primary precious metals are produced from gold and silver bearing concentrates produced from precious metal ores and as a by-product from the beneficiation of base metal ores. A small amount is also produced from placer mining operations. Precious metal ores are mined at various locations in the western United States.

Mining and beneficiation processes for precious metal-bearing ores, including cyanidation, amalgamation, flotation, and gravity concentration are outside the scope of this subcategory. Both the mining and beneficiation operations are regulated as part of the Ore Mining and Dressing Point Source Category.

Primary precious metals produced as a by-product of primary copper refining operations are regulated under nonferrous metals manufacturing phase I as part of the primary copper refining subcategory.

SMELTING

The gold and silver manufacturing process begins when the precious metals bearing concentrate is sent through a Dore furnace (smelter). In the Dore furnace, the gold, silver, and other precious metals are smelted in the presence of a fluxing agent (commonly soda ash, borax, or silica). This smelting operation produces a slag containing impurities such as copper and zinc, and a gold base alloy known as Dore, which may also contain silver.

The Dore gold may be cast and sold as a product or further refined.

GOLD-SILVER SEPARATION

The separation of gold and silver from Dore bars is accomplished through electrolytic refining or by the Miller process. In the electrolytic method, the Dore metal is cast into anodes and placed into a solution of silver nitrate ($AgNO_3$) electrolyte. When a current is applied fine silver is deposited upon the cathode. This silver is removed, washed, and cast into bars of fine silver for sale. Gold remains as slimes in the canvas anode bags. Gold slimes are washed with acid and rinsed with water before being cast as a product. This gold is about 99 percent pure. Silver is recovered in a cementation step from the silver crystals wash water and from the gold slimes acid wash and rinse water. In the cementation process, copper is added to the solution and replaces the silver, causing the silver to precipitate out of the solution. The recovered silver is returned to the anode casting stage.

Gold and silver can also be separated from the Dore metal while it is still molten. This purification step is known as the Miller process and consists of bubbling chlorine gas through the molten Dore metal in a parting furnace. This process converts the silver into silver chloride salt and volatilizes base metal impurities. The silver chloride salt rises to the surface and is skimmed off for further processing. The gold produced by the Miller process can be further purified by electrolytic refining or immediately cast as a product. The silver chloride salt which is skimmed off is remelted and cast into slabs. These slabs are reduced to silver metal in an acid solution. The resulting silver metal is remelted in the presence of borax flux and molten silver is then cast as a product.

FURTHER PURIFICATION

After separation, gold and silver can be further refined by various means. One technique to further refine gold is electrolysis. Impure gold is cast into anodes and purified electrolytically by the Wholwill process in a chloride solution. Gold, which is oxidized at the anode, passes into solution and is deposited upon the cathode. The gold cathode is melted and cast into bars with a purity greater than 99.9 percent. As described above, gold slimes can be further purified using an acid wash and water rinse process.

PROCESS WASTEWATER SOURCES

Although a variety of processes are involved in primary precious metals production, the process wastewater sources can be subdivided as follows:

1. Smelter wet air pollution control,
2. Silver chloride reduction spent solution,
3. Electrolytic cells wet air pollution control,
4. Electrolyte preparation wet air pollution control,
5. Silver crystal wash water, and
6. Gold slimes acid wash and water rinse.

DESCRIPTION OF PRIMARY MERCURY PRODUCTION

Primary mercury is produced from mercury ores and gold-bearing ores by roasting or calcining. The primary mercury production process is presented schematically in Figure III-2 and described below.

RAW MATERIALS

The principal source of mercury is cinnabar ore (mercury sulfide). Cinnabar ore is mined primarily in Nevada, California, and Oregon. In addition, a small amount of mercury is recovered as a co-product from gold ore.

ROASTING

After mining and beneficiation, mercury is extracted from mercury-bearing ores by roasting or calcining. In the roasting process, the mercury is vaporized and then recovered in a condenser, while the sulfur is oxidized to SO_2. Some water may condense with the mercury and is discharged as a waste stream. The mercury recovered from the condenser may be washed with water prior to being sold. The mining and beneficiation stage of mercury production is not within the scope of this subcategory.

Sulfur dioxide (SO_2) and other gaseous emissions from the mercury roasting furnace are controlled with a multistage scrubber. Sulfur dioxide emissions are controlled with a wet scrubber. After SO_2 removal, the clean stack gases are cooled with contact cooling water and discharged to the atmosphere. Calciner SO_2 scrubber liquor and stack gas contact cooling water are discharged as waste streams.

PROCESS WASTEWATER SOURCES

Although a variety of processes are involved in primary mercury production, the process wastewater sources can be subdivided as follows:

1. Calciner wet air pollution control,
2. Calcine quench water,
3. Calciner stack gas contact cooling water,
4. Condenser blowdown, and
5. Mercury cleaning bath water.

OTHER WASTEWATER SOURCES

There are other waste streams associated with the primary precious metals and mercury subcategory. These waste streams include, but are not limited to:

1. Casting contact cooling water,
2. Stormwater runoff, and
3. Maintenance and cleanup water.

These waste streams are not considered as a part of this rulemaking. EPA believes that the flows and pollutant loadings associated with these waste streams are insignificant relative to the waste streams selected, or are best handled by the appropriate permit authority on a case-by-case basis under authority of Section 403 of the Clean Water Act.

AGE, PRODUCTION, AND PROCESS PROFILE

Figure III-3 shows the location of the eight primary precious metals and mercury plants operating in the United States. Four of the eight plants are located in Nevada, with one of the remaining plants each being located in Idaho, Montana, Colorado, and South Dakota.

Table III-1 shows the relative age and discharge status of the primary precious metals and mercury plants. Seven of the eight plants in this subcategory have a zero discharge status, and one plant is a direct discharge facility. The average plant age is less than 12 years. Tables III-2 to III-4 provide a summary of the current production ranges. It can be seen that production of gold is evenly spread along the ranges with a mean production of 70,000 troy ounces/year. The mean production of silver is 222,500 troy ounces/year.

Table III-5 provides a summary of the number of plants generating wastewater for the waste streams associated with various processes and the number of plants with the process.

Table III-1

INITIAL OPERATING YEAR (RANGE) SUMMARY OF PLANTS IN THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY BY DISCHARGE TYPE

Type of Plant	Initial Operating Year (Range) (Plant Age in Years) 1983-1973 (0-11)	1972-1968 (12-16)	1967-1958 (17-26)	1957-1918 (27-66)	Before 1918 (66%)	Total
Direct	1	0	0	0	0	1
Indirect	0	0	0	0	0	0
Zero	4	1	1	0	1	7
TOTAL	5	1	1	0	1	8

Table III-2

PRODUCTION RANGES FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

Type of Plant	Gold Production Range for 1982 0-10,000 (troy oz./yr)	10,001-75,000 (troy oz./yr)	75,001-200,000 (troy oz./yr)	Total Number of Plants
Direct	1	0	0	1
Indirect	0	0	0	0
Zero	1	2	2	5
				6

Table III-3

PRODUCTION RANGES FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

Type of Plant	Silver Production Range for 1982 0-10,000 (troy oz./yr)	10,001-50,000 (troy oz./yr)	50,001-500,000 (troy oz./yr)	>500,000 (troy oz./yr)	Total Number of Plants
Direct	0	0	1	0	1
Indirect	0	0	0	0	0
Zero	1	3	0	1	5
					6

Table III-4

PRODUCTION RANGES FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

Mercury production ranges are not presented here because the information on which they are based has been claimed confidential.

Table III-5

SUMMARY OF PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY PROCESSES AND ASSOCIATED WASTE STREAMS

Process or Waste Stream	Number of Plants With Process or Waste Stream	Number of Plants Reporting Generation of Wastewater*
Roasting	8	
(P.M.) Smelter wet air pollution control	5	3
(Hg) Calciner wet air pollution control	1	1
(Hg) Calcine quench	1	1
(Hg) Calciner stack gas cooling water	1	1
(Hg) Condenser blowdown	2	1
Gold-Silver Separation	3	
(P.M.) Electrolytic preparation wet air pollution control	1	1
Further Purification	3	
(P.M.) Silver chloride reduction spent solution	1	1
(P.M.) Electrolytic cells wet air pollution control	1	1
(P.M.) Silver crystals wash water	1	1
(P.M.) Gold slimes acid wash and rinse water	1	1
(Hg) Mercury cleaning bath water	1	1

*Through reuse or evaporation practices, a plant may "generate" a wastewater from a particular process but not discharge it.

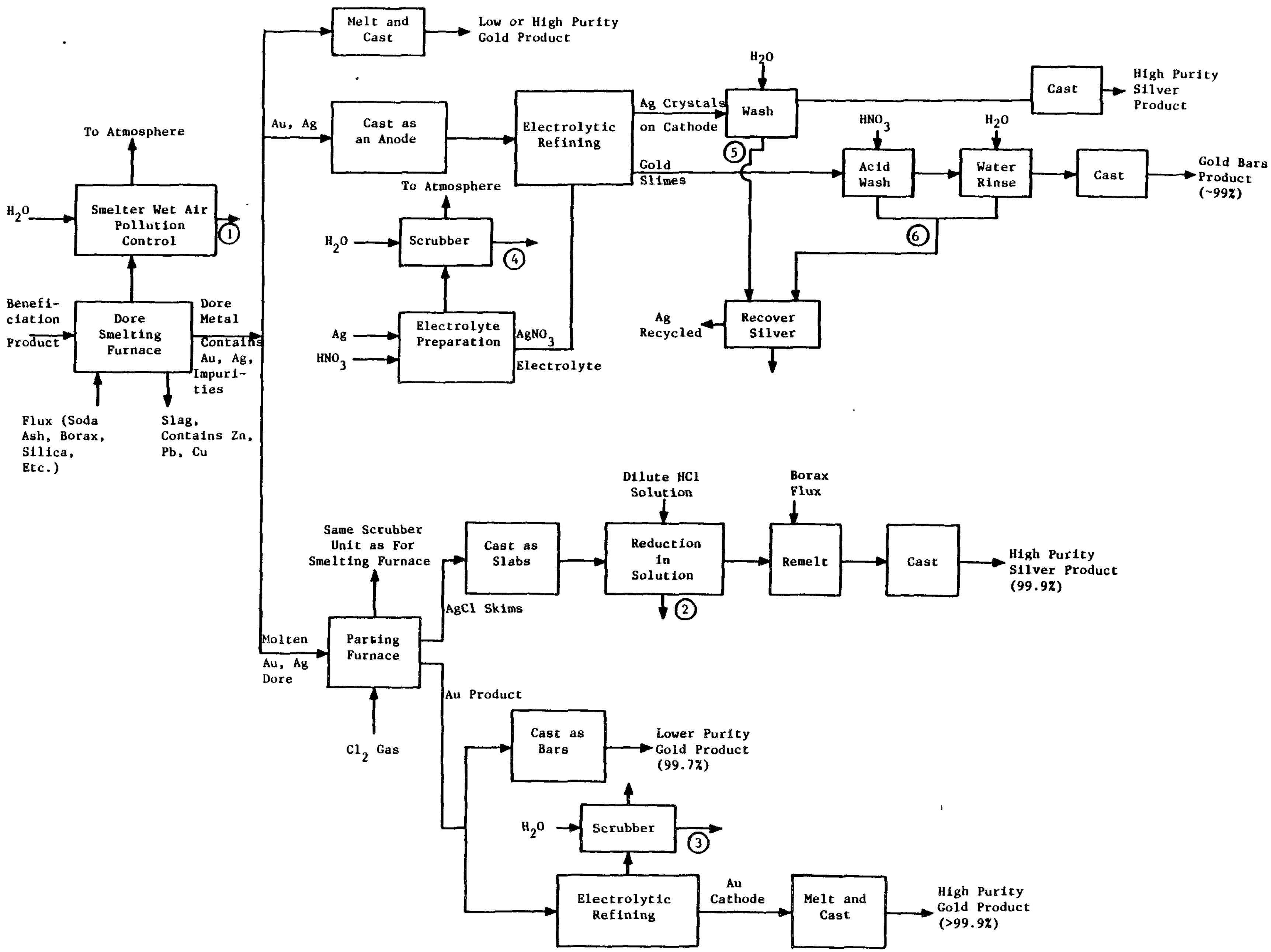

Figure III-1

PRIMARY PRECIOUS METALS PRODUCTION PROCESSES

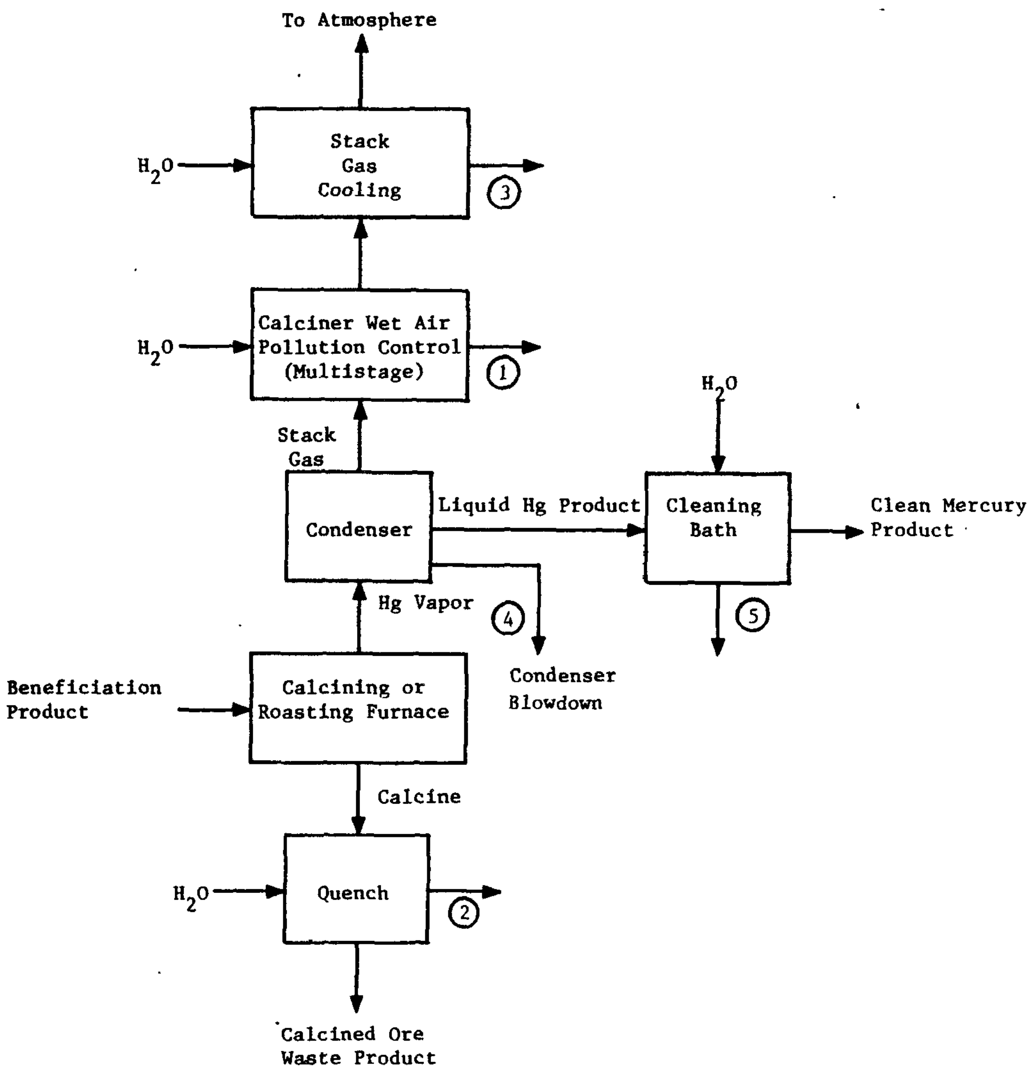

Figure III-2

PRIMARY MERCURY PRODUCTION PROCESS

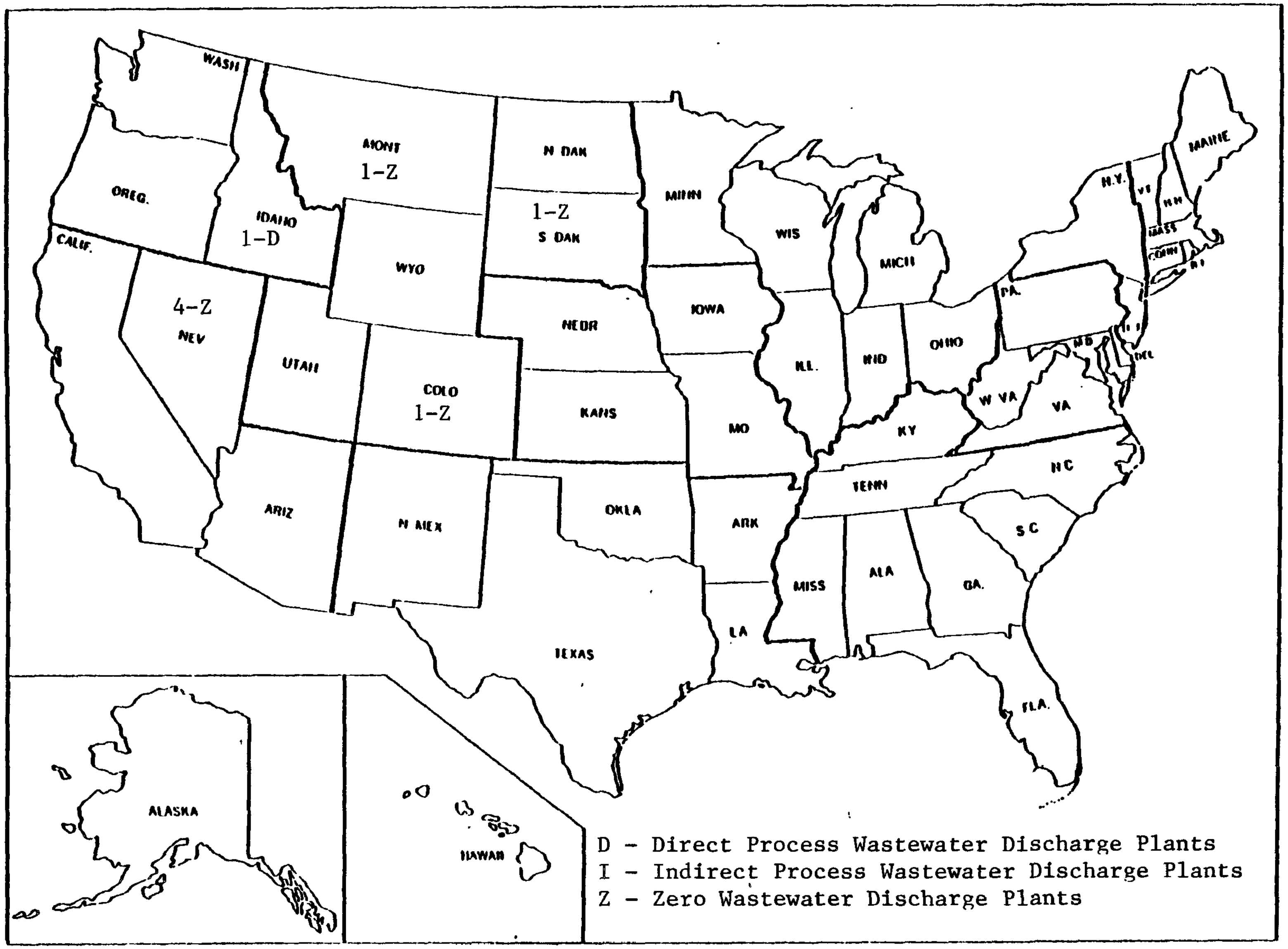

Figure III-3

GEOGRAPHIC LOCATIONS OF THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY PLANTS

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

SECTION IV

SUBCATEGORIZATION

As discussed in Section IV of the General Development Document, the nonferrous metals manufacturing category has been subcategorized to take into account pertinent industry characteristics, manufacturing process variations, and a number of other factors which affect the ability of the facilities to achieve effluent limitations. This section summarizes the factors considered during the designation of the primary precious metals and mercury subcategory and its related subdivisions. Production normalizing parameters for each subdivision will also be discussed.

FACTORS CONSIDERED IN SUBCATEGORIZATION

The following factors were evaluated for use in subcategorizing the nonferrous metals manufacturing category:

1. Metal products, co-products, and by-products;
2. Raw materials;
3. Manufacturing processes;
4. Product form;
5. Plant location;
6. Plant age;
7. Plant size;
8. Air pollution control methods;
9. Meteorological conditions;
10. Treatment costs;
11. Nonwater quality aspects;
12. Number of employees;
13. Total energy requirements; and
14. Unique plant characteristics.

Evaluation of all factors that could warrant subcategorization resulted in the designation of the primary precious metals and mercury subcategory. Three factors were particularly important in establishing these classifications: the type of metal produced, the nature of the raw material used, and the manufacturing processes involved.

In Section IV of the General Development Document, each of these factors is described, and the rationale for selecting metal product, manufacturing process, and raw materials as the principal factors used for subcategorization is discussed. On this basis, the nonferrous metals manufacturing category (phase II) was divided into 21 subcategories, one of them being primary precious metals and mercury.

FACTORS CONSIDERED IN SUBDIVIDING THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

The factors listed previously were each evaluated when considering subdivision of the primary precious metals and mercury subcategory. In the discussion that follows, the factors will be described as they pertain to this particular subcategory.

The rationale for considering further subdivision of the primary precious metals and mercury subcategory is based primarily on differences in the production processes and raw materials used. Within this subcategory, a number of different operations are performed, which may or may not have a water use or discharge, and which may require the establishment of separate effluent limitations. While primary precious metals and mercury is still considered a single subcategory, a more thorough examination of the production processes has illustrated the need for limitations and standards based on a specific set of waste streams. Limitations will be based on specific flow allowances for the following subdivisions:

1. Smelter wet air pollution control,
2. Silver chloride reduction spent solution,
3. Electrolytic cells wet air pollution control,
4. Electrolyte preparation wet air pollution control,
5. Silver crystal wash water,
6. Gold slimes acid wash and water rinse,
7. Calciner wet air pollution control,
8. Calcine quench water,
9. Calciner stack gas contact cooling water,
10. Condenser blowdown, and
11. Mercury cleaning bath water.

These subdivisions follow directly from differences within the three distinct production stages of primary precious metals and mercury.

The smelting of precious metals bearing concentrates to produce Dore metals gives rise to the first subdivision: the smelter wet air pollution control wastewater. If any remelt furnaces are used in the process, the resulting off-gases are usually combined with smelter off-gases for air pollution control. Thus, the smelter wet air pollution control subdivision represents the wet air pollution control wastewater for both smelters and remelt furnaces. The next two subdivisions result from the Miller process (electrolytic refining of gold) for purifying high silver content Dore metal. The electrolytic cells scrubber wastewater is the principal waste stream, but spent solution from silver reduction is also discharged.

The electrolytic refining of silver from Dore metal gives rise to the next three subdivisions. The washing of electrolysis products (silver crystals and gold slimes) creates two waste streams that can potentially be discharged. The fourth subdivision is created by the wet scrubber used to control air emissions from the electrolyte preparation stage.

The last five subdivisions result from the production of primary mercury. The treatment of calciner off-gases by wet scrubbing gives rise to the first of these subdivisions. Waste streams may also result from the quenching of calciner wastes to reduce their temperature prior to disposal and the cooling of calciner off-gases before discharge from the stack. During condensation of the vaporized mercury, the condensation of a water fraction can occur and this condenser blowdown is a possible waste stream. After condensation the liquid mercury may be further purified by use of cleaning baths. This cleaning operation is also a potential source of wastewater.

OTHER FACTORS

The other factors considered in this evaluation either support the establishment of the 11 subdivisions or were shown to be inappropriate bases for subdivision. Air pollution control methods, treatment costs, and total energy requirements are functions of the selected subcategorization factors--metal product, raw materials, and production processes. Therefore, they are not independent factors and do not affect the subcategorization which has been applied. As discussed in Section IV of the General Development Document, certain other factors, such as plant age, plant size, and the number of employees, were also evaluated and determined to be inappropriate for use as bases for subdivision of nonferrous metals plants.

PRODUCTION NORMALIZING PARAMETERS

As discussed previously, the effluent limitations and standards developed in this document establish mass limitations on the discharge of specific pollutant parameters. To allow these regulations to be applied to plants with various production capacities, the mass of pollutant discharged must be related to a unit of production. This factor is known as the production normalizing parameter (PNP).

In general, for each production process which has a wastewater associated with it, the actual mass of precious metal or mercury product produced will be used as the PNP. Thus, the PNPs for the 11 subdivisions are as follows:

Subdivision	PNP
1. Smelter wet air pollution control	troy ounce of gold and silver smelted
2. Silver chloride reduction spent solution	troy ounce of silver reduced in solution
3. Electrolytic cells wet air pollution control	troy ounce of gold refined electrolytically
4. Electrolyte preparation wet air pollution control	troy ounce of silver in electrolyte produced
5. Silver crystal wash water	troy ounce of silver crystals washed
6. Gold slimes acid wash and water rinse	troy ounce of gold slimes washed
7. Calciner wet air pollution control	kkg of mercury condensed
8. Calcine quench water	kkg of mercury condensed
9. Calciner stack gas contact cooling water	kkg of mercury condensed
10. Condenser blowdown	kkg of mercury condensed
11. Mercury cleaning bath water	kkg of mercury condensed

Other PNPs were considered. The use of production capacity instead of actual production was eliminated from consideration because the mass of the pollutant produced is more a function of true production than of installed capacity. The use of some common intermediate (i.e., gold and silver cathodes or silver chloride) as a basis for PNPs for all processes was rejected since not all plants follow the same production path to get to the specific end-product. Additionally, some plants divert part of their intermediate products and sell them instead of processing all input raw materials to one final product. If an "end-product" were chosen as the PNP, plants that had these upstream diversions would be allowed to discharge more per mass of product than their competitors who did not.

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

SECTION V

WATER USE AND WASTEWATER CHARACTERISTICS

This section describes the characteristics of the wastewaters associated with the primary precious metals and mercury subcategory. Water use and discharge rates are explained and then summarized in tables at the end of this section. Data used to characterize the wastewaters are presented. Finally, the specific source, water use and discharge flows, and wastewater characteristics for each separate wastewater source are discussed.

Section V of the General Development Document contains a detailed description of the data sources and methods of analysis used to characterize wastewater from the nonferrous metals manufacturing category. To summarize this information briefly, two principal data sources were used: data collection portfolios (dcp) and field sampling results. Data collection portfolios contain information regarding wastewater flows and production levels.

In order to quantify the pollutant discharge from primary precious metals and mercury plants, a field sampling program was conducted. A complete list of the pollutants considered and a summary of the techniques used in sampling and laboratory analyses are included in Section V of the General Development Document. Samples were analyzed for 124 of the 126 toxic pollutants and other pollutants deemed appropriate. (Because the analytical standard for TCDD was judged to be too hazardous to be made generally available, samples were never analyzed for this pollutant. Samples were also not analyzed for asbestos. There is no reason to expect that TCDD or asbestos would be present in nonferrous metals manufacturing wastewater.) A total of two plants were selected for sampling in the primary precious metals and mercury subcategory. In general, the samples were analyzed for three classes of pollutants: toxic organic pollutants, toxic metal pollutants, and criteria pollutants (which includes both conventional and nonconventional pollutants).

As described in Section IV of this supplement, the primary precious metals and mercury subcategory has been split into 11 subdivisions or wastewater sources, so that the proposed regulation contains mass discharge limitations and standards for 11 unit processes discharging process wastewater. Differences in the wastewater characteristics associated with these subdivisions are to be expected. For this reason, wastewater streams corresponding to each subdivision are addressed separately in the discussions that follow. These wastewater sources are:

1. Smelter wet air pollution control,
2. Silver chloride reduction spent solution,
3. Electrolytic cells wet air pollution control,
4. Electrolyte preparation wet air pollution control,
5. Silver crystal wash water,
6. Gold slimes acid wash and water rinse,
7. Calciner wet air pollution control,
8. Calcine quench water,
9. Calciner stack gas contact cooling water,
10. Condenser blowdown, and
11. Mercury cleaning bath water.

WASTEWATER FLOW RATES

Data supplied by dcp responses were evaluated, and two flow-to-production ratios, water use and wastewater discharge flow, were calculated for each stream. The two ratios are differentiated by the flow value used in calculation. Water use is defined as the volume of water or other fluid required for a given process per mass of product and is therefore based on the sum of recycle and make-up flows to a given process. Wastewater flow discharged after pretreatment or recycle (if these are present) is used in calculating the production normalized flow--the volume of wastewater discharged from a given process to further treatment, disposal, or discharge per mass of product produced. Differences between the water use and wastewater flows associated with a given stream result from recycle, evaporation, and carryover on the product. The production values used in calculation correspond to the production normalizing parameter, PNP, assigned to each stream, as outlined in Section IV. As an example, calcine quench water flow is related to the production of the refined mercury. As such, the discharge rate is expressed in liters of quench water per metric ton of mercury produced (gallons of quench water per ton of mercury).

The production normalized discharge flows were compiled and statistically analyzed by stream type. These production normalized water use and discharge flows are presented by subdivision in Tables V-1 through V-11 at the end of this section. Where appropriate, an attempt was made to identify factors that could account for variations in water use and discharge rates. These variations are discussed later in this section by subdivision. A similar analysis of factors affecting the wastewater flows is presented in Sections X, XI, and XII where representative BAT, NSPS, and pretreatment flows are selected for use in calculating the effluent limitations.

The water use and discharge rates shown do not include nonprocess wastewater, such as rainfall runoff and noncontact cooling water.

WASTEWATER CHARACTERISTICS DATA

Data used to characterize the various wastewaters associated with primary precious metals and mercury production come from two sources--data collection portfolios and analytical data from field sampling trips.

DATA COLLECTION PORTFOLIOS

In the data collection portfolios, the primary precious metals and mercury plants that generate wastewater were asked to specify the presence or absence of toxic pollutants in their wastewater. In most cases, the plants indicated that the toxic organic pollutants were believed to be absent. However, two of the plants stated that they either knew or believed the metals to be present. The responses for asbestos, cyanide, and the metals are summarized below:*

Pollutant	Known Present	Believed Present
Antimony	0	0
Arsenic	1	0
Asbestos	0	1
Beryllium	0	0
Cadmium	1	0
Chromium	1	0
Copper	1	0
Cyanide	1	0
Lead	1	0
Mercury	2	1
Nickel	1	0
Selenium	1	0
Silver	1	0
Thallium	0	0
Zinc	1	0

Although asbestos was reported as believed present by one plant, the trip report from this facility stated it was the mineral cummingtonite which was present and not asbestos. Although the two minerals have some similarities such as similar chemical formulas, cummingtonite is not listed by EPA as a toxic pollutant.

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*Six plants which produce primary precious metals and mercury have been omitted due to lack of data.

FIELD SAMPLING DATA

In order to quantify the concentrations of pollutants present in wastewater from primary precious metals and mercury plants, wastewater samples were collected at two plants. The analytical results from one of these two plants are not presented here because they are claimed to be confidential by the plant. A diagram indicating the sampling sites and contributing production processes at the non-confidential plant is shown in Figure V-1 (at the end of this section).

Raw wastewater data are summarized in Tables V-12 through V-15 (at the end of this section). Analytical results for the combined stream of smelter scrubber water and Miller electrolysis cell scrubber water as well as spent solution from silver reduction are contained in the confidential record. Table V-12 presents data for each of the three stages of the calciner scrubber system. Tables V-13, V-14, and V-15 present sampling data for calcine quench water, calciner stack gas cooling water, and mercury cleaning bath water, respectively. Note that the stream numbers listed in the tables correspond to those given in the individual plant sampling site diagram, Figure V-1. Where no data are listed for a specific day of sampling, the wastewater samples for the stream were not collected.

Several points regarding these tables should be noted. First, the data tables include some samples measured at concentrations considered not quantifiable. The base-neutral extractable, acid extractable, and volatile organics generally are considered not quantifiable at concentrations equal to or less than 0.010 mg/l. Below this concentration, organic analytical results are not quantitatively accurate; however, the analyses are useful to indicate the presence of a particular pollutant. The pesticide fraction is considered not quantifiable at concentrations equal to or less than 0.005 mg/l.

Second, the detection limits shown on the data tables for toxic metals and conventional and nonconventional pollutants are not the same in all cases as the published detection limits for these pollutants by the same analytical methods. The detection limits used were reported with the analytical data and hence are the appropriate limits to apply to the data. Detection limit variation can occur as a result of a number of laboratory-specific, equipment-specific, and daily operator-specific factors. These factors can include day-to-day differences in machine calibration, variation in stock solutions, and variation in operators.

Third, the statistical analysis of data includes some samples measured at concentrations considered not quantifiable. For data considered as detected but below quantifiable concentrations, a value of zero is used for averaging. Toxic organic, nonconventional, and conventional pollutant data reported with a "less than" sign are considered as detected, but not further quantifiable. A value of zero is also used for averaging. If a pollutant is reported as not detected, it is assigned a value of zero in calculating the average. Finally, toxic metal values reported as less than a certain value were considered as below quantification, and consequently were assigned a value of zero in the calculation of the average.

Finally, appropriate source water concentrations are presented with the summaries of the sampling data. The method by which each sample was collected is indicated by number, as follows:

1 One-time grab
2 Manual composite during intermittent process operation
3 8-hour manual composite
4 8-hour automatic composite
5 24-hour manual composite
6 24-hour automatic composite

WASTEWATER CHARACTERISTICS AND FLOWS BY SUBDIVISION

Since primary precious metals and mercury production involves 11 principal sources of wastewater and each has potentially different characteristics and flows, the wastewater characteristics and discharge rates corresponding to each subdivision will be described separately. A brief description of why the associated production processes generate a wastewater and explanations for variations of water use within each subdivision will also be discussed.

SMELTER WET AIR POLLUTION CONTROL

Six of the eight plants in this subcategory smelt or roast the precious metal-bearing raw material. Only three of those facilities, however, use a wet air pollution control device to control air emissions from the furnace. Two of these devices are scrubbers, while one (at plant 1003) is an electrostatic precipitator (ESP). Two plants practice dry air pollution control, and one plant does not practice any air pollution control. The production normalized water use and discharge rates are presented in Table V-1 in liters per troy ounce of gold and silver smelted.

Analytical data for the combined smelter wet air pollution control and electrolytic cells wet air pollution control waste streams are contained in the confidential record. The data show that this wastewater contains treatable concentrations of toxic metals, suspended solids, and oil and grease.

SILVER HLORIDE REDUCTION SPENT SOLUTION

Only on plant in the subcategory uses the Miller process to refine ore metal. Spent solution from the reduction of silver chlorid to silver metal is a potential waste stream. The production normalized water use and discharge flows are presented in Table V 2, in liters per troy ounce of silver reduced in solutio .

Samplin data for spent solution are contained in the confide tial record. This waste stream is very acidic (pH 0.9) and the sampling data indicate that high concentrations of toxic metals, suspended solids, and oil and grease are present.

ELECTRC YTIC CELLS WET AIR POLLUTION CONTROL

The use of wet scrubbers to control emissions from electrolytic cells i practiced at only one plant in this subcategory. Production normalized water use and discharge rates are presented in Table V 3. Sampling data for the combined smelter wet air pollution cc trol and electrolytic cell wet air pollution control waste s ream are contained in the confidential record. The data show th s waste stream to contain treatable concentrations of toxic m tals, suspended solids, and oil and grease.

ELECTRC YTE PREPARATION WET AIR POLLUTION CONTROL

The sil er nitrate electrolyte used in the electrolytic refining of Dore metal is prepared by combining pure silver with nitric acid. ne one facility that uses this process also uses a wet scrubbe to control air emissions from the preparation step, thereby generating a waste stream. Production normalized water use and discharge rates are presented in Table V-4 in liters per troy ou ce of silver in electrolyte produced. No sampling data were ga hered for this waste stream; however, it is expected to have ch racteristics similar to those of the combined raw wastewaters rom smelter wet air pollution control and the electrolytic cel scrubber. This waste stream, therefore, is expected to contain treatable concentrations of suspended solids, toxic metals, and oil and grease.

SILVER RYSTAL WASH WATER

After e ectrolytic refining of Dore metal, the silver which is deposit d upon the cathode is removed and washed. Production normali ed water use and discharge rates for this waste stream are pre ented in Table V-5, in liters per troy ounce of silver crystal washed.

Although no samples of this waste stream were analyzed, it is expected that its characteristics will be similar to wastewater from the secondary silver subcategory, and is contained in the nonferrous phase I public record for that subcategory (see stream 40 at secondary silver plant A). The data show treatable concentrations of toxic metals, suspended solids, and oil and grease.

GOLD SLIMES ACID WASH AND WATER RINSE

Gold slimes remaining in the canvas anode bag from electrolytic refining of Dore metal contain significant amounts of gold and some silver. The gold slimes are washed with nitric acid and water to remove the silver by dissolving it into solution. These wash waters are currently sent to a cementation step, and represent a potential source of wastewater. Production normalized water use and discharge rates for this subdivision are presented in Table V-6 in liters per troy ounce of gold slimes washed. No sampling data were collected for this waste stream; however, it is expected to have characteristics similar to those of gold precipitation and filtration (a very similar process step) wastewater in the secondary precious metals subcategory. This waste stream, therefore, is expected to contain treatable concentrations of toxic metals and suspended solids.

CALCINER WET AIR POLLUTION CONTROL

One of the two plants producing primary mercury uses a water scrubber to control air emissions from the calciner. This plant uses a series of three scrubbers (Venturi, Impinger, and SO_2). Sampling data for the wastewater generated by these scrubbers are presented in Table V-12. The scrubber waters have a low pH (2.3 to 2.6) and contain treatable concentrations of toxic metals such as lead, mercury, thallium and zinc, and suspended solids. The production normalized water use and discharge rates are shown in Table V-7.

CALCINE QUENCH WATER

One mercury producer uses water to quench the waste calcines from the mercury roaster to allow faster handling and disposal of these materials. Table V-8 presents the production normalized water use and discharge rates for this waste stream. Sampling data are summarized in Table V-13 and show high concentrations of toxic metals such as arsenic, mercury and zinc, and suspended solids. This waste stream has a nearly neutral pH of 6.8.

CALCINER STACK GAS CONTACT COOLING WATER

One facility uses contact cooling water to reduce the temperature of the calciner off-gases before releasing them to the atmosphere. Sampling data for this waste stream are summarized in

Table V-14. This waste stream has a pH of 2.5 and contains treatable concentrations of mercury and suspended solids. Production normalized water use and discharge rates are given in Table V-9.

CONDENSER BLOWDOWN

When mercury is vaporized in the calciner, some water contained in the Cinnibar or gold ore may also be vaporized. The condensation of mercury for recovery may result in the condensation of some water which is discharged as condenser blowdown. Table V-10 summarizes the production normalized water use and discharge rates for this waste stream.

Although no sampling data were collected for this waste stream, it is expected to be very similar to the discharge from the mercury cleaning bath. The data are presented in Table V-15, and the condenser blowdown stream is expected to contain treatable concentrations of mercury and suspended solids.

MERCURY CLEANING BATH WATER

Condensed mercury is processed for the removal of impurities by being passed through a water cleaning bath. This waste stream contains treatable concentrations of mercury and suspended solids and very low concentrations of other toxic metals. The sampling data for this waste stream are presented in Table V-15. Production normalized water use and discharge rates are provided in Table V-11.

Table V-1

WATER USE AND DISCHARGE RATES FOR
SMELTER WET AIR POLLUTION CONTROL

(liters/troy ounce of gold and silver smelted)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1131*	76	25.8	6.2
1003	90	5.3	0.53
1137	100	8.41	0
1068	Dry		
1158	Dry		

*No operations conducted in 1982; water use and discharge rates based on projected 1983 figures.

Table V-2

WATER USE AND DISCHARGE RATES FOR
SILVER CHLORIDE REDUCTION SPENT SOLUTION

(liters/troy ounce of silver reduced in solution)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1003	0	0.4	0.4

Table V-3

WATER USE AND DISCHARGE RATES FOR
ELECTROLYTIC CELLS WET AIR POLLUTION CONTROL

(liters/troy ounce of gold refined electrolytically)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1003	0	198	198

Table V-4

WATER USE AND DISCHARGE RATES FOR ELECTROLYTE PREPARATION WET AIR POLLUTION CONTROL

(liters/troy ounce of silver in electrolyte produced)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1160	0	0.05	0.05

Table V-5

WATER USE AND DISCHARGE RATES FOR SILVER CRYSTAL WASH WATER

(liters/troy ounce of silver crystals washed)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1160	0	0.29	0.29

Table V-6

WATER USE AND DISCHARGE RATES FOR
GOLD SLIMES ACID WASH AND WATER RINSE

(liters/troy ounce of gold slimes washed)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1160	0	4.0	4.0

Table V-7

WATER USE AND DISCHARGE RATES FOR
CALCINER WET AIR POLLUTION CONTROL

(liters/kkg of mercury condensed)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1124 (Venturi)	16	4,607	3,870
1124 (Impinger)	16	7,536	6,330
1124 (SO_2)	16	209,524	176,000
TOTAL	16	221,667	186,200

Table V-8

WATER USE AND DISCHARGE RATES FOR CALCINE QUENCH WATER

(liters/kkg of mercury condensed)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1124	0	17,600	17,600

Table V-9

WATER USE AND DISCHARGE RATES FOR CALCINER STACK GAS CONTACT COOLING WATER

(liters/kkg of mercury condensed)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1124	0	4,150	4,150

Table V-10

WATER USE AND DISCHARGE RATES FOR
CONDENSER BLOWDOWN

(liters/kkg of mercury condensed)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1068	0	13,800	13,800
1124	Dry		

Table V-11

WATER USE AND DISCHARGE RATES FOR MERCURY CLEANING BATH WATER

(liters/kkg of mercury condensed)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1124	0	1,400	1,400

Table V-12

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY SAMPLING DATA
CALCINER WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
114. antimony	40	1	<0.003	<0.003		
	41	1	<0.003	<0.003		
	42	1	<0.003	<0.003		
115. arsenic	40	1	0.013	0.32		
	41	1	0.013	0.059		
	42	1	0.013	0.013		
117. beryllium	40	1	<0.01	<0.01		
	41	1	<0.01	<0.01		
	42	1	<0.01	<0.01		
118. cadmium	40	1	<0.01	0.04		
	41	1	<0.01	<0.02		
	42	1	<0.01	<0.01		
119. chromium (total)	40	1	<0.02	<0.02		
	41	1	<0.02	<0.02		
	42	1	<0.02	<0.02		
120. copper	40	1	0.31	<0.01		
	41	1	0.31	<0.01		
	42	1	0.31	<0.01		

Table V-12 (Continued)

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY SAMPLING DATA
CALCINER WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
122. lead	40	1	<0.002	2.2		
	41	1	<0.002	<0.002		
	42	1	<0.002	<0.002		
123. mercury	40	1	0.016	360		
	41	1	0.016	130		
	42	1	0.016	0.84		
124. nickel	40	1	<0.05	<0.05		
	41	1	<0.05	<0.05		
	42	1	<0.05	<0.05		
125. selenium	40	1	<0.003	<0.003		
	41	1	<0.003	<0.003		
	42	1	<0.003	<0.003		
126. silver	40	1	<0.001	<0.001		
	41	1	<0.001	<0.001		
	42	1	<0.001	<0.001		
127. thallium	40	1	<0.002	0.61		
	41	1	<0.002	0.12		
	42	1	<0.002	<0.002		
128. zinc	40	1	<0.01	0.73		
	41	1	<0.01	<0.01		
	42	1	<0.01	<0.01		

Table V-12 (Continued)

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY SAMPLING DATA
CALCINER WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Nonconventional Pollutants						
acidity	40	1	<1	490		
	41	1	<1	490		
	42	1	<1	1,430		
alkalinity	40	1	190	<1		
	41	1	190	<1		
	42	1	190	<1		
aluminum	40	1	<0.05	<0.05		
	41	1	<0.05	<0.05		
	42	1	<0.05	<0.05		
barium	40	1	0.05	0.018		
	41	1	0.05	0.021		
	42	1	0.05	0.053		
boron	40	1	0.041	<0.009		
	41	1	0.041	<0.009		
	42	1	0.041	0.027		
calcium	40	1	52	52		
	41	1	52	53		
	42	1	52	51		
chloride	40	1	50	270		
	41	1	50	75		
	42	1	50	91		

Table V-12 (Continued)

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY SAMPLING DATA
CALCINER WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
cobalt	40	1	<0.006	<0.006		
	41	1	<0.006	<0.006		
	42	1	<0.006	<0.006		
fluoride	40	1	1.1	0.77		
	41	1	1.1	0.84		
	42	1	1.1	1.1		
iron	40	1	0.05	1.0		
	41	1	0.05	0.24		
	42	1	0.05	<0.02		
magnesium	40	1	8.0	7.7		
	41	1	8.0	8.0		
	42	1	8.0	8.0		
manganese	40	1	<0.01	<0.01		
	41	1	<0.01	<0.01		
	42	1	<0.01	<0.01		
molybdenum	40	1	<0.002	<0.002		
	41	1	<0.002	<0.002		
	42	1	<0.002	<0.002		
sodium	40	1	53	83		
	41	1	53	60		
	42	1	53	52		

Table V-12 (Continued)

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY SAMPLING DATA
CALCINER WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
sulfate	40	1	150	67,000		
	41	1	150	68,000		
	42	1	150	17,000		
tin	40	1	<0.12	<0.12		
	41	1	<0.12	<0.12		
	42	1	<0.12	<0.12		
titanium	40	1	<0.005	<0.005		
	41	1	<0.005	<0.005		
	42	1	<0.005	<0.005		
total solids (TS)	40	1	670	1,300		
	41	1	670	800		
	42	1	670	700		
vanadium	40	1	<0.003	<0.003		
	41	1	<0.003	<0.003		
	42	1	<0.003	<0.003		
yttrium	40	1	<0.002	<0.002		
	41	1	<0.002	<0.002		
	42	1	<0.002	<0.002		

Table V-12 (Continued)

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY SAMPLING DATA
CALCINER WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Conventional Pollutants						
oil and grease	40	1	<1	<1		
	41	1	<1	<1		
	42	1	<1	<1		
total suspended solids (TSS)	40	1	<1	80		
	41	1	<1	5		
	42	1	<1	<1		
pH (standard units)	40	1	6.9	2.3		
	41	1	6.9	2.3		
	42	1	6.9	2.6		

†Sample Type Code: 1 - One time grab

Table V-13

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY SAMPLING DATA
CALCINE QUENCH WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
114. antimony	45	1	<0.003	<0.007		
115. arsenic	45	1	0.013	17		
117. beryllium	45	1	<0.01	<0.01		
118. cadmium	45	1	<0.01	0.06		
119. chromium (total)	45	1	<0.02	0.09		
120. copper	45	1	0.31	0.30		
122. lead	45	1	<0.002	0.38		
123. mercury	45	1	0.016	1.4		
124. nickel	45	1	<0.05	<0.05		
125. selenium	45	1	<0.003	<0.003		
126. silver	45	1	<0.001	0.13		
127. thallium	45	1	<0.002	0.19		
128. zinc	45	1	<0.001	1.7		

Table V-13 (Continued)

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY SAMPLING DATA
CALCINE QUENCH WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants						
acidity	45	1	<1	<1		
alkalinity	45	1	190	48		
aluminum	45	1	<0.50	52		
barium	45	1	0.05	1.6		
boron	45	1	0.041	1.3		
calcium	45	1	52	1,800		
chloride	45	1	50	930		
cobalt	45	1	<0.006	0.044		
fluoride	45	1	1.1	5.6		
iron	45	1	0.05	150		
magnesium	45	1	8.0	21		
manganese	45	1	<0.01	0.75		
molybdenum	45	1	<0.002	0.66		

Table V-13 (Continued)

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY SAMPLING DATA
CALCINE QUENCH WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
sodium	45	1	53	2,600		
sulfate	45	1	150	1,900		
tin	45	1	<0.12	<0.12		
titanium	45	1	<0.005	12		
total solids (TS)	45	1	670	13,000		
vanadium	45	1	<0.003	0.55		
yttrium	45	1	<0.002	0.14		
Conventional Pollutants						
oil and grease	45	1	<1	<1		
total suspended solids	45	1	<1	3,700		
pH (standard units)	45	1	6.9	6.8		

†Sample Type Code: 1 - One-time grab

Table V-14

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY SAMPLING DATA
CALCINER STACK GAS CONTACT COOLING WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
114. antimony	43	1	<0.003	<0.003		
115. arsenic	43	1	0.013	0.017		
117. beryllium	43	1	<0.01	<0.01		
118. cadmium	43	1	<0.01	<0.01		
119. chromium (total)	43	1	<0.02	<0.02		
120. copper	43	1	0.31	<0.01		
122. lead	43	1	<0.002	<0.002		
123. mercury	43	1	0.016	2.1		
124. nickel	43	1	<0.05	<0.05		
125. selenium	43	1	<0.003	<0.003		
126. silver	43	1	<0.001	<0.001		
127. thallium	43	1	<0.002	0.004		
128. zinc	43	1	<0.01	<0.02		

Table V-14 (Continued)

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY SAMPLING DATA
CALCINER STACK GAS CONTACT COOLING WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants						
acidity	43	1	<1	1,800		
alkalinity	43	1	190	<1		
aluminum	43	1	<0.50	<0.50		
barium	43	1	0.050	0.047		
boron	43	1	0.041	<0.009		
calcium	43	1	52	52		
chloride	43	1	50	53		
cobalt	43	1	<0.006	<0.006		
fluoride	43	1	1.1	1.1		
iron	43	1	0.05	0.039		
magnesium	43	1	8.0	8.0		
manganese	43	1	<0.01	<0.01		
molybdenum	43	1	<0.002	<0.002		

Table V-14 (Continued)

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY SAMPLING DATA
CALCINER STACK GAS CONTACT COOLING WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
sodium	43	1	53	53		
sulfate	43	1	150	23,600		
tin	43	1	<0.12	<0.12		
titanium	43	1	<0.005	<0.005		
total solids (TS)	43	1	670	880		
vanadium	43	1	<0.003	<0.003		
yttrium	43	1	<0.002	<0.002		
Conventional Pollutants						
oil and grease	43	1	<1	<1		
total suspended solids	43	1	<1	4		
pH (standard units)	43	1	6.9	2.5		

†Sample Type Code: 1 - One-time grab

Table V-15

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY SAMPLING DATA
MERCURY CLEANING BATH WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
114. antimony	44	1	<0.003	<0.003		
115. arsenic	44	1	0.013	0.017		
117. beryllium	44	1	<0.01	<0.01		
118. cadmium	44	1	<0.01	<0.01		
119. chromium (total)	44	1	<0.02	<0.01		
120. copper	44	1	0.31	<0.01		
122. lead	44	1	<0.002	<0.002		
123. mercury	44	1	0.016	2.5		
124. nickel	44	1	<0.05	<0.05		
125. selenium	44	1	<0.003	<0.003		
126. silver	44	1	<0.001	<0.001		
127. thallium	44	1	<0.002	<0.002		
128. zinc	44	1	<0.01	<0.01		

Table V-15 (Continued)

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY SAMPLING DATA
MERCURY CLEANING BATH WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants						
acidity	44	1	<1	1,700		
alkalinity	44	1	190	170		
aluminum	44	1	<0.5	<0.5		
barium	44	1	0.050	0.059		
boron	44	1	0.041	0.022		
calcium	44	1	52	52		
chloride	44	1	50	47		
cobalt	44	1	<0.006	<0.006		
fluoride	44	1	1.1	0.96		
iron	44	1	0.05	<0.02		
magnesium	44	1	8.0	7.9		
manganese	44	1	<0.01	<0.01		
molybdenum	44	1	<0.002	<0.002		

Table V-15 (Continued)

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY SAMPLING DATA
MERCURY CLEANING BATH WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
sodium	44	1	53	53		
sulfate	44	1	150	74		
tin	44	1	<0.12	<0.12		
titanium	44	1	<0.005	<0.005		
total solids (TS)	44	1	670	690		
vanadium	44	1	<0.003	<0.003		
yttrium	44	1	<0.002	<0.002		
Conventional Pollutants						
oil and grease	44	1	<1	<1		
total suspended solids	44	1	<1	4		
pH (standard units)	44	1	6.9	7.5		

†Sample Type Code: 1 - One-time grab

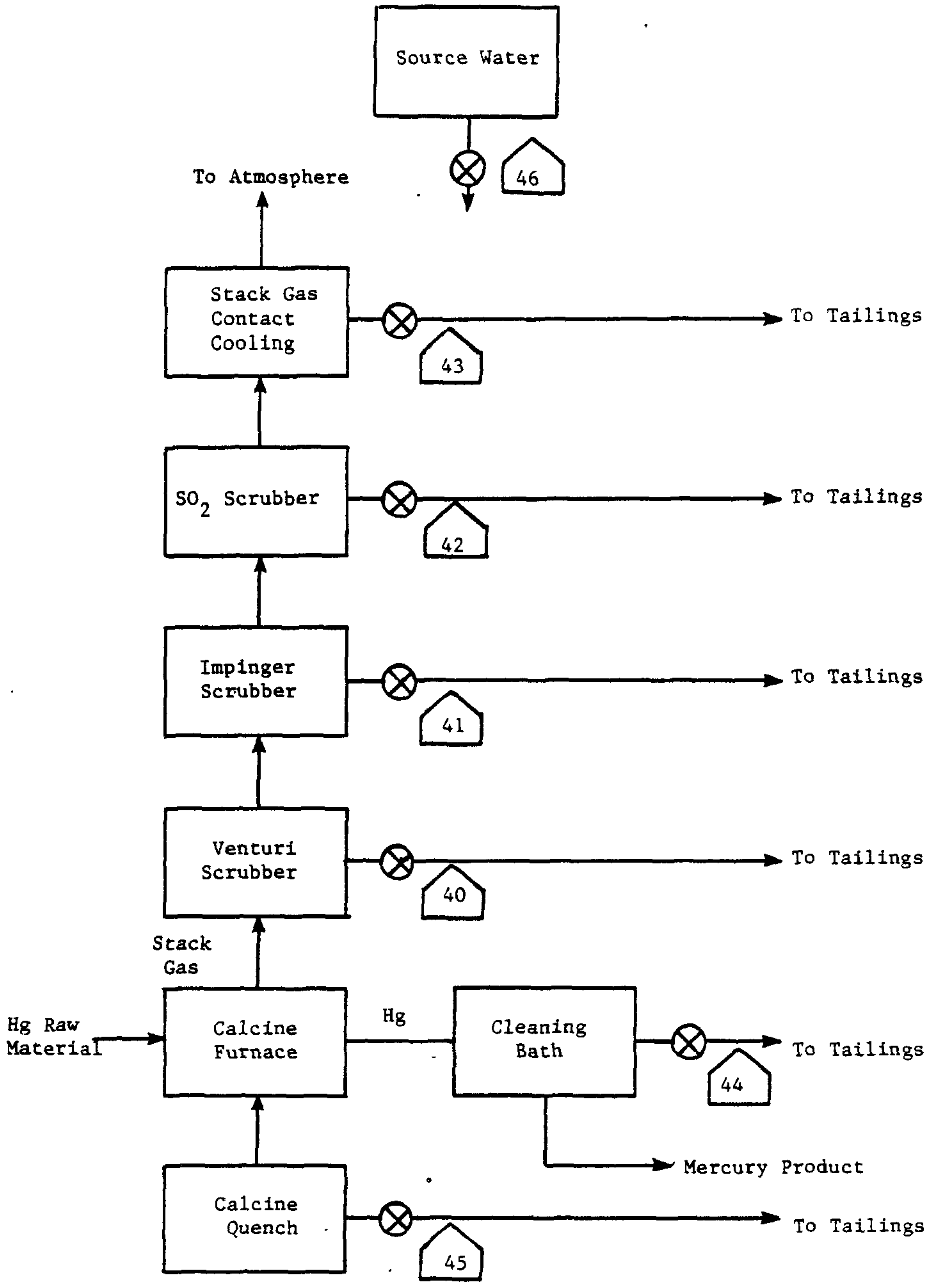

Figure V-1

SAMPLE LOCATIONS AT PRIMARY PRECIOUS
METALS AND MERCURY PLANT A

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

SECTION VI

SELECTION OF POLLUTANT PARAMETERS

Section V of this supplement presented data from primary precious metals and mercury plant sampling visits and subsequent chemical analyses. The analytical data from one primary precious metals plant was not presented in Section V because it was claimed to be confidential. This section examines both the confidential and nonconfidential data and discusses the selection or exclusion of pollutants for potential limitation. The legal basis for the exclusion of toxic pollutants under Paragraph 8(a) of the Settlement Agreement is presented in Section VI of the General Development Document.

Each pollutant selected for potential limitation is discussed in Section VI of the General Development Document. That discussion provides information concerning the nature of the pollutant (i.e., whether it is a naturally occurring substance, processed metal, or a manufactured compound); general physical properties and the form of the pollutant; toxic effects of the pollutant in humans and other animals; and behavior of the pollutant in POTW at the concentrations expected in industrial discharges.

The discussion that follows describes the analysis that was performed to select or exclude toxic pollutants for further consideration for limitations and standards. Also, it describes the analysis that was performed to select or exclude conventional pollutants for limitation. Toxic pollutants will be considered for limitation if they are present in concentrations treatable by the technologies considered in this analysis. The treatable concentrations used for the toxic metals were the long-term performance values achievable by chemical precipitation, sedimentation, and filtration. The treatable concentrations used for the toxic organics were the long-term performance values achievable by carbon adsorption (see Section VII of the General Development Document Combined Metals Data Base).

CONVENTIONAL POLLUTANT PARAMETERS

This study examined samples from the primary precious metals and mercury subcategory for three conventional pollutant parameters (oil and grease, total suspended solids, and pH).

CONVENTIONAL POLLUTANT PARAMETERS SELECTED

The conventional pollutants or pollutant parameters selected for limitation in this subcategory are:

oil and grease
total suspended solids (TSS)
pH

Oil and grease was detected in two of 10 samples at concentrations above the treatability concentration of 10.0 mg/l. The measured concentrations were 60 and 170 mg/l. These high concentrations occurred in the combined raw wastewater stream from the smelter and electrolytic cells wet air pollution control and in the silver chloride reduction spent solution. Therefore, oil and grease is selected for limitation in this subcategory.

TSS was detected at concentrations above the treatability concentration of 2.6 mg/l in eight of the 10 raw waste samples analyzed for this study. These eight TSS concentration values ranged from 4 to 3,700 mg/l. Furthermore, most of the specific methods used to remove toxic metals do so by converting these metals to precipitates, and these toxic-metal-containing precipitates should not be discharged. Meeting a limitation on total suspended solids helps ensure that removal of these precipitated toxic metals has been effective. For these reasons, total suspended solids are selected for limitation in this subcategory.

The nine pH values observed during this study ranged from 0.9 to 8.4. Six of the nine values were equal to or less than 2.6, one value was 6.8 and the other two fell within the 7.5 to 10.0 range considered desirable for discharge to receiving waters. Many deleterious effects are caused by extreme pH values or rapid changes in pH. Also, effective removal of toxic metals by precipitation requires careful control of pH. Since pH control within the desirable limits is readily attainable by available treatment, pH is selected for limitation in this subcategory.

TOXIC POLLUTANTS

The frequency of occurrence of the toxic pollutants in the raw wastewater samples taken is presented in Table VI-1. Table VI-1 is based on the raw wastewater data presented in Section V (see Tables V-12 through V-15) as well as the primary precious metals analytical data being held confidential. These data provide the basis for the categorization of specific pollutants, as discussed below.

TOXIC POLLUTANTS NEVER DETECTED

The toxic pollutants listed below were not detected in any raw wastewater samples from this subcategory; therefore, they are not selected for consideration in establishing limitations:

1. acenaphthene
2. acrolein
3. acrylonitrile

5. benzidine
6. carbon tetrachloride
7. chlorobenzene
8. 1,2,4-trichlorobenzene
9. hexachlorobenzene
10. 1,2-dichloroethane
11. 1,1,1-trichloroethane
12. hexachloroethane
13. 1,1-dichloroethane
14. 1,1,2-trichloroethane
15. 1,1,2,2-tetrachloroethane
16. chloroethane
17. bis(2-chloromethyl) ether (deleted)
18. bis(2-chloroethyl) ether
19. 2-chloroethyl vinyl ether
20. 2-chloronaphthalene
21. 2,4,6-trichlorophenol
22. parachlorometa cresol
23. chloroform
24. 2-chlorophenol
25. 1,2-dichlorobenzene
26. 1,3-dichlorobenzene
27. 1,4-dichlorobenzene
28. 3,3'-dichlorobenzidine
29. 1,1-dichloroethylene
30. 1,2-trans-dichloroethylene
31. 2,4-dichlorophenol
32. 1,2-dichloropropane
33. 1,3-dichloropropylene
34. 2,4-dimethylphenol
35. 2,4-dinitrotoluene
36. 2,6-dinitrotoluene
37. 1,2-diphenylhydrazine
38. ethylbenzene
39. fluoranthene
40. 4-chlorophenyl phenyl ether
41. 4-bromophenyl phenyl ether
42. bis(2-chloroisopropyl)ether
43. bis(2-chloroethoxy)methane
45. methyl chloride (chloromethane)
46. methyl bromide (bromomethane)
47. bromoform
48. dichlorobromomethane
49. trichlorofluoromethane (deleted)
50. dichlorodifluoromethane (deleted)
51. chlorodibromomethane
52. hexachlorobutadiene
53. hexachlorocyclopentadiene
54. isophorone
55. naphthalene
56. nitrobenzene

57. 2-nitrophenol
58. 4-nitrophenol
59. 2,4-dinitrophenol
60. 4,6-dinitro-o-cresol
61. N-nitrosodimethylamine
62. N-nitrosodiphenylamine
63. N-nitrosodi-n-propylamine
64. pentachlorophenol
67. butyl benzyl phthalate
69. di-n-octyl phthalate
71. dimethyl phthalate
72. benzo(a)anthracene
73. benzo(a)pyrene
74. 3,4-benzofluoranthene
75. benzo(k)fluoranthene
76. chrysene
77. acenaphthylene
79. benzo(ghi)perylene
80. fluorene
82. dibenzo(a,h)anthracene
83. indeno (1,2,3-cd)pyrene
84. pyrene
85. tetrachloroethylene
87. trichloroethylene
88. vinyl chloride
89. aldrin
90. dieldrin
91. chlordane
92. 4,4'-DDT
93. 4,4'-DDE
94. 4,4'-DDD
95. alpha-endosulfan
96. beta-endosulfan
97. endosulfan sulfate
98. endrin
99. endrin aldehyde
100. heptachlor
101. heptachlor epoxide
102. alpha-BHC
103. beta-BHC
104. gamma-BHC
105. delta-BHC
106. PCB-1242 (a)
107. PCB-1254 (a)
108. PCB-1221 (a)
109. PCB-1232 (b)
110. PCB-1248 (b)
111. PCB-1260 (b)
112. PCB-1016 (b)
113. toxaphene

116. asbestos
129. 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)

(a),(b) Reported together.

TOXIC POLLUTANTS NEVER FOUND ABOVE THEIR ANALYTICAL QUANTIFICATION CONCENTRATION

The toxic pollutants listed below were never found above their analytical quantification concentration in any raw wastewater samples from this subcategory; therefore, they are not selected for consideration in establishing limitations.

65. phenol
66. bis(2-ethylhexyl) phthalate
68. di-n-butyl phthalate
78. anthracene (a)
81. phenanthrene (a)
114. antimony

(a) Reported together.

TOXIC POLLUTANTS PRESENT BELOW CONCENTRATIONS ACHIEVABLE BY TREATMENT

The pollutants listed below are not selected for consideration in establishing limitations because they were not found in any raw wastewater samples from this subcategory above concentrations considered achievable by existing or available treatment technologies. These pollutants are discussed individually following the list.

117. beryllium
125. selenium

Beryllium was detected at a concentration of 0.15 mg/l in one of the 10 samples analyzed. Available treatment methods can reduce beryllium concentrations only to 0.2 mg/l and this pollutant is, therefore, not considered for limitation.

Selenium was detected in two of 10 samples at concentrations ranging from 0.044 to 0.063 mg/l. These concentrations are below the minimum selenium concentration of 0.2 mg/l achievable by available treatment methods. Additionally, these concentrations of selenium may be attributable to its presence in the source water at a concentration of 0.10 mg/l. Selenium, therefore, is not considered for limitation.

TOXIC POLLUTANTS DETECTED IN A SMALL NUMBER OF SOURCES

The following pollutants were not selected for limitation because they are detectable in the effluent from only a small number of sources within the subcategory and they are uniquely related to only those sources.

4. benzene
44. methylene chloride
70. diethyl phthalate
86. toluene
121. cyanide

Although these pollutants were not selected for limitation in establishing nationwide regulations, it may be appropriate, on a case-by-case basis, for the local permitter to specify effluent limitations.

Benzene was detected above its treatable concentration of 0.01 mg/l in one of three samples analyzed at a concentration of 0.016 mg/l. This pollutant is not attributable to specific materials or processes asociated with the primary precious metals and mercury subcategory, and is not expected to be present in the wastewater. For this reason, and because very little removal of benzene can be expected with treatment, this pollutant is not considered for limitation.

Methylene chloride was detected above its treatability concentration of 0.01 mg/l at concentrations ranging from 0.036 to 0.046 mg/l in all three samples analyzed. This pollutant is not attributable to specific materials or processes associated with the primary precious metals and mercury subcategory, but is a common solvent used in analytical laboratories. Because methylene chloride is not expected to be present in the wastewater, as well as the high probability of sample contamination, this pollutant is not considered for limitation.

Diethyl phthalate was detected above its treatable concentration of 0.01 mg/l in one of three samples analyzed at a concentration of 0.016 mg/l. This pollutant is not attributable to specific materials or processes associated with the primary precious metals and mercury subcategory, and is not expected to be present in the wastewater. For this reason, and because very little removal of diethyl phthalate can be expected with treatment, this pollutant is not considered for limitation.

Toluene was detected above its treatable concentration of 0.01 mg/l in two of three samples analyzed at concentrations of 0.023 and 0.05 mg/l. This pollutant is not attributable to specific materials or processes associated with the primary precious metals and mercury subcategory, and is not expected to be present in the wastewater. For this reason, and because very little removal of toluene can be expected with treatment, this pollutant is not considered for limitation.

Cyanide was measured at concentrations ranging from 0.049 to 0.2 mg/l in three of the four samples for which it was analyzed. These concentrations are above the treatability concentration of 0.047 mg/l, but are suspected to be present because of source water contamination. The source water was found to contain cyanide at a concentration of 8.6 mg/l. Because of its presence in the source water at a high concentration, cyanide is not considered for limitation.

TOXIC POLLUTANTS SELECTED FOR FURTHER CONSIDERATION IN ESTABLISHING LIMITATIONS AND STANDARDS

The toxic pollutants listed below are selected for further consideration in establishing limitations and standards for this subcategory. The toxic pollutants selected for further consideration for limitation are each discussed following the list.

115. arsenic
118. cadmium
119. chromium
120. copper
122. lead
123. mercury
124. nickel
126. silver
127. thallium
128. zinc

Arsenic was detected in two of 10 samples at concentrations of 0.6 and 17 mg/l. The concentration achievable by treatment methods is 0.34 mg/l. These concentrations were detected in silver chloride reduction spent solution and calcine quench water. Arsenic was detected, but at levels below treatability, in the other eight samples. Therefore, arsenic is selected for further consideration for limitation.

Cadmium was detected above its treatable concentration (0.049 mg/l) in two of 10 raw wastewater samples analyzed. The treatable concentrations were detected in silver chloride reduction spent solution and calcine quench water. Therefore, cadmium is selected for further consideration for limitation.

Chromium was detected above its treatable concentration of 0.07 mg/l in silver chloride reduction spent solution and calcine quench water. The highest concentration was 25 mg/l. All eight other samples indicated that chromium was present, but at a concentration below treatability. Therefore, chromium is selected for further consideration for limitation.

Copper was measured in two samples at concentrations above the treatable concentration of 0.39 mg/l. Copper was also detected in the remaining eight samples, but at concentrations below that achievable by treatment. The highest concentration of copper found was 23,000 mg/l. Therefore, copper is selected for further consideration for limitation.

Lead was detected in six raw waste streams at concentrations above the 0.08 mg/l attainable by identified treatment technology. These concentrations ranged from 0.1 to 600 mg/l. For this reason, lead is selected for further consideration for limitation.

Mercury was detected in six of the 10 samples analyzed at concentrations ranging from 0.84 to 360 mg/l. These concentrations are well above the concentration of 0.036 achievable by current treatment methods. In addition, mercury was detected in the remaining four samples, but at values below the treatable concentration. For these reasons, mercury is selected for further consideration for limitation.

Nickel was detected in the silver chloride reduction spent solution at a concentration of 29 mg/l. The treatable concentration for nickel is 0.22 mg/l. Nickel was detected, but below treatable concentrations in all nine of the other samples. Therefore, nickel is selected for further consideration for limitation.

Silver was detected in two samples at concentrations of 0.13 and 6.1 mg/l. These concentrations are above silver's treatable concentration of 0.07 mg/l. Silver is, therefore, selected for further consideration for limitation.

Thallium was detected above its treatable concentration (0.34 mg/l) in two of 10 samples analyzed. The quantifiable concentrations ranged from 0.12 to 2.6 mg/l. Since thallium was present in concentrations exceeding the concentration achievable by identified treatment technology, it is selected for consideration for limitation.

Zinc was detected above its treatable concentration (0.23 mg/l) in three of 10 samples analyzed. The quantifiable concentrations ranged from 0.10 to 15.0 mg/l. Since zinc was present in concentrations exceeding the concentration achievable by identified treatment technology, it is selected for consideration for limitation.

Table VI-1

FREQUENCY OF OCCURRENCE OF TOXIC POLLUTANTS PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY RAW WASTEWATER

Pollutant	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentration (mg/l)(b)	Number of Streams Analyzed	Number of Samples Analyzed	ND	Detected Below Quantification Concentration	Detected Below Treatable Concentration	Detected Above Treatable Concentration
1. acenaphthene	0.010	0.01	2	3	3			
2. acrolein	0.010	0.01	2	3	3			
3. acrylonitrile	0.010	0.01	2	3	3			
4. benzene	0.010	0.01	2	3		2		1
5. benzidine	0.010	0.01	2	3	3			
6. carbon tetrachloride	0.010	0.01	2	3	3			
7. chlorobenzene	0.010	0.01	2	3	3			
8. 1,2,4-trichlorobenzene	0.010	0.01	2	3	3			
9. hexachlorobenzene	0.010	0.01	2	3	3			
10. 1,2-dichloroethane	0.010	0.01	2	3	3			
11. 1,1,1-trichloroethane	0.010	0.01	2	3	3			
12. hexachloroethane	0.010	0.01	2	3	3			
13. 1,1-dichloroethane	0.010	0.01	2	3	3			
14. 1,1,2-trichloroethane	0.010	0.01	2	3	3			
15. 1,1,2,2-tetrachloroethane	0.010	0.01	2	3	3			
16. chloroethane	0.010	0.01	2	3	3			
17. bis(chloromethyl) ether	0.010	0.01	2	3	3			
18. bis(2-chloroethyl) ether	0.010	0.01	2	3	3			
19. 2-chloroethyl vinyl ether	0.010	0.01	2	3	3			
20. 2-chloronaphthalene	0.010	0.01	2	3	3			
21. 2,4,6-trichlorophenol	0.010	0.01	2	3	3			
22. parachlorometa cresol	0.010	0.01	2	3	3			
23. chloroform	0.010	0.01	2	3	3			
24. 2-chlorophenol	0.010	0.01	2	3	3			
25. 1,2-dichlorobenzene	0.010	0.01	2	3	3			
26. 1,3-dichlorobenzene	0.010	0.01	2	3	3			
27. 1,4-dichlorobenzene	0.010	0.01	2	3	3			
28. 3,3'-dichlorobenzidine	0.010	0.01	2	3	3			
29. 1,1-dichloroethylene	0.010	0.01	2	3	3			
30. 1,2-trans-dichloroethylene	0.010	0.01	2	3	3			
31. 2,4-dichlorophenol	0.010	0.01	2	3	3			
32. 1,2-dichloropropane	0.010	0.01	2	3	3			
33. 1,3-dichloropropylene	0.010	0.01	2	3	3			
34. 2,4-dimethylphenol	0.010	0.01	2	3	3			

Table VI-1 (Continued)

FREQUENCY OF OCCURRENCE OF TOXIC POLLUTANTS PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY RAW WASTEWATER

Pollutant	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentration (mg/l)(b)	Number of Streams Analyzed	Number of Samples Analyzed	ND	Detected Below Quantification Concentration	Detected Below Treatable Concentration	Detected Above Treatable Concentration
35. 2,4-dinitrotoluene	0.010	0.01	2	3	3			
36. 2,6-dinitrotoluene	0.010	0.01	2	3	3			
37. 1,2-diphenylhydrazine	0.010	0.01	2	3	3			
38. ethylbenzene	0.010	0.01	2	3	3			
39. fluoranthene	0.010	0.01	2	3	3			
40. 4-chlorophenyl phenyl ether	0.010	0.01	2	3	3			
41. 4-bromophenyl phenyl ether	0.010	0.01	2	3	3			
42. bis(2-chloroisopropyl) ether	0.010	0.01	2	3	3			
43. bis(2-chloroethoxy) methane	0.010	0.01	2	3	3			
44. methylene chloride	0.010	0.01	2	3				3
45. methyl chloride	0.010	0.01	2	3	3			
46. methyl bromide	0.010	0.01	2	3	3			
47. bromoform	0.010	0.01	2	3	3			
48. dichlorobromomethane	0.010	0.01	2	3	3			
49. trichlorofluoromethane	0.010	0.01	2	3	3			
50. dichlorodifluoromethane	0.010	0.01	2	3	3			
51. chlorodibromomethane	0.010	0.01	2	3	3			
52. hexachlorobutadiene	0.010	0.01	2	3	3			
53. hexachlorocyclopentadiene	0.010	0.01	2	3	3			
54. isophorone	0.010	0.01	2	3	3			
55. naphthalene	0.010	0.01	2	3	3			
56. nitrobenzene	0.010	0.01	2	3	3			
57. 2-nitrophenol	0.010	0.01	2	3	3			
58. 4-nitrophenol	0.010	0.01	2	3	3			
59. 2,4-dinitrophenol	0.010	0.01	2	3	3			
60. 4,6-dinitro-o-cresol	0.010	0.01	2	3	3			
61. N-nitrosodimethylamine	0.010	0.01	2	3	3			
62. N-nitrosodiphenylamine	0.010	0.01	2	3	3			
63. N-nitrosodi-n-propylamine	0.010	0.01	2	3	3			
64. pentachlorophenol	0.010	0.01	2	3	3			
65. phenol	0.010	0.01	2	3	2	1		
66. bis(2-ethylhexyl) phthalate	0.010	0.01	2	3		3		
67. butyl benzyl phthalate	0.010	0.01	2	3	3			
68. di-n-butyl phthalate	0.010	0.01	2	3	1	2		

Table VI-1 (Continued)

FREQUENCY OF OCCURRENCE OF TOXIC POLLUTANTS PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY RAW WASTEWATER

Pollutant	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentration (mg/l)(b)	Number of Streams Analyzed	Number of Samples Analyzed	ND	Detected Below Quantification Concentration	Detected Below Treatable Concentration	Detected Above Treatable Concentration
69. di-n-octyl phthalate	0.010	0.01	2	3	3			
70. diethyl phthalate	0.010	0.01	2	3		2		1
71. dimethyl phthalate	0.010	0.01	2	3	3			
72. benzo(a)anthracene	0.010	0.01	2	3	3			
73. benzo(a)pyrene	0.010	0.01	2	3	3			
74. 3,4-benzofluoranthene	0.010	0.01	2	3	3			
75. benzo(k)fluoranthene	0.010	0.01	2	3	3			
76. chrysene	0.010	0.01	2	3	3			
77. acenaphthylene	0.010	0.01	2	3	3			
78. anthracene (c)	0.010	0.01	2	3		3		
79. benzo(ghi)perylene	0.010	0.01	2	3	3			
80. fluorene	0.010	0.01	2	3	3			
81. phenanthrene (c)	0.010	0.01	2	3		3		
82. dibenzo(a,h)anthracene	0.010	0.01	2	3	3			
83. indeno(1,2,3-cd)pyrene	0.010	0.01	2	3	3			
84. pyrene	0.010	0.01	2	3	3			
85. tetrachloroethylene	0.010	0.01	2	3	3			
86. toluene	0.010	0.01	2	3		1		2
87. trichloroethylene	0.010	0.01	2	3	3			
88. vinyl chloride	0.010	0.01	2	3	3			
114. antimony	0.100	0.47	8	10		10	0	0
115. arsenic	0.010	0.34	8	10		0	8	2
117. beryllium	0.010	0.20	8	10		9	1	0
118. cadmium	0.002	0.049	8	10		6	2	2
119. chromium	0.005	0.07	8	10		5	3	2
120. copper	0.009	0.39	8	10		5	3	2
121. cyanide (d)	0.02	0.047	2	4		0	1	3
122. lead	0.020	0.08	8	10		4	0	6
123. mercury	0.0001	0.036	8	10		0	4	6
124. nickel	0.005	0.22	8	10		6	3	1
125. selenium	0.01	0.20	8	10		8	2	0
126. silver	0.02	0.07	8	10		5	3	2

Table VI-1 (Continued)

FREQUENCY OF OCCURRENCE OF TOXIC POLLUTANTS PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY RAW WASTEWATER

Pollutant	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentration (mg/l)(b)	Number of Streams Analyzed	Number of Samples Analyzed	ND	Detected Below Quantification Concentration	Detected Below Treatable Concentration	Detected Above Treatable Concentration
127. thallium	0.100	0.34	8	10		6	2	2
128. zinc	0.050	0.23	8	10		4	3	3
oil and grease	5.0	10.0	8	10		8	0	2
total suspended solids (TSS)	1.0	2.6	8	10		2	0	8

(a) Analytical quantification concentration was reported with the data (see Section V).

(b) Treatable concentrations are based on performance of chemical precipitation, sedimentation, and filtration.

(c) Reported together.

(d) Analytical quantification concentration for EPA Method 335.2, Total Cyanide Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, March 1979.

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

SECTION VII

CONTROL AND TREATMENT TECHNOLOGIES

The preceding sections of this supplement discussed the sources, flows, and characteristics of the wastewaters from primary precious metals and mercury plants. This section summarizes the description of these wastewaters and indicates the treatment technologies which are currently practiced in the primary precious metals and mercury subcategory for each waste stream. Secondly, this section presents the control and treatment technology options which were examined by the Agency for possible application to the primary precious metals and mercury subcategory.

CURRENT CONTROL AND TREATMENT PRACTICES

Control and treatment technologies are discussed in general in Section VII of the General Development Document. The basic principles of these technologies and the applicability to wastewater similar to that found in this subcategory are presented there. This section presents a summary of the control and treatment technologies that are currently being applied to each of the sources generating wastewater in this subcategory. As discussed in Section V, wastewater associated with the primary precious metals and mercury subcategory is characterized by the presence of the toxic metal pollutants, suspended solids, and oil and grease. This analysis is supported by the raw (untreated) wastewater data presented for specific sources. Construction of one wastewater treatment system for combined treatment allows plants to take advantage of economic scale and in some instances to combine streams of different alkalinity to reduce treatment chemical requirements.

All but one of the plants within this subcategory have a zero discharge status. The one discharging facility discharges to a surface water from a tailings pond. Zero discharge is achieved in most plants through a combination treatment system consisting of a tailings pond and recycle or reuse. One of the three plants with a smelter scrubber achieves zero discharge of that waste stream by 100 percent recycle. Partial recycle is used only on two waste streams, the smelter scrubber and the calciner scrubber wastewater. Table VII-1 presents a summary of the number of plants with each waste stream and the treatment technologies currently in place.

CONTROL AND TREATMENT OPTIONS

The Agency examined three control and treatment technology options that are applicable to the primary precious metals and mercury subcategory. The options selected for evaluation represent a combination of in-process flow reduction, preliminary treatment technologies applicable to individual waste streams, and end-of-pipe treatment technologies.

OPTION A

Option A for the primary precious metals and mercury subcategory requires control and treatment technologies to reduce the discharge of wastewater volume and pollutant mass.

The Option A treatment scheme consists of chemical precipitation and sedimentation technology. Specifically, lime or some other alkaline compound is used to precipitate toxic metal ions as metal hydroxides. The metal hydroxides and suspended solids settle out and the sludge is collected. Vacuum filtration is used to dewater sludge.

Preliminary treatment consisting of oil skimming to remove oil and grease is also included in Option A.

OPTION B

Option B for the primary precious metals and mercury subcategory consists of the Option A (oil skimming, chemical precipitation and sedimentation) treatment scheme plus flow reduction techniques to reduce the discharge of wastewater volume. In-process changes which allow for recycle of smelter, electrolytic cells, and calciner scrubber water are the principal control mechanisms for flow reduction.

OPTION C

Option C for the primary precious metals and mercury subcategory consists of all control and treatment requirements of Option B (in-process flow reduction, oil skimming, chemical precipitation and sedimentation) plus multimedia filtration technology added at the end of the Option B treatment scheme. Multimedia filtration is used to remove suspended solids, including precipitates of metals, beyond the concentration attainable by gravity sedimentation. The filter suggested is of the gravity, mixed-media type, although other forms of filters, such as rapid sand filters or pressure filters would perform satisfactorily. The addition of filters also provides consistent removal during periods of time in which there are rapid increases in flows or loadings of pollutants to the treatment system.

Table VII-1

SUMMARY OF WASTE STREAMS AND TREATMENT PRACTICES
IN PRIMARY PRECIOUS METALS AND MERCURY PLANTS

Waste Stream	Number of Plants With Waste Stream	Number of Plants With Tailings Pond Treatment	Number of Plants With Recycle or Reuse
Smelter wet air pollution control	3	2	3
Silver chloride reduction spent solution	1	1	1
Electrolytic cells wet air pollution control	1	1	1
Electrolyte preparation wet air pollution control	1	1	0
Silver crystals wash water	1	1	0
Gold slimes acid wash and water rinse	1	1	0
Calciner wet air pollution control	1	1	1
Calcine quench water	1	1	1
Calciner stack gas contact cooling water	1	1	1
Condenser blowdown	1	1	1
Mercury cleaning bath water	1	1	1

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

SECTION VIII

COSTS, ENERGY, AND NONWATER QUALITY ASPECTS

This section presents a summary of compliance costs for the primary precious metals and mercury subcategory and a description of the treatment options and subcategory-specific assumptions used to develop these estimates. Together with the estimated pollutant reduction performance presented in Sections IX, X, XI, and XII of this supplement, these cost etimates provide a basis for evaluating each regulatory option. These cost estimates are also used in determining the probable economic impact of regulation on the subcategory at different pollutant discharge levels. In addition, this section addresses nonwater quality environmental impacts of wastewater treatment and control alternatives, including air pollution, solid wastes, and energy requirements, which are specific to the primary precious metals and mercury subcategory.

TREATMENT OPTIONS FOR EXISTING SOURCES

As discussed in Section VII, three treatment options have been developed for existing primary precious metals and mercury sources. The options are summarized below and schematically presented in Figures X-1 through X-3.

OPTION A

Option A consists of preliminary treatment using oil/water-separation where required and chemical precipitation and sedimentation end-of-pipe technology.

OPTION B

Option B consists of in-process flow reduction and oil/water separation preliminary treatment where required, and end-of-pipe technology consisting of chemical precipitation and sedimentation. The in-process flow reduction measure consists of the recycle of smelter scrubber water, electrolytic cells scrubber water, and calciner scrubber water through holding tanks.

OPTION C

Option C requires the in-process flow reduction and oil/water separation preliminary treatment measures of Option B, and end-of-pipe treatment technology consisting of chemical precipitation, sedimentation, and multimedia filtration.

COST METHODOLOGY

A detailed discussion of the methodology used to develop the compliance costs is presented in Section VIII of the General Development Document. Plant-by-plant compliance costs have been estimated for the nonferrous metals manufacturing category and are presented in the administrative record supporting this regulation. The costs developed for the proposed regulation are presented in Table VIII-1 for the direct dischargers.

Each of the general assumptions used to develop compliance costs is presented in Section VIII of the General Development Document. No subcategory-specific assumptions were used in developing compliance costs for the primary precious metals and mercury subcategory.

NONWATER QUALITY ASPECTS

A general discussion of the nonwater quality aspects of the control and treatment options considered for the nonferrous metals category is contained in Section VIII of the General Development Document. Nonwater quality impacts specific to the primary precious metals and mercury subcategory, including energy requirements, solid waste and air pollution, are discussed below.

ENERGY REQUIREMENTS

The methodology used for determining the energy requirements for the various options is discussed in Section VIII of the General Development Document. Energy requirements for the three options considered are estimated at 4,224 kWh/yr, 4,224 kWh/yr, and 5,155 kWh/yr for Options A, B, and C, respectively. Option B energy requirements are the same as those for Option A because the one discharging plant has no flow reduction. Option C, which includes filtration, increases energy consumption over Option B by approximately 18 percent. Option C represents roughly 1 percent of a typical plant's electrical energy usage. It is therefore concluded that the energy requirements of the treatment options considered will have no significant impact on total plant energy consumption.

SOLID WASTE

Sludge generated in the primary precious metals and mercury subcategory is due to oily wastes from oil/water separation and the precipitation of metal hydroxides and carbonates using lime. Sludges associated with the primary precious metals and mercury subcategory will necessarily contain quantities of toxic metal pollutants. These sludges are not subject to regulation as hazardous wastes since wastes generated by primary smelters and refiners are currently exempt from regulation by Act of Congress (Resource Conservation and Recovery Act (RCRA), Section 3001(b)), as interpreted by EPA. If a small excess of lime is added during treatment, the Agency does not believe these sludges would be identified as hazardous under RCRA in any case. (Compliance costs include this amount of lime.) This judgment is based on the results of Extraction Procedure (EP) toxicity tests performed on similar sludges (toxic metal-bearing sludges) generated by other industries such as the iron and steel industry. A small amount of excess lime was added during treatment, and the sludges subsequently generated passed the toxicity test. See CFR §261.24. Thus, the Agency believes that the wastewater sludges will similarly not be EP toxic if the recommended technology is applied.

Although it is the Agency's view that solid wastes generated as a result of these guidelines are not expected to be hazardous, generators of these wastes must test the waste to determine if the wastes meet any of the characteristics of hazardous waste (see 40 CFR 262.11).

If these wastes should be identified or are listed as hazardous, they will come within the scope of RCRA's "cradle to grave" hazardous waste management program, requiring regulation from the point of generation to point of final disposition. EPA's generator standards would require generators of hazardous nonferrous metals manufacturing wastes to meet containerization, labeling, recordkeeping, and reporting requirements; if plants dispose of hazardous wastes off-site, they would have to prepare a manifest which would track the movement of the wastes from the generator's premises to a permitted off-site treatment, storage, or disposal facility. See 40 CFR 262.20 45 FR 33142 (May 19, 1980), as amended at 45 FR 86973 (December 31, 1980). The transporter regulations require transporters of hazardous wastes to comply with the manifest system to assure that the wastes are delivered to a permitted facility. See 40 CFR 263.20 45 FR 33151 (May 19, 1980), as amended at 45 FR 86973 (December 31, 1980). Finally, RCRA regulations establish standards for hazardous waste treatment, storage, and disposal facilities allowed to receive such wastes. See 40 CFR Part 464 46 FR 2802 (January 12, 1981), 47 FR 32274 (July 26, 1982).

Even if these wastes are not identified as hazardous, they still must be disposed of in compliance with the Subtitle D open dumping standards, implementing 4004 of RCRA. See 44 FR 53438 (September 13, 1979). The Agency has calculated as part of the costs for wastewater treatment the cost of hauling and disposing of these wastes. For more details, see Section VIII of the General Development Document.

Sludge generation for BPT of the primary precious metals and mercury subcategory is estimated at 11.355 metric tons per year. Sludge generation for BAT is not expected to be significantly different.

AIR POLLUTION

There is no reason to believe that any substantial air pollution problems will result from implementation of oil/water separation, chemical precipitation, sedimentation, and multimedia filtration. These technologies transfer pollutants to solid waste and are not likely to transfer pollutants to air.

Table VIII-1

COST OF COMPLIANCE FOR THE
PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY
DIRECT DISCHARGERS

(March, 1982 Dollars)

Option	Total Required Capital Cost	Total Annual Cost
A	27,500	9,000
B	27,500	9,000
C	30,000	10,000

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

SECTION IX

BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE

This section defines the effluent characteristics attainable through the application of best practicable control technology currently available (BPT), Section 301(b)(a)(A). BPT reflects the existing performance by plants of various sizes, ages, and manufacturing processes within the primary precious metals and mercury subcategory, as well as the established performance of the recommended BPT systems. Particular consideration is given to the treatment already in place at plants within the data base.

The factors considered in identifying BPT include the total cost of applying the technology in relation to the effluent reduction benefits from such application, the age of equipment and facilities involved, the manufacturing processes employed, nonwater quality environmental impacts (including energy requirements), and other factors the Administrator considers appropriate. In general, the BPT level represents the average of the existing performances of plants of various ages, sizes, processes, or other common characteristics. Where existing performance is uniformly inadequate, BPT may be transferred from a different subcategory or category. Limitations based on transfer of technology are supported by a rationale concluding that the technology is, indeed, transferable, and a reasonable prediction that it will be capable of achieving the prescribed effluent limits (see Tanner's Council of America v. Train, 540 F.2d 1188 (4th Cir. 1176). BPT focuses on end-of-pipe treatment rather than process changes or internal controls, except where such practices are common within the subcategory.

TECHNICAL APPROACH TO BPT

The Agency studied the nonferrous metals category to identify the processes used, the wastewaters generated, and the treatment processes installed. Information was collected from the category using data collection portfolios, and specific plants were sampled and the wastewaters analyzed. In making technical assessments of data, reviewing manufacturing processes, and assessing wastewater treatment technology options, both indirect and direct dischargers have been considered as a single group. An examination of plants and processes did not indicate any process differences based on the type of discharge, whether it be direct or indirect.

As explained in Section IV, the primary precious metals and mercury subcategory has been subdivided into 11 potential wastewater sources. Since the water use, discharge rates, and pollutant characteristics of each of these wastewaters is potentially unique, effluent limitations will be developed for each of the 11 subdivisions.

For each of the subdivisions, a specific approach was followed for the development of BPT mass limitations. The first requirement to develop these limititations is to account for production and flow variability from plant to plant. Therefore, a unit of production or production normalizing parameter (PNP) was determined for each waste stream which could then be related to the flow from the process to determine a production normalized flow. Selection of the PNP for each process element is discussed in Section IV. Each process within the subcategory was then analyzed to determine (1) which subdivisions were present, (2) the specific flow rates generated for each subdivision, and (3) the specific production normalized flows for each subdivision. This analysis is discussed in detail in Section V. Nonprocess wastewaters such as rainfall runoff and noncontact cooling water are not considered in the analysis.

Production normalized flows for each subdivision were then analyzed to determine the flow to be used as part of the basis for BPT mass limitations. The selected flow (sometimes referred to as a BPT regulatory flow or BPT discharge rate) reflects the water use controls which are common practices within the category. The BPT regulatory flow is based on the average of all applicable data. Plants with normalized flows above the average may have to implement some method of flow reduction to achieve the BPT limitations.

The second requirement to calculate mass limitations is the set of concentrations that are achievable by application of the BPT level of treatment technology. Section VII discusses the various control and treatment technologies which are currently in place for each wastewater source. In most cases, the current control and treatment technologies consist of a combination of tailings ponds and reuse and recycle of process water. Chemical precipitation and sedimentation technology and performance is transferred to this subcategory, because current treatment is inadequate. Oil skimming is applied to streams with treatable concentrations of oil and grease.

Using these regulatory flows and the achievable concentrations, the next step is to calculate mass loadings for each wastewater source or subdivision. This calculation was made on a stream-by-stream basis, primarily because plants in this subcategory may perform one or more of the operations in various combinations.

The mass loadings (milligrams of pollutant per troy ounce or metric ton of production - mg/T.O. or mg/kkg) were calculated by multiplying the BPT regulatory flow (l/T.O. or l/kkg) by the concentration achievable by the BPT level of treatment technology (mg/l) for each pollutant parameter to be limited under BPT. These mass loadings are published in the Federal Register and in CFR Part 400 as the effluent limitations guidelines.

The mass loadings which are allowed under BPT for each plant will be the sum of the individual mass loadings for the various wastewater sources which are found at particular plants. Accordingly, all the wastewater generated within a plant may be combined for treatment in a single or common treatment system, but the effluent limitations for these combined wastewaters are based on the various wastewater sources which actually contribute to the combined flow. This method accounts for the variety of combinations of wastewater sources and production processes which may be found at primary precious metals and mercury plants.

The Agency usually establishes wastewater limitations in terms of mass rather than concentration. This approach prevents the use of dilution as a treatment method (except for controlling pH). The production normalized wastewater flow (l/T.O. or l/kkg) is a link between the production operations and the effluent limitations. The pollutant discharge attributable to each operation can be calculated from the normalized flow and effluent concentration achievable by the treatment technology and summed to derive an appropriate limitation for each plant.

INDUSTRY COST AND POLLUTANT REMOVAL ESTIMATES

In balancing costs in relation to pollutant removal estimates, EPA considers the volume and nature of existing discharges, the volume and nature of discharges expected after application of BPT, the general environmental effects of the pollutants, and the cost and economic impacts of the required pollution control level. The Act does not require or permit consideration of water quality problems attributable to particular point sources or industries, or water quality improvements in particular water quality bodies. Accordingly, water quality considerations were not the basis for selecting the proposed BPT. See Weyerhaeuser Company v. Costle, 590 F.2d 1011 (D.C. Cir. 1978).

The methodology for calculating pollutant removal estiamtes and plant compliance costs is discussed in Section X. Table X-2 shows the estimated pollutant removals for each treatment option for direct dischargers. Compliance costs are presented in Table X-3.

BPT OPTION SELECTION

The technology basis for the BPT limitations is Option A, chemical precipitation and sedimentation technology to remove metals and solids from combined wastewaters and to control pH, and oil skimming to remove oil and grease. These technologies are not in-place at the one discharger in this subcategory. The pollutants specifically proposed for regulation at BPT are arsenic, lead, mercury, silver, zinc, oil and grease, TSS, and pH.

Implementation of the proposed BPT limitations will remove annually an estimated 914 kg of toxic metals and 334 kg of TSS. We project a capital cost of $27,500 and an annualized cost of $9,000 for achieving proposed BPT limitations.

More stringent technology options were not selected for BPT since they require in-process changes or end-of-pipe technologies less widely practiced in the subcategory, and, therefore, are more appropriately considered under BAT.

WASTEWATER DISCHARGE RATES

A BPT discharge rate is calculated for each subdivision based on the average of the flows of the existing plants, as determined from analysis of the dcp. The discharge rate is used with the achievable treatment concentration to determine BPT effluent limitations. Since the discharge rate may be different for each wastewater source, separate production normalized discharge rates for each of the 11 wastewater sources are discussed below and summarized in Table IX-1. The discharge rates are normalized on a production basis by relating the amount of wastewater generated to the mass of the intermediate product which is produced by the process associated with the waste stream in question. These production normalizing parameters, or PNP's, are also listed in Table IX-1.

Section V of this supplement further describes the discharge flow rates and presents the water use and discharge flow rates for each plant by subdivision.

SMELTER WET AIR POLLUTION CONTROL

The BPT wastewater discharge rate for smelter wet air pollution control is 13.2 liters per troy ounce (3.5 gal/troy ounce) of gold and silver smelted, based on zero percent recycle. This rate is allocated only for plants practicing wet air pollution control for the smelter. Three plants reported this waste stream, as shown in Table V-1. The BPT rate is based on the average water use rate for these three plants (25.8, 8.4, and 5.3 liters per troy ounce).

EPA is also considering a BPT wastewater discharge rate for this waste stream of 1.32 liters per troy ounce, based on 90 percent recycle. Recycle is demonstrated for this waste stream. EPA will select between the two flow rates at promulgation, based on public comment.

SILVER CHLORIDE REDUCTION SPENT SOLUTION

The BPT wastewater discharge rate for silver chloride reduction spent solution is 0.4 liters per troy ounce (0.11 gal/troy ounce) of silver reduced in solution. Water use and discharge rates are presented in Table V-2. This normalized flow is based upon the only reported value.

ELECTROLYTIC CELLS WET AIR POLLUTION CONTROL

The BPT wastewater discharge rate for the electrolytic cells wet air pollution control is 198 liters per troy ounce (52.3 gal/troy ounce) of gold refined electrolytically. This normalized flow is based upon the only reported value for this subcategory. The reported water use and discharge rates are presented in Table V-3.

ELECTROLYTE PREPARATION WET AIR POLLUTION CONTROL

The BPT wastewater discharge rate for the electrolyte preparation wet air pollution control is 0.05 liters per troy ounce (0.013 gal/troy ounce) of silver in the electrolyte produced. This normalized flow is based upon the only value reported for this subcategory. Water use and discharge rates are provided in Table V-4.

SILVER CRYSTAL WASH WATER

The BPT wastewater discharge rate for silver crystal wash water is 0.29 liters per troy ounce (0.08 gal/troy ounce) of silver crystals washed. Table V-5 presents the water use and discharge rates for this waste stream. The BPT rate is based on the only reported value. This rate is allocated to any plant washing silver crystals refined electrolytically.

GOLD SLIMES ACID WASH AND WATER RINSE

The BPT wastewater discharge rate for this waste stream is 4.0 liters per troy ounce (1.06 gal/troy ounce) of gold slimes washed. This normalized flow is equivalent to the only value reported for gold slimes acid wash and rinse water. Water use and discharge rates are provided in Table V-6.

CALCINER WET AIR POLLUTION CONTROL

The BPT wastewater discharge rate for the calciner wet air pollution control is 186,200 l/kkg (49,200 gal/kkg) of mercury condensed. This normalized flow is based upon the sum of the flows from three in-series scrubbers at the only facility reporting a calciner scrubber (plant 1124). Table V-7 summarizes the water use and discharge rates for this subdivision. This discharge rate represents 16 percent recycle of scrubber liquor, which is the rate currently achieved by the one plant with this stream.

CALCINE QUENCH WATER

The BPT wastewater discharge rate for calcine quench water is 17,600 l/kkg (4,650 gal/kkg) of mercury condensed. This production normalized discharge rate is based upon the only reported value for this waste stream. Water use and discharge rates are presented in Table V-8.

CALCINER STACK GAS CONTACT COOLING WATER

The BPT wastewater discharge rate selected for calciner stack gas contact cooling water is 4,150 l/kkg (1,096 gal/kkg) of mercury condensed. This discharge rate is equivalent to the discharge rate of the only plant reporting this waste stream. Table V-9 presents the reported water use and discharge rates for this waste stream.

CONDENSER BLOWDOWN

The BPT wastewater discharge for condenser blowdown is 13,800 l/kkg (3,646 gal/kkg) of mercury condensed. Water use and discharge rates for this waste stream are provided in Table V-10. The condenser blowdown normalized discharge rate is based upon the only value reported for this waste stream (plant 1068).

MERCURY CLEANING BATH WATER

The BPT wastewater discharge rate for mercury cleaning bath water is 1,400 l/kkg (370 gal/kkg) of mercury condensed. This normalized flow is equivalent to the only reported water discharge rate for this waste stream. Table V-11 provides the reported water use and discharge flows for this subdivision.

REGULATED POLLUTANT PARAMETERS

The raw wastewater concentrations from individual operations and the subcategory as a whole were examined to select certain pollutant parameters for limitation. This examination and evaluation is presented in Sections VI and X. Eight pollutants or pollutant parameters are selected for limitation under BPT and are listed below:

115. arsenic
122. lead
123. mercury
126. silver
128. zinc
oil and grease
total suspended solids (TSS)
pH

EFFLUENT LIMITATIONS

The concentrations achievable by application of the proposed BPT treatment are explained in Section VII of the General Development Document and summarized there in Table VII-19. The achievable treatment concentrations (both one-day maximum and monthly average values) are multiplied by the BPT normalized discharge flows summarized in Table IX-1 to calculate the mass of pollutants allowed to be discharged per mass of product. The results of these calculations in milligrams of pollutant per troy ounce or kilogram of product represent the BPT effluent limitations and are presented in Table IX-2 for each individual waste stream.

Table IX-1

BPT WASTEWATER DISCHARGE RATES FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

	Waste Stream	BPT Discharge Rate (l/T.O. or l/kkg)	BPT Discharge Rate (gal/T.O. or gal/kkg)	PNP
1.	Smelter wet air pollution control	13.2	3.5	troy ounce of gold and silver smelted
2.	Silver chloride reduction spent solution	0.4	0.11	troy ounce of silver reduced in solution
3.	Electrolytic cells wet air pollution control	198	52.3	troy ounce of silver refined electrolytically
4.	Electrolyte preparation wet air pollution control	0.05	0.013	troy ounce of silver in electrolyte produced
5.	Silver crystal wash water	0.29	0.08	troy ounce of silver crystals washed
6.	Gold slimes acid wash and water rinse	4.0	1.06	troy ounce of gold slimes washed
7.	Calciner wet air pollution control	186,200	49,200	kkg of mercury condensed
8.	Calcine quench water	17,600	4,650	kkg of mercury condensed
9.	Calciner stack gas contact cooling water	4,150	1,096	kkg of mercury condensed
10.	Condenser blowdown	13,800	3,646	kkg of mercury condensed
11.	Mercury cleaning bath water	1,400	370	kkg of mercury condensed

Table IX-2

BPT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(a) Smelter Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold and silver smelted		
Arsenic	27.590	12.280
Lead	5.544	2.640
Mercury	3.300	1.320
Silver	5.412	2.244
Zinc	19.270	8.052
Oil and grease	264.000	158.400
Total suspended solids	541.200	257.400
pH	Within the range of 7.5 to 10.0 at all times	

(b) Silver Chloride Reduction Spent Solution

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver reduced in solution		
Arsenic	0.836	0.372
Lead	0.168	0.080
Mercury	0.100	0.040
Silver	0.164	0.068
Zinc	0.584	0.244
Oil and grease	8.000	4.800
Total suspended solids	16.400	7.800
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (Continued)

BPT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(c) Electrolytic Cells Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold refined electrolytically		
Arsenic	413.800	184.100
Lead	83.160	39.600
Mercury	49.500	19.800
Silver	81.180	33.660
Zinc	289.100	120.800
Oil and grease	3,960.000	2,376.000
Total suspended solids	8,118.000	3,861.000
pH	Within the range of 7.5 to 10.0 at all times	

(d) Electrolyte Preparation Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver in electrolyte produced		
Arsenic	0.105	0.047
Lead	0.021	0.010
Mercury	0.013	0.005
Silver	0.021	0.009
Zinc	0.073	0.031
Oil and grease	1.000	0.600
Total suspended solids	2.050	0.975
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (Continued)

BPT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(e) Silver Crystals Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/troy ounce of silver crystals washed	
Arsenic	0.606	0.270
Lead	0.122	0.058
Mercury	0.073	0.029
Silver	0.119	0.049
Zinc	0.423	0.177
Oil and grease	5.800	3.480
Total suspended solids	11.890	5.655
pH	Within the range of 7.5 to 10.0 at all times	

(f) Gold Slimes Acid Wash and Water Rinse

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/troy ounce of gold slimes washed	
Arsenic	8.360	3.720
Lead	1.680	0.800
Mercury	1.000	0.400
Silver	1.640	0.680
Zinc	5.840	2.440
Oil and grease	80.000	48.000
Total suspended solids	164.000	78.000
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (Continued)

BPT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(g) Calciner Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	388.800	173.000
Lead	78.120	37.200
Mercury	46.500	18.600
Silver	76.260	31.620
Zinc	271.600	113.500
Oil and grease	3,720.000	2,232.000
Total suspended solids	7,626.000	3,627.000
pH	Within the range of 7.5 to 10.0 at all times	

(h) Calcine Quench Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	36.790	16.370
Lead	7.392	3.520
Mercury	4.400	1.760
Silver	7.216	2.992
Zinc	25.700	10.740
Oil and grease	352.000	211.200
Total suspended solids	721.600	343.200
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (Continued)

BPT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(i) Calciner Stack Gas Contact Cooling Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	8.674	3.860
Lead	1.743	0.830
Mercury	1.038	0.415
Silver	1.702	0.706
Zinc	6.059	2.532
Oil and grease	83.000	49.800
Total suspended solids	170.200	80.930
pH	Within the range of 7.5 to 10.0 at all times	

(j) Condenser Blowdown

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	28.840	12.830
Lead	5.796	2.760
Mercury	3.450	1.380
Silver	5.658	2.346
Zinc	20.150	8.418
Oil and grease	276.000	165.600
Total suspended solids	565.800	269.100
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (Continued)

BPT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(k) Mercury Cleaning Bath Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	2.926	1.302
Lead	0.588	0.280
Mercury	0.350	0.140
Silver	0.574	0.238
Zinc	2.044	0.854
Oil and grease	28.000	16.800
Total suspended solids	57.400	27.300
pH	Within the range of 7.5 to 10.0 at all times	

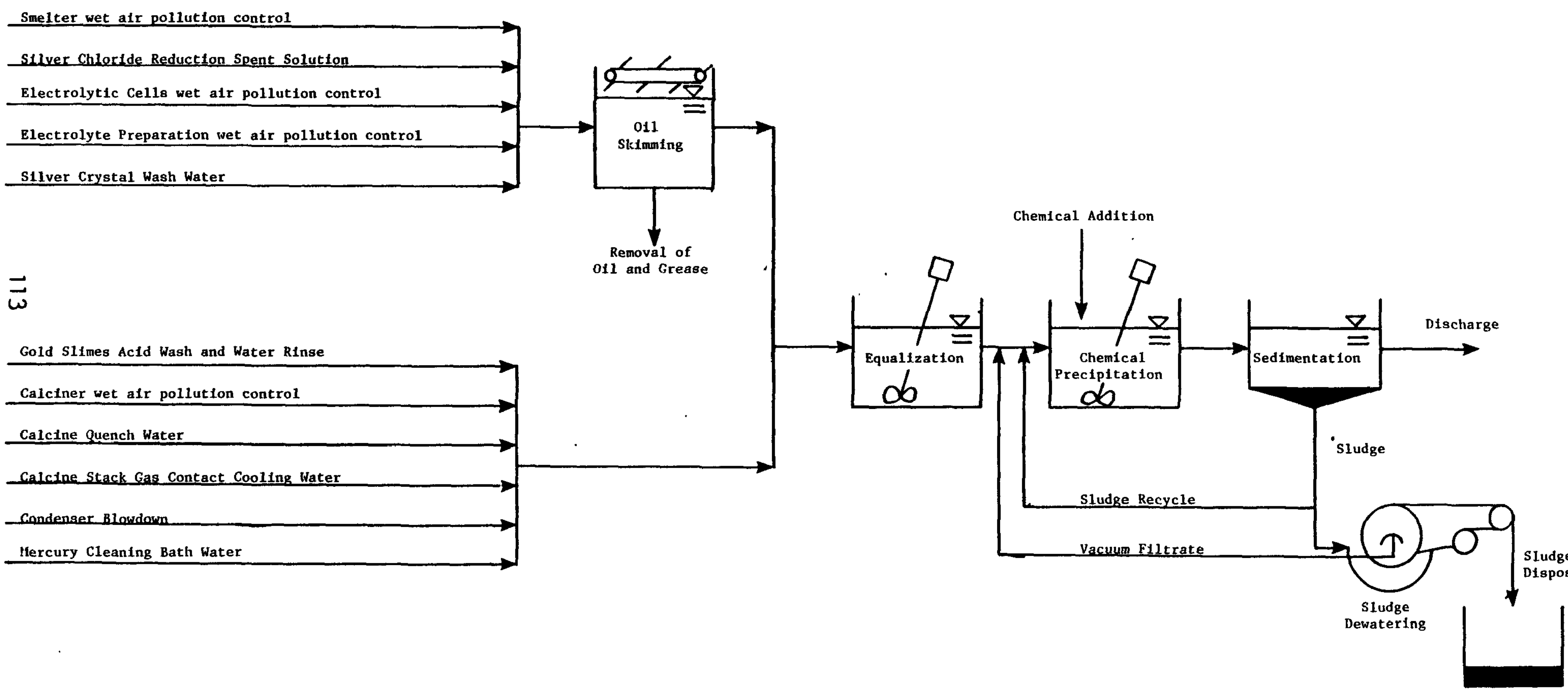

Figure IX-1

BPT TREATMENT SCHEME FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

SECTION X

BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE

The effluent limitations which must be achieved by July 1, 1984 are based on the best control and treatment technology used by a specific point source within the industrial category or subcategory, or by another category where it is readily transferable. Emphasis is placed on additional treatment techniques applied at the end of the treatment systems currently used, as well as reduction of the amount of water used and discharged, process control, and treatment technology optimization.

The factors considered in assessing best available technology economically achievable (BAT) include the age of equipment and facilities involved, the process used, process changes, nonwater quality environmental impacts (including energy requirements), and the costs of application of such technology (Section 304(b)(2)(B) of the Clean Water Act). At a minimum, BAT represents the best available technology economically achievable at plants of various ages, sizes, processes, or other characteristics. Where the Agency has found the existing performance to be uniformly inadequate, BAT may be transferred from a different subcategory or category. BAT may include feasible process changes or internal controls, even when not in common practice.

The statutory assessment of BAT considers costs, but does not require a balancing of costs against pollutant removals (see Weyerhaeuser v. Costle, 11 ERC 2149 (D.C. Cir. 1978)). However, in assessing the proposed BAT, the Agency has given substantial weight to the economic achievability of the technology.

TECHNICAL APPROACH TO BAT

The Agency reviewed a wide range of technology options and evaluated the available possibilities to ensure that the most effective and beneficial technologies were used as the basis of BAT. To accomplish this, the Agency elected to examine three technology options which could be applied to the primary precious metals and mercury subcategory as alternatives for the basis of BAT effluent limitations.

For the development of BAT effluent limitations, mass loadings were calculated for each wastewater source or subdivision in the subcategory using the same technical approach as described in Section IX for BPT limitations development. The differences in the mass loadings for BPT and BAT are due to increased treatment effectiveness achievable with the more sophisticated BAT treatment technology and reductions in the effluent flows allocated to various waste streams.

In summary, the treatment technologies considered for the primary precious metals and mercury subcategory are:

Option A (Figure X-1):

- Oil skimming preliminary treatment for streams containing oil and grease at treatable concentrations
- Chemical precipitation and sedimentation

Option B (Figure X-2) is based on

- In-process flow reduction of wet air pollution control water
- Oil skimming preliminary treatment for streams containing oil and grease at treatable concentrations
- Chemical precipitation and sedimentation

Option C (Figure X-3) is based on

- In-process flow reduction of wet air pollution control water
- Oil skimming preliminary treatment for streams containing oil and grease at treatable concentrations
- Chemical precipitation and sedimentation
- Multimedia filtration

The three options examined for BAT are discussed in greater detail below. The first option considered is the same as the BPT treatment technology which was presented in the previous section.

OPTION A

Option A for the primary precious metals and mercury subcategory is equivalent to the control and treatment technologies which were analyzed for BPT in Section IX. The BPT end-of-pipe treatment scheme includes chemical precipitation and sedimentation (lime and settle) technology, with oil skimming preliminary treatment of wastewaters containing treatable concentrations of oil and grease (see Figure X-1). The discharge rates for Option A are equal to the discharge rates allocated to each stream as a BPT discharge flow.

OPTION B

Option B for the primary precious metals and mercury subcategory achieves lower pollutant discharge by building upon the Option A (oil skimming preliminary treatment, chemical precipitation and sedimentation) treatment technology. Flow reduction measures are added to the Option A treatment scheme (see Figure X-2). These flow reduction measures, including in-process changes, result in the concentration of pollutants in some wastewater streams. As explained in Section VII of the General Development Document, treatment of a more concentrated effluent allows achievement of a greater net pollutant removal and introduces the possible economic benefits associated with treating a lower volume of wastewater.

Option B flow reduction measures are reflected in the BAT wastewater discharge rates. Flow reduction has been included in determining the BAT discharge rates for smelter wet air pollution control, electrolytic cells wet air pollution control, and calciner wet air pollution control. Based on available data, the Agency did not feel that further flow reduction over BPT would be feasible for the remaining eight waste streams in the primary precious metals and mercury subcategory. These waste streams are:

1. Silver chloride reduction spent solution,
2. Electrolyte preparation wet air pollution control,
3. Silver crystal wash water,
4. Gold slimes acid wash and water rinse,
5. Calcine quench water,
6. Calciner stack gas contact cooling water,
7. Condenser blowdown, and
8. Mercury cleaning bath water.

Flow reduction measures used in Option B to reduce process wastewater generation or discharge rates include the following:

Recycle of Water Used in Wet Air Pollution Control

There are four wastewater sources associated with wet air pollution control which are regulated under the primary precious metals and mercury subcategory:

1. Smelter wet air pollution control,
2. Electrolytic cells wet air pollution control,
3. Electrolyte preparation wet air pollution control, and
4. Calciner wet air pollution control.

Table X-1 presents the number of plants reporting wastewater from the wet air pollution control sources listed above, the number of plants practicing recycle, and the range of recycle values being listed. Recycle of smelter scrubber water, electrolytic cell scrubber water, and calciner scrubber water are required for BAT. Recycle of electrolyte preparation wet air pollution control is not required for BAT because the BPT discharge flow is close to the minimum possible water discharge from a scrubber. The recycle rate used for all three other sources is based on 90 percent recycle of the average water use reported by all the plants with each waste stream, as will be shown later.

OPTION C

Option C for the primary precious metals and mercury subcategory consists of all control and treatment requirements of Option B (in-process flow reduction, oil skimming preliminary treatment, chemical precipitation and sedimentation) plus multimedia filtration technology added at the end of the Option B treatment scheme (see Figure X-3). Multimedia filtration is used to remove suspended solids, including precipitates of toxic metals, beyond the concentration attainable by gravity sedimentation. The filter suggested is of the gravity, mixed media type, although other filters, such as rapid sand filters or pressure filters, would perform satisfactorily.

INDUSTRY COST AND ENVIRONMENTAL BENEFITS

As one means of evaluating each technology option, EPA developed estimates of the pollutant removal benefits and the compliance costs associated with each option. The methodologies are described below.

POLLUTANT REMOVAL ESTIMATES

A complete description of the methodology used to calculate the estimated pollutant removal, or benefit, achieved by the application of the various treatment options is presented in Section X of the General Development Document. In short, sampling data collected during the field sampling program were used to characterize the major waste streams considered for regulation. At each sampled facility, the sampling data was production normalized for each unit operation (i.e., mass of pollutant generated per mass of product manufactured). This value, referred to as the raw waste, was used to estimate the mass of toxic pollutants generated within the primary precious metals and mercury subcategory. The pollutant removal estimates were calculated for each plant by first estimating the total mass of each pollutant in the untreated wastewater. This was calculated by first multiplying the raw waste values by the corresponding production value for that stream and then summing these values for each pollutant for every stream generated by the plant.

Next, the volume of wastewater discharged after the application of each treatment option was estimated for each operation at each plant by comparing the actual discharge to the regulatory flow.

The smaller of the two values was selected and summed with the other plant flows. The mass of pollutant discharged was then estimated by multiplying the achievable concentration values attainable with the option (mg/l) by the estimated volume of process wastewater discharged by the subcategory. The mass of pollutant removed is the difference between the estimated mass of pollutant generated within the subcategory and the mass of pollutant discharged after application of the treatment option. The pollutant removal estimates for direct dischargers in the primary precious metals and mercury subcategory are presented in Table X-2.

COMPLIANCE COSTS

In estimating subcategory-wide compliance costs, the first step was to develop a cost estimation model, relating the total costs associated with installation and operation of wastewater treatment technologies to plant process wastewater discharge. EPA applied the model to each plant. The plant's investment and operating costs are determined by what treatment it has in place and by its individual process wastewater discharge flow. As discussed above, this flow is either the actual or the BAT regulatory flow, whichever is lesser. The final step was to annualize the capital costs, and to sum the annualized capital costs, and the operating and maintenance costs for each plant, yielding the cost of compliance for the subcategory (see Table X-3). These costs were used in assessing economic achievability.

BAT OPTION SELECTION

Our proposed BAT limitations for this subcategory are based on preliminary treatment consisting of oil skimming and end-of-pipe treatment consisting of chemical precipitation and sedimentation (BPT technology), and filtration (Option C).

The pollutants specifically limited under BAT are arsenic, lead, mercury, silver, and zinc. The toxic pollutants cadmium, chromium, copper, nickel, and thallium were also considered for regulation because they were found at treatable concentrations in the raw wastewaters from this subcategory. These pollutants were not selected for specific regulation because they will be effectively controlled when the regulated toxic metals are treated to the concentrations achievable by the model BAT technology.

Implementation of the proposed BAT limitations would remove annually an estimated 914.5 kg of toxic metals. Estimated capital cost for achieving proposed BAT is $30,000 and annualized cost is $10,000.

Oil skimming is demonstrated in the nonferrous metals manufacturing category. Although no primary precious metals and mercury plants have oil skimming in place, it is necessary to reduce oil and grease concentrations in the discharge from this subcategory.

WASTEWATER DISCHARGE RATES

A BAT discharge rate was calculated for each subdivision based upon the flows of the existing plants, as determined from analysis of the data collection portfolios. The discharge rate is used with the achievable treatment concentrations to determine BAT effluent limitations. Since the discharge rate may be different for each wastewater source, separate production normalized discharge rates for each of the 11 wastewater sources were determined and are summarized in Table X-4. The discharge rates are normalized on a production basis by relating the amount of wastewater generated to the mass of the intermediate product which is produced by the process associated with the waste stream in question. These production normalizing parameters (PNP) are also listed in Table X-4.

As discussed previously, the BAT wastewater discharge rate equals the BPT wastewater discharge rate for eight of the 11 waste streams in the primary precious metals and mercury subcategory. Based on the available data, the Agency determined that further flow reduction would not be feasible for these eight wastewater sources. Wastewater streams for which BAT discharge rates differ from BPT are discussed below.

SMELTER WET AIR POLLUTION CONTROL

The BAT wastewater discharge rate for smelter wet air pollution control is 1.3 liters per troy ounce of gold and silver smelted. This rate is based on 90 percent recycle of the average water use rate reported for this waste stream, as shown in Table V-1. This rate corresponds to 90 percent recycle of the BPT discharge rate. As shown in Table VI-1, recycle is demonstrated for this stream.

ELECTROLYTIC CELLS WET AIR POLLUTION CONTROL

The BAT wastewater discharge rate for electrolytic cells wet air pollution control is 19.8 liters per troy ounce of gold refined electrolytically. This rate is based on 90 percent recycle of the water use rate reported by the one plant with this waste stream, as shown in Table V-3. The Agency believes this waste stream can be operated with 90 percent recycle, even though recycle is not demonstrated for it.

CALCINER WET AIR POLLUTION CONTROL

The BAT wastewater discharge rate for calciner wet air pollution control is 22,000 liters per metric ton of mercury condensed. This rate is based on 90 percent recycle of the water use rate reported by the only plant with this waste stream. As shown in Table V-7, the plant reported a flow of 186,000 l/kkg, which represents a 16 percent recycle rate. The BAT rate was determined by the following formula:

$$(186{,}000 \text{ l/kkg}) \frac{(1.00 - 0.90)}{(1.00 - 0.16)} = 22{,}000 \text{ l/kkg}$$

Although 90 percent recycle is not demonstrated for this waste stream, the Agency believes it is achievable.

REGULATED POLLUTANT PARAMETERS

In implementing the terms of the Consent Agreement in NRDC v. Train, Op. Cit., and 33 U.S.C. §1314(b)(2)(A and B) (1976), the Agency placed particular emphasis on the toxic pollutants. The raw wastewater concentrations from individual operations and the subcategory as a whole were examined to select certain pollutant parameters for consideration for limitation. This examination and evaluation, presented in Section VI, concluded that 10 pollutants are present in primary precious metals and mercury wastewaters at concentrations than can be effectively reduced by identified treatment technologies (refer to Section VI).

The high cost associated with analysis for toxic metal pollutants has prompted EPA to develop an alternative method for regulating and monitoring toxic pollutant discharges from the nonferrous metals manufacturing category. Rather than developing specific effluent mass limitations and standards for each of the toxic metals found in treatable concentrations in the raw wastewaters from a given subcategory, the Agency is proposing effluent mass limitations only for those pollutants generated in the greatest quantities as shown by the pollutant removal analysis. The pollutants selected for specific limitation are listed below:

115. arsenic
122. lead
123. mercury
126. silver
128. zinc

By establishing limitations and standards for certain toxic metal pollutants, dischargers will attain the same degree of control over toxic metal pollutants as they would have been required to achieve had all the toxic metal pollutants been directly limited.

This approach is technically justified since the treatable concentrations used for chemical precipitation and sedimentation technology are based on optimized treatment for concomitant multiple metals removal. Thus, even though metals have somewhat different theoretical solubilities, they will be removed at very nearly the same rate in a chemical precipitation and sedimentation treatment system operated for multiple metals removal. Filtration as part of the technology basis is likewise justified because this technology removes metals non-preferentially.

The toxic metal pollutants selected for specific limitation in the primary precious metals and mercury subcategory to control the discharges of toxic metal pollutants are arsenic, lead, mercury, silver, and zinc.

The following toxic pollutants are excluded from limitation on the basis that they are effectively controlled by the limitations developed for arsenic, lead, mercury, silver, and zinc:

118. cadmium
119. chromium
120. copper
124. nickel
127. thallium

EFFLUENT LIMITATIONS

The treatable concentrations, achievable by application of the BAT technology (Option C), are summarized in Table VII-19 of the General Development Document. These treatable concentrations (both one-day maximum and monthly average) are multiplied by the BAT normalized discharge flows summarized in Table X-4 to calculate the mass of pollutants allowed to be discharged per mass of product. The results of these calculations in milligrams of pollutant per troy ounce or kilogram of product represent the BAT effluent limitations for the primary precious metals and mercury subcategory. BAT effluent limitations based on Option C (oil skimming, chemical precipitation, sedimentation, in-process flow reduction, and multimedia filtration) are presented in Table X-5.

Table X-1

CURRENT RECYCLE PRACTICES WITHIN THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

	Number of Plants With Wastewater	Number of Plants Practicing Recycle	Range of Recycle Values (%)
Smelter wet air pollution control	3	3	76-100
Electrolytic cells wet air pollution control	1	0	0
Electrolyte preparation wet air pollution control	1	0	0
Calciner wet air pollution control	1	1	16

Table X-2

POLLUTANT REMOVAL ESTIMATES FOR DIRECT DISCHARGERS IN THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

Pollutant	Raw Waste (kg/yr)	Option A Discharge (kg/yr)	Option A Removed (kg/yr)	Option B Discharge (kg/yr)	Option B Removed (kg/yr)	Option C Discharge (kg/yr)	Option C Removed (kg/yr)
Antimony	18.465	0.414	18.050	0.414	18.050	0.278	18.186
Arsenic	887.902	0.302	887.600	0.302	887.600	0.201	887.701
Cadmium	0.291	0.047	0.244	0.047	0.244	0.029	0.262
Chromium (Total)	0	0	0	0	0	0	0
Copper	4.586	0.343	4.242	0.343	4.242	0.231	4.355
Cyanide (Total)	0	0	0	0	0	0	0
Lead	1.160	0.071	1.089	0.071	1.089	0.047	1.113
Mercury	2.385	0.036	2.349	0.036	2.349	0.021	2.363
Nickel	0	0	0	0	0	0	0
Selenium	0	0	0	0	0	0	0
Silver	0.003	0.003	0	0.003	0	0.003	0
Thallium	0	0	0	0	0	0	0
Zinc	0.605	0.195	0.409	0.195	0.409	0.136	0.468
TOTAL TOXICS	915.396	1.412	913.984	1.412	913.984	0.948	914.449
TSS	340.815	7.103	333.712	7.103	333.712	1.539	339.276
Oil and Grease	0.048	0.047	0.001	0.047	0.001	0.047	0.001
TOTAL CONVENTIONALS	340.863	7.150	333.713	7.150	333.713	1.586	339.277
TOTAL POLLUTANTS	1,256.259	8.562	1,247.697	8.562	1,247.697	2.534	1,253.726

Option A - Oil skimming, chemical precipitation and sedimentation.

Option B - Flow reduction, oil skimming, chemical precipitation and sedimentation.

Option C - Flow reduction, oil skimming, chemical precipitation and sedimentation, and filtration.

Table X-3

COST OF COMPLIANCE FOR DIRECT DISCHARGERS IN THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

Option	Total Required Capital Cost (1982 Dollars)	Total Annual Cost (1982 Dollars)
A	27,500	9,000
B	27,500	9,000
C	30,000	10,000

Table X-4

BAT WASTEWATER DISCHARGE RATES FOR THE
PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

Waste Stream	BAT Discharge Rate (l/T.O. or l/kkg)	BAT Discharge Rate (gal/T.O. or gal/kkg)	PNP
1. Smelter wet air pollution control	1.3	0.343	troy ounce of gold and silver smelted
2. Silver chloride reduction spent solution	0.4	0.11	troy ounce of silver reduced in solution
3. Electrolytic cells wet air pollution control	19.8	5.23	troy ounce of gold refined electrolytically
4. Electrolyte preparation wet air pollution control	0.05	0.013	troy ounce of silver in electrolyte produced
5. Silver crystal wash water	0.29	0.08	troy ounce of silver crystals washed
6. Gold slimes acid wash and water rinse	4.0	1.06	troy ounce of gold slimes washed
7. Calciner wet air pollution control	22,000	5,812	kkg of mercury condensed
8. Calcine quench water	17,600	4,650	kkg of mercury condensed
9. Calciner stack gas contact cooling water	4,150	1,096	kkg of mercury condensed
10. Condenser blowdown	13,800	3,646	kkg of mercury condensed
11. Mercury cleaning bath water	1,400	370	kkg of mercury condensed

Table X-5

BAT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(a) Smelter Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold and silver smelted		
Arsenic	1.807	0.806
Lead	0.364	0.169
Mercury	0.195	0.078
Silver	0.377	0.156
Zinc	1.326	0.546

(b) Silver Chloride Reduction Spent Solution

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver reduced in solution		
Arsenic	0.556	0.248
Lead	0.112	0.052
Mercury	0.060	0.024
Silver	0.116	0.048
Zinc	0.408	0.168

(c) Electrolytic Cells Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold refined electrolytically		
Arsenic	27.520	12.280
Lead	5.544	2.574
Mercury	2.970	1.188
Silver	5.742	2.376
Zinc	20.200	8.316

Table X-5 (Continued)

BAT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(d) Electrolyte Preparation Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver in electrolyte produced		
Arsenic	0.070	0.031
Lead	0.014	0.007
Mercury	0.008	0.003
Silver	0.015	0.006
Zinc	0.051	0.021

(e) Silver Crystals Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver crystals washed		
Arsenic	0.403	0.180
Lead	0.081	0.038
Mercury	0.044	0.017
Silver	0.084	0.035
Zinc	0.296	0.122

(f) Gold Slimes Acid Wash and Water Rinse

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold slimes washed		
Arsenic	5.560	2.480
Lead	1.120	0.520
Mercury	0.600	0.240
Silver	1.160	0.480
Zinc	4.080	1.680

Table X-5 (Continued)

BAT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(g) Calciner Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	30.580	13.640
Lead	6.160	2.860
Mercury	3.300	1.320
Silver	6.380	2.640
Zinc	22.440	9.240

(h) Calcine Quench Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	24.470	10.910
Lead	4.928	2.288
Mercury	2.640	1.056
Silver	5.104	2.112
Zinc	17.950	7.392

(i) Calciner Stack Gas Contact Cooling Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	5.769	2.573
Lead	1.162	0.540
Mercury	0.623	0.249
Silver	1.204	0.498
Zinc	4.233	1.743

Table X-5 (Continued)

BAT MASS LIMITATIONS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(j) Condenser Blowdown

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	19.180	8.556
Lead	3.864	1.794
Mercury	2.070	0.828
Silver	4.002	1.656
Zinc	14.080	5.796

(k) Mercury Cleaning Bath Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	1.946	0.868
Lead	0.392	0.182
Mercury	0.210	0.084
Silver	0.406	0.168
Zinc	1.428	0.588

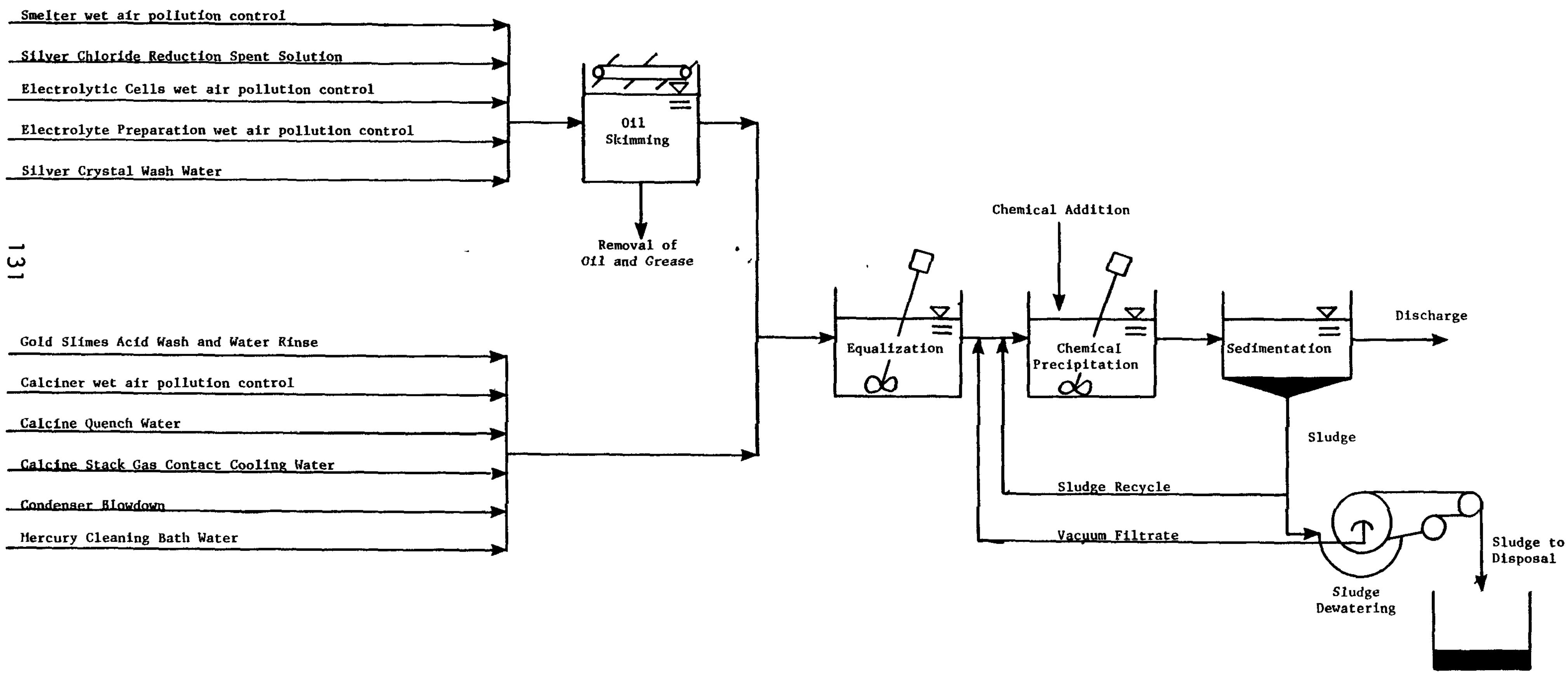

Figure X-1

BAT TREATMENT SCHEME FOR OPTION A

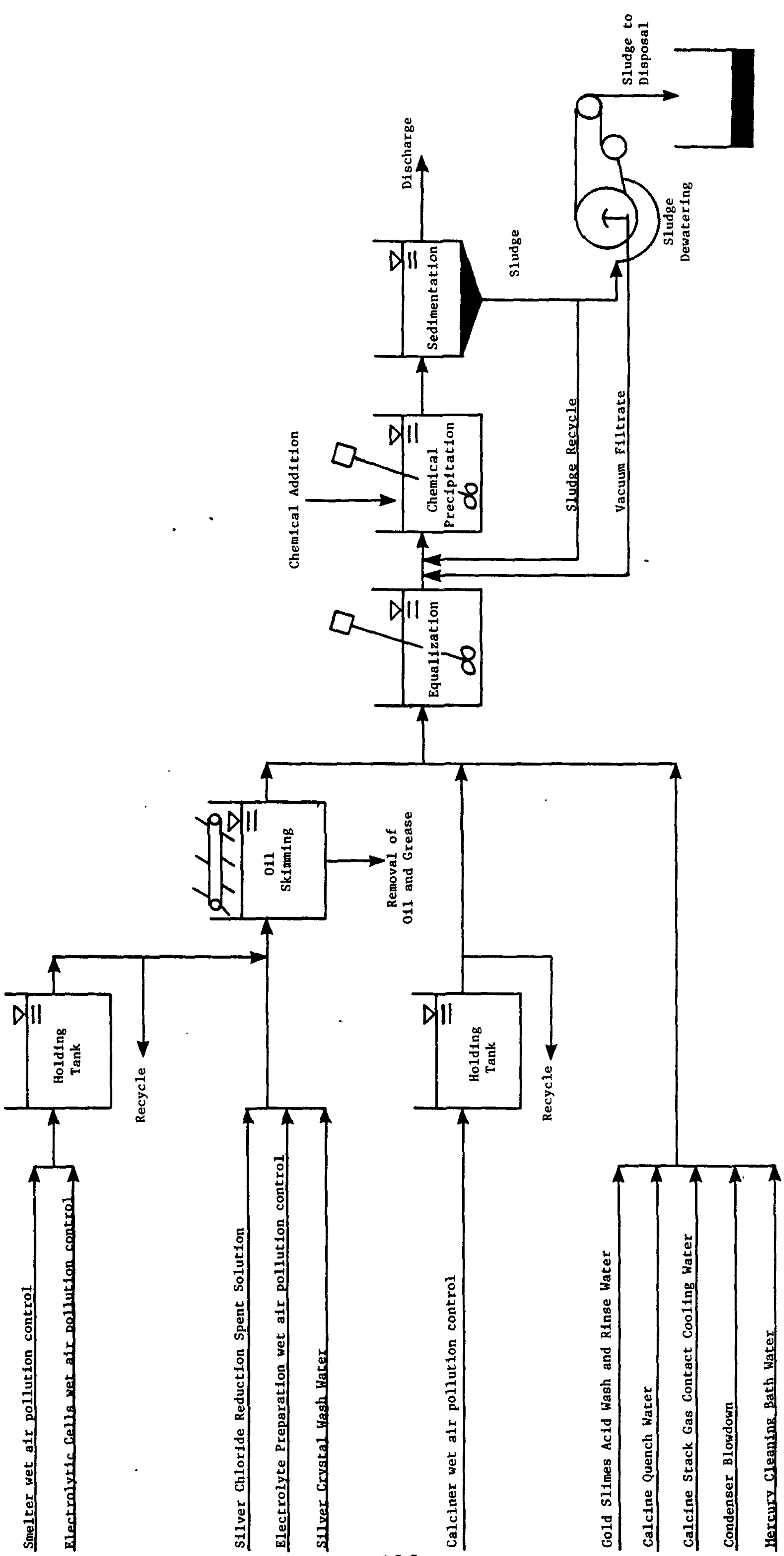

Figure X-2

BAT TREATMENT SCHEME FOR OPTION B

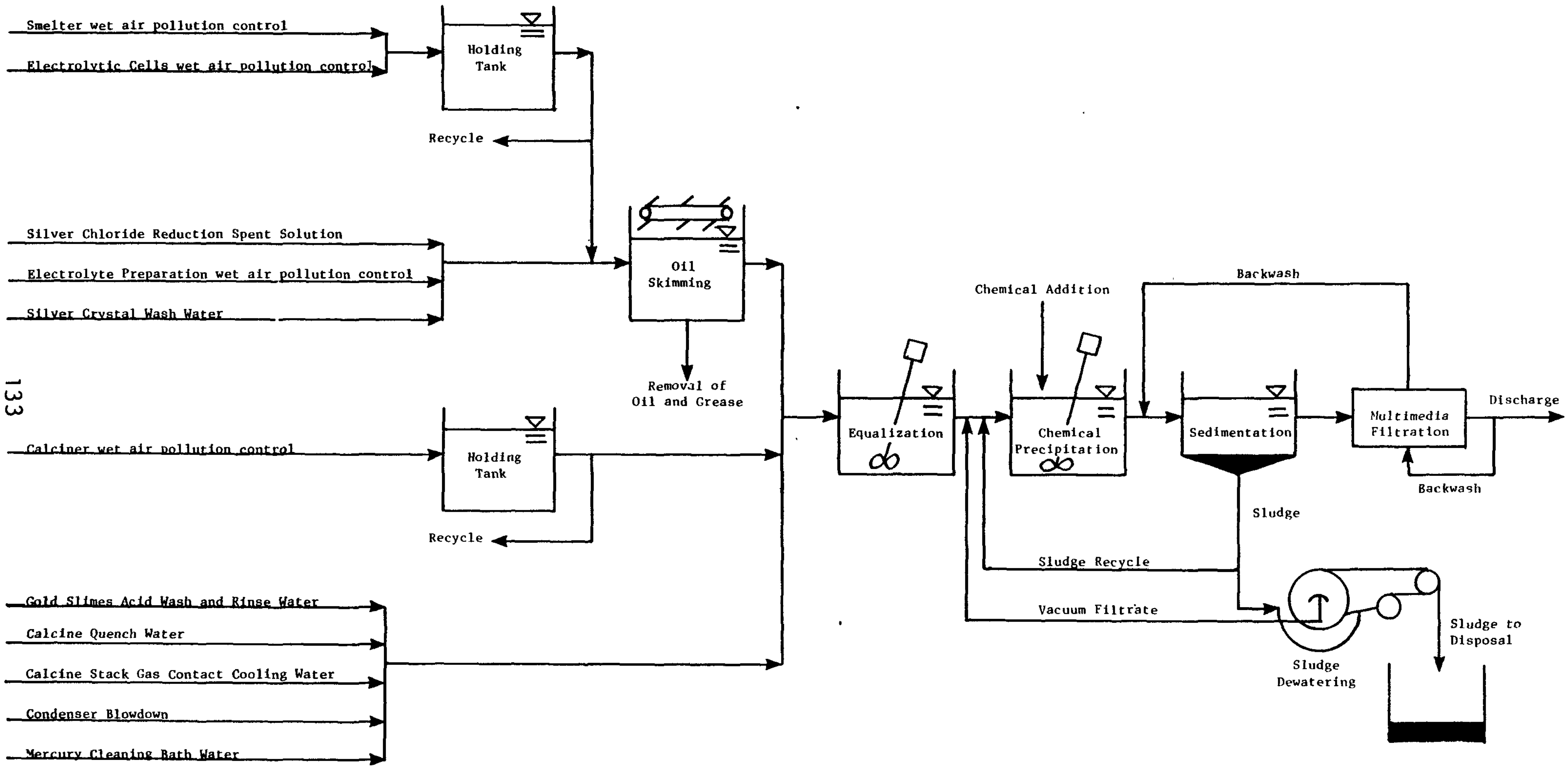

Figure X-3

BAT TREATMENT SCHEME FOR OPTION C

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

SECTION XI

NEW SOURCE PERFORMANCE STANDARDS

The basis for new source performance standards (NSPS) under Section 306 of the Act is the best available demonstrated technology (BDT). New plants have the opportunity to design the best and most efficient production processes and wastewater treatment technologies without facing the added costs and restrictions encountered in retrofitting an existing plant. Therefore, Congress directed EPA to consider the best demonstrated process changes, in-plant controls, and end-of-pipe treatment technologies which reduce pollution to the maximum extent feasible.

This section describes the technologies for treatment of wastewater from new sources and presents mass discharge standards for regulatory pollutants for NSPS in the primary precious metals and mercury subcategory, based on the selected treatment technology.

TECHNICAL APPROACH TO NSPS

New source performance standards are equivalent to the best available technology (BAT) selected for currently existing primary precious metals and mercury plants. This result is a consequence of careful review by the Agency of a wide range of technical options for new source treatment systems which is discussed in Section XI of the General Development Document. This review of the primary precious metals and mercury subcategory found no new, economically feasible, demonstrated technologies which could be considered an improvement over those chosen for consideration for BAT. Additionally, there was nothing found to indicate that the wastewater flows and characteristics of new plants would not be similar to those from existing plants, since the processes used by new sources are not expected to differ from those used at existing sources. Consequently, BAT production normalized discharge rates, which are based on the best existing practices of the subcategory, can also be applied to new sources. These rates are presented in Table XI-1.

Treatment technologies considered for the NSPS options are identical to the treatment technologies considered for the BAT options. These options are:

OPTION A

- Preliminary treatment with oil skimming (where required)
- Chemical precipitation and sedimentation

OPTION B

- Preliminary treatment with oil skimming (where required)
- Chemical precipitation and sedimentation
- In-process flow reduction of smelter, electrolytic cells, and calciner scrubber liquor

OPTION C

- Preliminary treatment with oil skimming (where required)
- Chemical precipitation and sedimentation
- In-process flow reduction of smelter, electrolytic cells, and calciner scrubber liquor
- Multimedia filtration

NSPS OPTION SELECTION

We are proposing that NSPS be equal to BAT. Our review of the subcategory indicates that no new demonstrated technologies that improve on BAT technology exist. We do not believe that new plants could achieve any flow reduction beyond the allowances proposed for BAT. Because NSPS is equal to BAT we believe that the proposed NSPS will not have a detrimental impact on the entry of new plants into this subcategory.

REGULATED POLLUTANT PARAMETERS

The Agency has no reason to believe that the pollutants that will be found in treatable concentrations in processes within new sources will be any different than with existing sources. Accordingly, pollutants and pollutant parameters selected for limitation under NSPS, in accordance with the rationale of Sections VI and X, are identical to those selected for BAT. The conventional pollutant parameters oil and grease, TSS, and pH are also selected for limitation.

NEW SOURCE PERFORMANCE STANDARDS

The NSPS discharge flows for each wastewater source are the same as the discharge rates for BAT and are shown in Table XI-1. The mass of pollutant allowed to be discharged per mass of product is calculated by multiplying the appropriate treatable concentration (mg/l) by the production normalized wastewater discharge flows (l/T.O. or l/kkg). The treatable concentrations are listed in Table VII-19 of the General Development Document. The results of these calculations are the production-based new source performance standards. These standards are presented in Tables XI-2.

Table XI-1

NSPS WASTEWATER DISCHARGE RATES FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

	Waste Stream	NSPS Discharge Rate (l/T.O. or l/kkg)	NSPS Discharge Rate (gal/T.O. or gal/kkg)	PNP
1.	Smelter wet air pollution control	1.3	0.343	troy ounce of gold and silver smelted
2.	Silver chloride reduction spent solution	0.4	0.11	troy ounce of silver reduced in solution
3.	Electrolytic cells wet air pollution control	19.8	5.23	troy ounce of gold refined electrolytically
4.	Electrolyte preparation wet air pollution control	0.05	0.013	troy ounce of silver in electrolyte produced
5.	Silver crystal wash water	0.29	0.08	troy ounce of silver crystals washed
6.	Gold slimes acid wash and water rinse	4.0	1.06	troy ounce of gold slimes washed
7.	Calciner wet air pollution control	22,000	5,812	kkg of mercury condensed
8.	Calcine quench water	17,600	4,650	kkg of mercury condensed
9.	Calciner stack gas contact cooling water	4,150	1,096	kkg of mercury condensed
10.	Condenser blowdown	13,800	3,646	kkg of mercury condensed
11.	Mercury cleaning bath water	1,400	370	kkg of mercury condensed

Table XI-2

NSPS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(a) Smelter Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold and silver smelted		
Arsenic	1.807	0.806
Lead	0.364	0.169
Mercury	0.195	0.078
Silver	0.377	0.156
Zinc	1.326	0.546
Oil and grease	13.000	13.000
Total suspended solids	19.500	15.600
pH	Within the range of 7.5 to 10.0 at all times	

(b) Silver Chloride Reduction Spent Solution

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver reduced in solution		
Arsenic	0.556	0.248
Lead	0.112	0.052
Mercury	0.060	0.024
Silver	0.116	0.048
Zinc	0.408	0.168
Oil and grease	4.000	4.000
Total suspended solids	6.000	4.800
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (Continued)

NSPS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(c) Electrolytic Cells Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold refined electrolytically		
Arsenic	27.520	12.280
Lead	5.544	2.574
Mercury	2.970	1.188
Silver	5.742	2.376
Zinc	20.200	8.316
Oil and grease	198.000	198.000
Total suspended solids	297.000	237.600
pH	Within the range of 7.5 to 10.0 at all times	

(d) Electrolyte Preparation Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver in electrolyte produced		
Arsenic	0.070	0.031
Lead	0.014	0.007
Mercury	0.008	0.003
Silver	0.015	0.006
Zinc	0.051	0.021
Oil and grease	0.500	0.500
Total suspended solids	0.750	0.600
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (Continued)

NSPS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(e) Silver Crystals Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver crystals washed		
Arsenic	0.403	0.180
Lead	0.081	0.038
Mercury	0.044	0.017
Silver	0.084	0.035
Zinc	0.296	0.122
Oil and grease	2.900	2.900
Total suspended solids	4.350	3.480
pH	Within the range of 7.5 to 10.0 at all times	

(f) Gold Slimes Acid Wash and Water Rinse

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold slimes washed		
Arsenic	5.560	2.480
Lead	1.120	0.520
Mercury	0.600	0.240
Silver	1.160	0.480
Zinc	4.080	1.680
Oil and grease	40.000	40.000
Total suspended solids	60.000	48.000
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (Continued)

NSPS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(g) Calciner Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	30.580	13.640
Lead	6.160	2.860
Mercury	3.300	1.320
Silver	6.380	2.640
Zinc	22.440	9.240
Oil and grease	220.000	220.000
Total suspended solids	330.000	264.000
pH	Within the range of 7.5 to 10.0 at all times	

(h) Calcine Quench Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	24.470	10.910
Lead	4.928	2.288
Mercury	2.640	1.056
Silver	5.104	2.112
Zinc	17.950	7.392
Oil and grease	176.000	176.000
Total suspended solids	264.000	211.200
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (Continued)

NSPS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(i) Calciner Stack Gas Contact Cooling Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	5.769	2.573
Lead	1.162	0.540
Mercury	0.623	0.249
Silver	1.204	0.498
Zinc	4.233	1.743
Oil and grease	41.500	41.500
Total suspended solids	62.250	49.800
pH	Within the range of 7.5 to 10.0 at all times	

(j) Condenser Blowdown

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	19.180	8.556
Lead	3.864	1.794
Mercury	2.070	0.828
Silver	4.002	1.656
Zinc	14.080	5.796
Oil and grease	138.000	138.000
Total suspended solids	207.000	165.600
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (Continued)

NSPS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(k) Mercury Cleaning Bath Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	1.946	0.868
Lead	0.392	0.182
Mercury	0.210	0.084
Silver	0.406	0.168
Zinc	1.428	0.588
Oil and grease	14.000	14.000
Total suspended solids	21.000	16.800
pH	Within the range of 7.5 to 10.0 at all times	

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

SECTION XII

PRETREATMENT STANDARDS

Section 307(b) of the Act requires EPA to promulgate pretreatment standards for existing sources (PSES), which must be achieved within three years of promulgation. PSES are designed to prevent the discharge of pollutants which pass through, interfere with, or are otherwise incompatible with the operation of publicly owned treatment works (POTW). The Clean Water Act of 1977 requires pretreatment for pollutants, such as heavy metals, that limit POTW sludge management alternatives. Section 307(c) of the Act requires EPA to promulgate pretreatment standards for new sources (PSNS) at the same time that it promulgates NSPS. New indirect discharge facilities, like new direct discharge facilities, have the opportunity to incorporate the best available demonstrated technologies, including process changes, in-plant controls, and end-of-pipe treatment technologies, and to use plant site selection to ensure adequate treatment system installation. Pretreatment standards are to be technology based, analogous to the best available technology for removal of toxic pollutants.

EPA is not proposing pretreatment standards for existing sources in this subcategory because no indirect dischargers exist. However, EPA is proposing pretreatment standards for new sources because plants may be constructed in the future which may discharge to a POTW.

This section describes the control and treatment technologies for pretreatment of process wastewaters from new sources in the primary precious metals and mercury subcategory. Pretreatment standards for regulated pollutants are presented based on the selected control and treatment technology.

TECHNICAL APPROACH TO PRETREATMENT

Before proposing pretreatment standards, the Agency examines whether the pollutants discharged by the industry pass through the POTW or interfere with the POTW operation or its chosen sludge disposal practices. In determining whether pollutants pass through a well-operated POTW, achieving secondary treatment, the Agency compares the percentage of a pollutant removed by POTW with the percentage removed by direct dischargers applying the best available technology economically achievable. A pollutant is deemed to pass through the POTW when the average percentage removed nationwide by well-operated POTW meeting secondary treatment requirements, is less than the percentage removed by direct dischargers complying with BAT effluent limitations guidelines for that pollutant. (See generally, 46 FR at 9415-16 (January 28, 1981)).

This definition of pass through satisfies two competing objectives set by Congress: (1) that standards for indirect dischargers be equivalent to standards for direct dischargers while at the same time, (2) that the treatment capability and performance of the POTW be recognized and taken into account in regulating the discharge of pollutants from indirect dischargers.

The Agency compares percentage removal rather than the mass or concentration of pollutants discharged because the latter would not take into account the mass of pollutants discharged to the POTW from non-industrial sources or the dilution of the pollutants in the POTW effluent to lower concentrations due to the addition of large amounts of non-industrial wastewater.

PRETREATMENT STANDARDS FOR NEW SOURCES

Options for pretreatment of wastewaters from new sources are based on increasing the effectiveness of end-of-pipe treatment technologies. All in-plant changes and applicable end-of-pipe treatment processes have been discussed previously in Sections X and XI. The options for PSNS are the same as the BAT and NSPS options discussed in Sections X and XI, respectively.

A description of each option is presented in Sections X and XI, while a more detailed discussion, including pollutants controlled by each treatment process is presented in Section VII of the General Development Document.

Treatment technologies considered for the PSNS options are:

OPTION A

- Preliminary treatment with oil skimming (where required)
- Chemical precipitation and sedimentation

OPTION B

- Preliminary treatment with oil skimming (where required)
- Chemical precipitation and sedimentation
- In-process flow reduction of smelter, electrolytic cells, and calciner scrubber liquor

OPTION C

- Preliminary treatment with oil skimming (where required)
- Chemical precipitation and sedimentation
- In-process flow reduction of smelter, electrolytic cells, and calciner scrubber liquor
- Multimedia filtration

PSNS OPTION SELECTION

We are proposing PSNS equal to NSPS and BAT for this subcategory. It is necessary to propose PSNS to prevent pass-through of arsenic, lead, mercury, silver, and zinc. These toxic pollutants are removed by a well-operated POTW at an average of 62 percent, while BAT technology removes approximately 93 percent.

The technology basis for PSNS thus is chemical precipitation and sedimentation, oil skimming, wastewater flow reduction and filtration (Option C). Flow reduction is based on 90 percent recycle of scrubber effluent that is the flow basis of BAT.

We believe that the proposed PSNS are achievable, and that they are not a barrier to entry of new plants into this subcategory.

REGULATED POLLUTANT PARAMETERS

Pollutants selected for limitation, in accordance with the rationale of Sections VI and X, are identical to those selected for limitation for BAT. It is necessary to propose PSNS to prevent the pass-through of arsenic, lead, mercury, silver, and zinc.

PRETREATMENT STANDARDS

Pretreatment standards are based on the treatable concentrations from the selected treatment technology, (Option C), and the discharge rates determined in Sections X and XI for BAT and NSPS, respectively. These discharge rates are presented in Table XII-1. A mass of pollutant per mass of product (mg/troy ounce or mg/kilogram) allocation is given for each subdivision within the subcategory. This pollutant allocation is based on the product of the treatable concentration from the proposed treatment (mg/l) and the production normalized wastewater discharge rate (l/troy ounce or l/kkg). The achievable treatment concentrations for BAT are identical to those for PSNS. These concentrations are listed in Tables VII-19 of the General Development Document. PSNS are presented in Table XII-2.

Table XII-1

PSNS WASTEWATER DISCHARGE RATES FOR THE
PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

	PSNS Discharge Rate		
Waste Stream	(l/T.O. or l/kkg)	(gal/T.O. or gal/kkg)	PNP
1. Smelter wet air pollution control	1.3	0.343	troy ounce of gold and silver smelted
2. Silver chloride reduction spent solution	0.4	0.11	troy ounce of silver reduced in solution
3. Electrolytic cells wet air pollution control	19.8	5.23	troy ounce of gold refined electrolytically
4. Electrolyte preparation wet air pollution control	0.05	0.013	troy ounce of silver in electrolyte produced
5. Silver crystal wash water	0.29	0.08	troy ounce of silver crystals washed
6. Gold slimes acid wash and water rinse	4.0	1.06	troy ounce of gold slimes washed
7. Calciner wet air pollution control	22,000	5,812	kkg of mercury condensed
8. Calcine quench water	17,600	4,650	kkg of mercury condensed
9. Calciner stack gas contact cooling water	4,150	1,096	kkg of mercury condensed
10. Condenser blowdown	13,800	3,646	kkg of mercury condensed
11. Mercury cleaning bath water	1,400	370	kkg of mercury condensed

Table XII-2

PSNS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(a) Smelter Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold and silver smelted		
Arsenic	1.807	0.806
Lead	0.364	0.169
Mercury	0.195	0.078
Silver	0.377	0.156
Zinc	1.326	0.546

(b) Silver Chloride Reduction Spent Solution

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver reduced in solution		
Arsenic	0.556	0.248
Lead	0.112	0.052
Mercury	0.060	0.024
Silver	0.116	0.048
Zinc	0.408	0.168

(c) Electrolytic Cells Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold refined electrolytically		
Arsenic	27.520	12.280
Lead	5.544	2.574
Mercury	2.970	1.188
Silver	5.742	2.376
Zinc	20.200	8.316

Table XII-2 (Continued)

PSNS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(d) Electrolyte Preparation Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver in electrolyte produced		
Arsenic	0.070	0.031
Lead	0.014	0.007
Mercury	0.008	0.003
Silver	0.015	0.006
Zinc	0.051	0.021

(e) Silver Crystals Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of silver crystals washed		
Arsenic	0.403	0.180
Lead	0.081	0.038
Mercury	0.044	0.017
Silver	0.084	0.035
Zinc	0.296	0.122

(f) Gold Slimes Acid Wash and Water Rinse

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold slimes washed		
Arsenic	5.560	2.480
Lead	1.120	0.520
Mercury	0.600	0.240
Silver	1.160	0.480
Zinc	4.080	1.680

Table XII-2 (Continued)

PSNS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(g) Calciner Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	30.580	13.640
Lead	6.160	2.860
Mercury	3.300	1.320
Silver	6.380	2.640
Zinc	22.440	9.240

(h) Calcine Quench Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	24.470	10.910
Lead	4.928	2.288
Mercury	2.640	1.056
Silver	5.104	2.112
Zinc	17.950	7.392

(i) Calciner Stack Gas Contact Cooling Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	5.769	2.573
Lead	1.162	0.540
Mercury	0.623	0.249
Silver	1.204	0.498
Zinc	4.233	1.743

Table XII-2 (Continued)

PSNS FOR THE PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

(j) Condenser Blowdown

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	19.180	8.556
Lead	3.864	1.794
Mercury	2.070	0.828
Silver	4.002	1.656
Zinc	14.080	5.796

(k) Mercury Cleaning Bath Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury condensed		
Arsenic	1.946	0.868
Lead	0.392	0.182
Mercury	0.210	0.084
Silver	0.406	0.168
Zinc	1.428	0.588

PRIMARY PRECIOUS METALS AND MERCURY SUBCATEGORY

SECTION XIII

BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY

EPA is not proposing best conventional pollutant control technology (BCT) for the primary precious metals and mercury subcategory at this time.