United States
Environmental Protection
Agency

Effluent Guidelines Division
WH-552
Washington, D.C. 20460

EPA-440/1-84/019-b
July 1984

Water and Waste Management

440184019B4

EPA

Development Document for Effluent Limitations Guidelines and Standards for the

Proposed

Nonferrous Metals

Point Source Category

Phase II

Supplemental Development Document For:

Primary and Secondary Tin

DEVELOPMENT DOCUMENT

for

EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS

for the

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY

PHASE II

Primary and Secondary Tin Supplement

Jack E. Ravan
Assistant Administrator for Water

Edwin L. Johnson
Director
Office of Water Regulations and Standards

U.S. Environmental Protection Agency
Region V, Library
230 South Dearborn Street
Chicago, Illinois 60604

Jeffery D. Denit, Director
Effluent Guidelines Division

Ernst P. Hall, P.E., Chief
Metals and Machinery Branch

James R. Berlow, P.E.
Technical Project Officer

July 1984

U.S. Environmental Protection Agency
Office of Water
Office of Water Regulations and Standards
Effluent Guidelines Division
Washington, D.C. 20460

U.S. Environmental Protection Agency

PRIMARY AND SECONDARY TIN SUBCATEGORY

TABLE OF CONTENTS

PRIMARY AND SECONDARY TIN SUBCATEGORY

TABLE OF CONTENTS (Continued)

PRIMARY AND SECONDARY TIN SUBCATEGORY

TABLE OF CONTENTS (Continued)

PRIMARY AND SECONDARY TIN SUBCATEGORY

TABLE OF CONTENTS (Continued)

PRIMARY AND SECONDARY TIN SUBCATEGORY

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF TABLES (Continued)

PRIMARY AND SECONDARY TIN SUBCATEGORY

LIST OF FIGURES

PRIMARY AND SECONDARY TIN 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 and secondary tin 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 existing indirect dischargers (PSES), pretreatment standards for new indirect dischargers (PSNS), and standards of performance for new source direct dischargers (NSPS).

The primary and secondary tin subcategory is comprised of twelve plants. Of the twelve plants, three discharge directly to rivers, lakes, or streams; two discharge to publicly owned treatment works (POTW); and seven achieve zero discharge of process wastewater.

EPA first studied the primary and secondary tin subcategory to determine whether differences in raw materials, final products, manufacturing processes, equipment, age and size of plants, or 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, ten subdivisions have been identified for this subcategory that warrant separate effluent limitations. These include:

- Tin smelter SO_2 scrubber,
- Dealuminizing rinse,
- Tin mud acid neutralization filtrate,
- Tin hydroxide wash,
- Spent electrowinning solution from new scrap,
- Spent electrowinning solution from municipal solid waste,
- Tin hydroxide supernatant from scrap,
- Tin hydroxide supernatant from spent plating solutions,
- Tin hydroxide supernatant from sludge solids, and
- Tin hydroxide filtrate.

EPA also identified several distinct control and treatment technologies (both in-plant and end-of-pipe) applicable to the primary and secondary tin 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. Metals removal based on chemical precipitation and sedimentation technology is the basis for the BPT limitations. Steam stripping was selected as the technology basis for ammonia limitations and cyanide precipitation was selected as the basis for cyanide limitations. To meet the BPT effluent limitations based on this technology, the primary and secondary tin subcategory is expected to incur capital and annual costs. However, these costs are not presented here because they are based on information claimed to be confidential.

For BAT, the Agency has built upon the BPT technology basis by adding filtration as an effluent polishing step to the end-of-pipe treatment scheme. To meet the BAT effluent limitations based on this technology, the primary and secondary tin subcategory is estimated to incur capital and annual costs. However, these costs are not presented here because the data on which they are based has been claimed to be confidential.

NSPS, which are based on best demonstrated technology, 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. However, the technology basis of BAT has been determined as the best demonstrated technology for this subcategory.

The technology basis for PSES is equivalent to BAT. To meet the pretreatment standards for existing sources, the primary and secondary tin subcategory is estimated to incur a capital cost of $341,700 and an annual cost of $119,900. For PSNS, the Agency selected end-of-pipe treatment and in-process flow reduction control techniques equivalent to NSPS.

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

PRIMARY AND SECONDARY TIN SUBCATEGORY

SECTION II

RECOMMENDATIONS

1. EPA has divided the primary and secondary tin subcategory into ten subdivisions for the purpose of effluent limitations and standards. These subdivisions are:

(a) Tin smelter SO_2 scrubber,
(b) Dealuminizing rinse,
(c) Tin mud acid neutralization filtrate,
(d) Tin hydroxide wash,
(e) Spent electrowinning solution from new scrap,
(f) Spent electrowinning solution from municipal solid waste
(g) Tin hydroxide supernatant from scrap,
(h) Tin hydroxide supernatant from spent plating solutions,
(i) Tin hydroxide supernatant from sludge solids, and
(j) Tin hydroxide filtrate.

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 ammonia steam stripping and cyanide precipitation for selected waste streams. The following BPT limitations are proposed:

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(a) Tin Smelter SO_2 Scrubber

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal produced		
Antimony	62.190	27.740
Lead	9.102	4.334
Nickel	41.610	27.520
Cyanide (total)	6.284	2.600
Ammonia (as N)	2,889.000	1,270.000
Fluoride	758.500	433.400
Tin	106.600	47.240
Total suspended solids	888.500	422.600
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(b) Dealuminizing Rinse

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of dealuminized scrap produced		
Antimony	0.101	0.045
Lead	0.015	0.007
Nickel	0.067	0.044
Cyanide (total)	0.010	0.004
Ammonia (as N)	4.666	2.051
Fluoride	1.225	0.700
Tin	0.172	0.076
Total suspended solids	1.435	0.683
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(c) Tin Mud Acid Neutralization Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of neutralized dewatered tin mud produced		
Antimony	14.490	6.460
Lead	2.120	1.010
Nickel	9.690	6.410
Cyanide (total)	1.464	0.606
Ammonia (as N)	672.800	295.800
Fluoride	176.700	101.000
Tin	24.830	11.000
Total suspended solids	206.900	98.420
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(d) Tin Hydroxide Wash

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin hydroxide washed		
Antimony	34.310	15.300
Lead	5.020	2.391
Nickel	22.950	15.180
Cyanide (total)	3.466	1.434
Ammonia (as N)	1,593.000	700.400
Fluoride	418.400	239.100
Tin	58.810	26.058
Total suspended solids	490.100	233.100
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(e) Spent Electrowinning Solution from New Scrap

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of cathode tin produced		
Antimony	48.220	21.510
Lead	7.056	3.360
Nickel	32.260	21.340
Cyanide (total)	4.872	2.016
Ammonia (as N)	2,239.000	984.500
Fluoride	588.000	336.000
Tin	82.660	36.620
Total suspended solids	688.800	327.600
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(f) Spent Electrowinning Solution from Municipal Solid Waste

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of MSW scrap used as raw material		
Antimony	0.342	0.152
Lead	0.050	0.024
Nickel	0.229	0.151
Cyanide (total)	0.035	0.014
Ammonia (as N)	15.860	6.973
Fluoride	4.165	2.380
Tin	0.585	0.259
Total suspended solids	4.879	2.321
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(g) Tin Hydroxide Supernatant from Scrap

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from scrap		
Antimony	159.700	71.220
Lead	23.370	11.130
Nickel	106.800	70.660
Cyanide (total)	16.140	6.677
Ammonia (as N)	7,417.000	3,261.000
Fluoride	1,948.000	1,113.000
Tin	273.700	121.300
Total suspended solids	2,281.000	1,085.000
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(h) Tin Hydroxide Supernatant from Spent Plating Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from spent plating solutions		
Antimony	109.000	48.610
Lead	15.950	7.596
Nickel	72.920	48.230
Cyanide (total)	11.010	4.557
Ammonia (as N)	5,062.000	2,226.000
Fluoride	1,329.000	759.600
Tin	186.900	82.790
Total suspended solids	1,557.000	740.600
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(i) Tin Hydroxide Supernatant from Sludge Solids

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from sludge solids		
Antimony	477.500	213.000
Lead	69.870	33.270
Nickel	319.400	211.300
Cyanide (total)	48.240	19.960
Ammonia (as N)	22,180.000	9,749.000
Fluoride	5,823.000	3,327.000
Tin	818.500	362.700
Total suspended solids	6,821.000	3,244.000
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(j) Tin Hydroxide Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal produced		
Antimony	71.880	32.060
Lead	10.520	5.009
Nickel	48.090	31.810
Cyanide (total)	7.263	3.005
Ammonia (as N)	3,338.000	1,468.000
Fluoride	876.600	500.900
Tin	123.200	54.600
Total suspended solids	1,027.000	488.400
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 along with preliminary treatment consisting of ammonia steam stripping and cyanide precipitation for selected waste streams. The following BAT effluent limitations are proposed:

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(a) Tin Smelter SO_2 Scrubber

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal produced		
Antimony	41.830	18.640
Lead	6.068	2.817
Nickel	11.920	8.018
Cyanide (total)	4.334	1.734
Ammonia (as N)	2,889.000	1,270.000
Fluoride	758.500	433.400
Tin	71.080	31.640

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(b) Dealuminizing Rinse

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of dealuminized scrap produced		
Antimony	0.068	0.030
Lead	0.010	0.005
Nickel	0.019	0.013
Cyanide (total)	0.0070	0.0028
Ammonia (as N)	4.666	2.051
Fluoride	1.225	0.700
Tin	0.115	0.051

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(c) Tin Mud Acid Neutralization Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of neutralized dewatered tin mud produced		
Antimony	9.741	4.341
Lead	1.413	0.656
Nickel	2.776	1.868
Cyanide (total)	1.009	0.404
Ammonia (as N)	672.800	295.800
Fluoride	176.700	101.000
Tin	16.550	7.370

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(d) Tin Hydroxide Wash

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin hydroxide washed		
Antimony	23.070	10.280
Lead	3.347	1.554
Nickel	6.574	4.423
Cyanide (total)	2.391	0.956
Ammonia (as N)	1,593.000	700.400
Fluoride	418.400	239.100
Tin	39.210	17.450

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(e) Spent Electrowinning Solution from New Scrap

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of cathode tin produced		
Antimony	32.430	14.450
Lead	4.704	2.184
Nickel	9.240	6.216
Cyanide (total)	3.360	1.344
Ammonia (as N)	2,239.000	984.500
Fluoride	588.000	336.000
Tin	55.100	24.530

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(f) Spent Electrowinning Solution from Municipal Solid Waste

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of MSW scrap used as raw material		
Antimony	0.230	0.102
Lead	0.033	0.015
Nickel	0.065	0.044
Cyanide (total)	0.0238	0.0095
Ammonia (as N)	15.860	6.973
Fluoride	4.165	2.380
Tin	0.390	0.174

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(g) Tin Hydroxide Supernatant from Scrap

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from scrap		
Antimony	107.400	47.850
Lead	15.580	7.233
Nickel	30.600	20.590
Cyanide (total)	11.130	4.451
Ammonia (as N)	7,417.000	3,261.000
Fluoride	1,948.000	1,113.000
Tin	182.500	81.230

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(h) Tin Hydroxide Supernatant from Spent Plating Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from spent plating soultions		
Antimony	73.300	32.660
Lead	10.640	4.937
Nickel	20.890	14.050
Cyanide (total)	7.596	3.038
Ammonia (as N)	5,062.000	2,226.000
Fluoride	1,329.000	759.600
Tin	124.600	55.450

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(i) Tin Hydroxide Supernatant from Sludge Solids

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from sludge solids		
Antimony	321.100	143.100
Lead	46.580	21.630
Nickel	91.500	61.560
Cyanide (total)	33.270	13.310
Ammonia (as N)	22,180.000	9,749.000
Fluoride	5,823.000	3,327.000
Tin	545.700	242.900

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(j) Tin Hydroxide Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal produced		
Antimony	48.340	21.540
Lead	7.013	3.256
Nickel	13.780	9.266
Cyanide (total)	5.009	2.004
Ammonia (as N)	3,338.000	1,468.000
Fluoride	876.600	500.900
Tin	82.140	36.560

4. NSPS are based on the performance achievable by the application of chemical precipitation, sedimentation, and multimedia filtration (lime, settle and filter) technology, along with preliminary treatment consisting of ammonia steam stripping and cyanide precipitation for selected waste streams. The following effluent standards are proposed for new sources:

NSPS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(a) Tin Smelter SO_2 Scrubber

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal produced		
Antimony	41.830	18.640
Lead	6.068	2.817
Nickel	11.920	8.018
Cyanide (total)	4.334	1.734
Ammonia (as N)	2,889.000	1,270.000
Fluoride	758.500	433.400
Tin	71.080	31.640
Total suspended solids	325.100	260.100
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(b) Dealuminizing Rinse

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of dealuminized scrap produced		
Antimony	0.068	0.030
Lead	0.010	0.005
Nickel	0.019	0.013
Cyanide (total)	0.0070	0.0028
Ammonia (as N)	4.666	2.051
Fluoride	1.225	0.700
Tin	0.115	0.051
Total suspended solids	0.525	0.420
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(c) Tin Mud Acid Neutralization Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of neutralized dewatered tin mud produced		
Antimony	9.741	4.341
Lead	1.413	0.656
Nickel	2.776	1.868
Cyanide (total)	1.009	0.404
Ammonia (as N)	672.800	295.800
Fluoride	176.700	101.000
Tin	16.550	7.370
Total suspended solids	75.710	60.570
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(d) Tin Hydroxide Wash

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin hydroxide washed		
Antimony	23.070	10.280
Lead	3.347	1.554
Nickel	6.574	4.423
Cyanide (total)	2.391	0.956
Ammonia (as N)	1,593.000	700.400
Fluoride	418.400	239.100
Tin	39.210	17.450
Total suspended solids	179.300	143.500
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(e) Spent Electrowinning Solution from New Scrap

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of cathode tin produced		
Antimony	32.430	14.450
Lead	4.704	2.184
Nickel	9.240	6.216
Cyanide (total)	3.360	1.344
Ammonia (as N)	2,239.000	984.500
Fluoride	588.000	336.000
Tin	55.100	24.530
Total suspended solids	252.000	201.600
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(f) Spent Electrowinning Solution from Municipal Solid Waste

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of MSW scrap used as raw material		
Antimony	0.230	0.102
Lead	0.033	0.015
Nickel	0.065	0.044
Cyanide (total)	0.0238	0.0095
Ammonia (as N)	15.860	6.973
Fluoride	4.165	2.380
Tin	0.390	0.174
Total suspended solids	1.785	1.428
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY SUBCATEGORY

(g) Tin Hydroxide Supernatant from Scrap

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from scrap		
Antimony	107.400	47.850
Lead	15.580	7.233
Nickel	30.600	20.590
Cyanide (total)	11.130	4.451
Ammonia (as N)	7,417.000	3,261.000
Fluoride	1,948.000	1,113.000
Tin	182.500	81.230
Total suspended solids	834.600	667.700
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(h) Tin Hydroxide Supernatant from Spent Plating Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from spent plating solutions		
Antimony	73.300	32.660
Lead	10.640	4.937
Nickel	20.890	14.050
Cyanide (total)	7.596	3.038
Ammonia (as N)	5,062.000	2,226.000
Fluoride	1,329.000	759.600
Tin	124.600	55.450
Total suspended solids	569.700	455.800
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(i) Tin Hydroxide Supernatant from Sludge Solids

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from sludge solids		
Antimony	321.100	143.100
Lead	46.580	21.630
Nickel	91.500	61.560
Cyanide (total)	33.270	13.310
Ammonia (as N)	22,180.000	9,749.000
Fluoride	5,823.000	3,327.000
Tin	545.700	242.900
Total suspended solids	2,496.000	1,997.000
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(j) Tin Hydroxide Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal produced		
Antimony	48.340	21.540
Lead	7.013	3.256
Nickel	13.780	9.266
Cyanide (total)	5.009	2.004
Ammonia (as N)	3,338.000	1,468.000
Fluoride	876.600	500.900
Tin	82.140	36.560
Total suspended solids	375.700	300.500
pH	Within the range of 7.5 to 10.0 at all times	

5. PSES are proposed based on the performance achievable by the application of chemical precipitation, sedimentation, and multimedia filtration (lime, settle and filter) technology, along with preliminary treatment consisting of ammonia steam stripping and cyanide precipitation for selected waste streams. The following pretreatment standards are proposed for existing sources:

PSES FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(a) Tin Smelter SO_2 Scrubber

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal produced		
Antimony	41.830	18.640
Lead	6.068	2.817
Nickel	11.920	8.018
Cyanide (total)	4.334	1.734
Ammonia (as N)	2,889.000	1,270.000
Fluoride	758.500	433.400
Tin	71.080	31.640

PSES FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(b) Dealuminizing Rinse

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of dealuminized scrap produced		
Antimony	0.068	0.030
Lead	0.010	0.005
Nickel	0.019	0.013
Cyanide (total)	0.0070	0.0028
Ammonia (as N)	4.666	2.051
Fluoride	1.225	0.700
Tin	0.115	0.051

PSES FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(c) Tin Mud Acid Neutralization Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of neutralized dewatered tin mud produced		
Antimony	9.741	4.341
Lead	1.413	0.656
Nickel	2.776	1.868
Cyanide (total)	1.009	0.404
Ammonia (as N)	672.800	295.800
Fluoride	176.700	101.000
Tin	16.550	7.370

PSES FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(d) Tin Hydroxide Wash

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin hydroxide washed		
Antimony	23.070	10.280
Lead	3.347	1.554
Nickel	6.574	4.423
Cyanide (total)	2.391	0.956
Ammonia (as N)	1,593.000	700.400
Fluoride	418.400	239.100
Tin	39.210	17.450

PSES FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(e) Spent Electrowinning Solution from New Scrap

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of cathode tin produced		
Antimony	32.430	14.450
Lead	4.704	2.184
Nickel	9.240	6.216
Cyanide (total)	3.360	1.344
Ammonia (as N)	2,239.000	984.500
Fluoride	588.000	336.000
Tin	55.100	24.530

PSES FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(f) Spent Electrowinning Solution from Municipal Solid Waste

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of MSW scrap used as raw material		
Antimony	0.230	0.102
Lead	0.033	0.015
Nickel	0.065	0.044
Cyanide (total)	0.0238	0.0095
Ammonia (as N)	15.860	6.973
Fluoride	4.165	2.380
Tin	0.390	0.174

PSES FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(g) Tin Hydroxide Supernatant from Scrap

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from scrap		
Antimony	107.400	47.850
Lead	15.580	7.233
Nickel	30.600	20.590
Cyanide (total)	11.130	4.451
Ammonia (as N)	7,417.000	3,261.000
Fluoride	1,948.000	1,113.000
Tin	182.500	81.230

PSES FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(h) Tin Hydroxide Supernatant from Spent Plating Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from spent plating solutions		
Antimony	73.300	32.660
Lead	10.640	4.937
Nickel	20.890	14.050
Cyanide (total)	7.596	3.038
Ammonia (as N)	5,062.000	2,226.000
Fluoride	1,329.000	759.600
Tin	124.600	55.450

PSES FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(i) Tin Hydroxide Supernatant from Sludge Solids

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from sludge solids		
Antimony	321.100	143.100
Lead	46.580	21.630
Nickel	91.500	61.560
Cyanide (total)	33.270	13.310
Ammonia (as N)	22,180.000	9,749.000
Fluoride	5,823.000	3,327.000
Tin	545.700	242.900

PSES FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(j) Tin Hydroxide Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal produced		
Antimony	48.340	21.540
Lead	7.013	3.256
Nickel	13.780	9.266
Cyanide (total)	5.009	2.004
Ammonia (as N)	3,338.000	1,468.000
Fluoride	876.600	500.900
Tin	82.140	36.560

6. PSNS are proposed based on the performance achievable by the application of chemical precipitation, sedimentation, and multimedia filtration (lime, settle and filter) technology, along with preliminary treatment consisting of ammonia steam stripping and cyanide precipitation for selected waste streams. The following pretreatment standards are proposed for new sources.

PSNS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(a) Tin Smelter SO_2 Scrubber

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal produced		
Antimony	41.830	18.640
Lead	6.068	2.817
Nickel	11.920	8.018
Cyanide (total)	4.334	1.734
Ammonia (as N)	2,889.000	1,270.000
Fluoride	758.500	433.400
Tin	71.080	31.640

PSNS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(b) Dealuminizing Rinse

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of dealuminized scrap produced		
Antimony	0.068	0.030
Lead	0.010	0.005
Nickel	0.019	0.013
Cyanide (total)	0.0070	0.0028
Ammonia (as N)	4.666	2.051
Fluoride	1.225	0.700
Tin	0.115	0.051

PSNS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(c) Tin Mud Acid Neutralization Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of neutralized dewatered tin mud produced		
Antimony	9.741	4.341
Lead	1.413	0.656
Nickel	2.776	1.868
Cyanide (total)	1.009	0.404
Ammonia (as N)	672.800	295.800
Fluoride	176.700	101.000
Tin	16.550	7.370

PSNS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(d) Tin Hydroxide Wash

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin hydroxide washed		
Antimony	23.070	10.280
Lead	3.347	1.554
Nickel	6.574	4.423
Cyanide (total)	2.391	0.956
Ammonia (as N)	1,593.000	700.400
Fluoride	418.400	239.100
Tin	39.210	17.450

PSNS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(e) Spent Electrowinning Solution from New Scrap

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of cathode tin produced		
Antimony	32.430	14.450
Lead	4.704	2.184
Nickel	9.240	6.216
Cyanide (total)	3.360	1.344
Ammonia (as N)	2,239.000	984.500
Fluoride	588.000	336.000
Tin	55.100	24.530

PSNS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(f) Spent Electrowinning Solution from Municipal Solid Waste

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of MSW scrap used as raw material		
Antimony	0.230	0.102
Lead	0.033	0.015
Nickel	0.065	0.044
Cyanide (total)	0.0238	0.0095
Ammonia (as N)	15.860	6.973
Fluoride	4.165	2.380
Tin	0.390	0.174

PSNS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(g) Tin Hydroxide Supernatant from Scrap

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from scrap		
Antimony	107.400	47.850
Lead	15.580	7.233
Nickel	30.600	20.590
Cyanide (total)	11.130	4.451
Ammonia (as N)	7,417.000	3,261.000
Fluoride	1,948.000	1,113.000
Tin	182.500	81.230

PSNS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(h) Tin Hydroxide Supernatant from Spent Plating Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from spent plating solutions		
Antimony	73.300	32.660
Lead	10.640	4.937
Nickel	20.890	14.050
Cyanide (total)	7.596	3.038
Ammonia (as N)	5,062.000	2,226.000
Fluoride	1,329.000	759.600
Tin	124.600	55.450

PSNS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(i) Tin Hydroxide Supernatant from Sludge Solids

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from sludge solids		
Antimony	321.100	143.100
Lead	46.580	21.630
Nickel	91.500	61.560
Cyanide (total)	33.270	13.310
Ammonia (as N)	22,180.000	9,749.000
Fluoride	5,823.000	3,327.000
Tin	545.700	242.900

PSNS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(j) Tin Hydroxide Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal produced		
Antimony	48.340	21.540
Lead	7.013	3.256
Nickel	13.780	9.266
Cyanide (total)	5.009	2.004
Ammonia (as N)	3,338.000	1,468.000
Fluoride	876.600	500.900
Tin	82.140	36.560

PRIMARY AND SECONDARY TIN SUBCATEGORY

SECTION III

INDUSTRY PROFILE

This section of the primary and secondary tin supplement describes the raw materials and processes used in the production of primary and secondary tin and presents a profile of the primary and secondary tin plants identified in this study. A discussion of the purpose, authority and methodology for this study, and a general description of the nonferrous metals manufacturing category is presented in Section III of the General Development Document.

The largest total use of tin is in solders which are manufactured from both primary tin and secondary tin. The low melting point of tin (232°C) makes it ideal for this application. Tin plated steel products represent the second largest use of tin. Only primary tin is used for this application.

Tin is also used in a number of alloys including brass, bronze, and white metal alloys including babbit. White metal alloys are low melting point alloys consisting primarily of tin or lead. These alloys may also contain lesser amounts of copper, zinc and antimony and are used primarily in bearings.

DESCRIPTION OF PRIMARY AND SECONDARY TIN PRODUCTION

Primary tin is produced by smelting tin concentrates with limestone and coke. The crude tin is then electrolytically refined and cast. The process is presented schematically in Figure III-1.

Secondary tin may also be produced by smelting tin residues, particularly detinners mud from secondary tin recovery operations. Most secondary tin, however, is produced by dissolving tin from tin plated steel scrap, and recovering the tin by electrowinning. Tin may also be recovered from solution by precipitation of tin as tin hydroxide, $Sn(OH)_4$. A smaller amount of secondary tin is recovered from tin plating sludges which are generated by tin plated steel production operations. Secondary tin production can be divided into four major operations: alkaline detinning, electrowinning, tin hydroxide precipitation, and reduction to tin metal. These operations are shown schematically in Figure III-2.

RAW MATERIALS

Tin concentrates used in primary tin production are produced as a by-product from molybdenum mining operations in Colorado or from gold placer mining operations in Alaska.

The principal raw material for the secondary tin industry is tin plated steel scrap. Virtually all of this scrap comes from fabrication plants which produce cans and a variety of other tin plated steel products. Such scrap may include punched sheets, rolls and bundles. One producer also reported tin recovery from tin plated steel separated from municipal solid waste. Two producers reported that they recovered tin from spent tin electroplating solutions and plating sludges.

TIN SMELTING

There is currently one tin smelter in the United States. Tin concentrates and residues are smelted in a reverbertory furnace with limestone and coke at 1200 to 1300°C. Sulfur dioxide emissions from the smelting furnace are controlled with a caustic scrubber. Crude molten tin is removed from the furnace, fire refined and cast into anodes. The anodes are consumed in an electrolytic refining process and the purified tin is cast into ingots.

ALKALINE DETINNING

The first step in recovering tin from tin plated scrap is hot alkaline detinning. Tin plated scrap is loaded into perforated steel detinning baskets and placed in a detinning tank which contains a solution of sodium hydroxide and sodium nitrate. The solution is heated to near the boiling point and the tin dissolves into solution as sodium stannate, Na_2SnO_3. The chemical reaction (not balanced) is as follows:

$$Sn + NaNO_3 + NaOH + H_2O \longrightarrow Na_2SnO_3 \cdot H_2O + NH_3 + N_2$$

The detinning cycle is complete after 4 to 12 hours. Scrap containing aluminum is pretreated in a solution of sodium hydroxide, in which the aluminum dissolves. After rinsing, the dealuminized scrap is sent to the detinning tanks.

There are two variations of the alkaline detinning process: the saturated process and the unsaturated process. In the saturated process, the sodium stannate solution is allowed to become supersaturated and sodium stannate crystals precipitate from solution. The sodium stannate is recovered from the solution in a filter press and the solution is returned to the detinning tanks. The sodium stannate filter cake may then be sold as a product or redissolved in water for further processing or electrowinning.

In the unsaturated process, the sodium stannate concentration in the solution is kept below the saturation point and the solution is pumped directly to further processing or electrowinning. In both the saturated and the unsaturated process, the sodium stannate solution is purified by adding sodium sulfide, Na_2S or sodium hydrosulfide, NaHS, to precipitate lead and other metal impurities as insoluble metal sulfides. The precipitated residue is called tin mud or detinners mud and is sold to tin smelters.

Detinners mud may also include residues removed from the bottoms of detinning tanks. This mud contains 3 to 5 percent tin and is sold as a by-product to tin smelters. The tin mud is usually rinsed to recover any soluble tin which may be present. The rinse water is recycled to the detinning tanks. One producer reported an acid neutralization step in which sulfuric acid is added to the mud. The neutralized mud is then dewatered in a filter press and sold as a by-product containing approximately 10 percent tin.

When the detinning cycle is complete, the detinned steel is removed from the detinning tanks. The steel is then rinsed to recover any tin solution which may be adhering to it, pressed or baled, and sold as a product. The rinse water is recycled to the detinning tanks to recover tin.

ELECTROWINNING

The purified sodium stannate solution is sent to electrolytic cells where pure tin metal is deposited onto cathodes. The tin is then removed from the cathodes, melted and cast. The electrowinning solution is then recycled to the detinning tanks. A blowdown stream must periodically be discharged from the electrowinning circuit in order to control the concentration of aluminum, carbonates, and other impurities in the solution.

One producer reported the use of tin hydroxide, $Sn(OH)_4$, as a raw material. The tin hydroxide is first washed with water and then dissolved in a solution of sodium hydroxide. The resultant sodium stannate solution is then purified and added to the sodium stannate solution from alkaline detinning and the combined solution enters the electrowinning tanks.

PRECIPITATION OF TIN HYDROXIDE

As an alternative to electrowinning, tin can be recovered from solution as tin hydroxide, $Sn(OH)_4$. Sulfuric acid is added to lower the pH to 7 and sodium carbonate is then added to raise the pH to 7.8. At this point tin hydroxide will precipitate from the solution. One plant which uses this process precipitates tin from a solution which is a mixture of alkaline detinning solution and a solution generated by dissolving tin electroplating sludge in water. The other plant which precipitates tin hydroxide uses spent tin electroplating solution as a raw material and facilitates precipitation through the addition of ammonia.

REDUCTION TO TIN METAL

The tin hydroxide is dried and calcined in a furnace to produce tin dioxide, SnO_2. The tin dioxide is then charged to a reduction furnace with carbon where it is reduced to tin metal.

PROCESS WASTEWATER SOURCES

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

1. Tin smelter SO_2 scrubber
2. Dealuminizing rinse,
3. Tin mud acid neutralization filtrate,
4. Tin hydroxide wash,
5. Spent electrowinning solution from new scrap,
6. Spent electrowinning solution from municipal solid waste
7. Tin hydroxide supernatant from scrap,
8. Tin hydroxide supernatant from spent plating solutions
9. Tin hydroxide supernatant from sludge solids, and
10. Tin hydroxide filtrate.

OTHER WASTEWATER SOURCES

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

1. Noncontact 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

Table III-1 shows the relative age and discharge status of the primary and secondary tin plants. the average plant age is between 16 and 25 years. All of the plants have been built since 1940. Table III-2 shows the 1982 production for primary and secondary tin. The 11 secondary tin plants have production levels less than 1,000 kkg/yr. The only primary tin producer has a production level between 1,000 and 5,000 kkg/yr from both primary and secondary materials.

Table III-3 provides a summary of the number of plants with the various production processes and the number of plants which generate wastewater from each process. The one plant which practices tin smelting is the only domestic primary tin producer. Alkaline detinning is practiced by 10 of the 11 secondary tin plants. Of these 10 plants, eight also practice electrowinning. Figure III-3 shows the geographic locations of the primary and secondary tin facilities in the United States by discharge status.

Table III-1

INITIAL OPERATING YEAR (RANGE) SUMMARY OF PLANTS IN THE PRIMARY AND SECONDARY TIN SUBCATEGORY BY DISCHARGE TYPE

Discharge Type	Initial Operating Year (Range) (Plant Age in Years) 1982-1973 (0-10)	1972-1968 (11-15)	1967-1958 (16-25)	1957-1948 (26-35)	1947-1938 (36-45)	Total
Direct	0	0	1	1	1	3
Indirect	0	0	2	0	0	2
Zero	2	1	2	1	1	7
TOTAL	2	1	5	2	2	12

Table III-2

PRODUCTION RANGES FOR PRIMARY AND SECONDARY TIN PLANTS FOR 1982

Discharge Type	0-100 (kkg/yr)	100-1,000 (kkg/yr)	1,000-5,000 (kkg/yr)	Total
Direct*				3
Indirect	2	0	0	2
Zero	3	4	0	7
TOTAL*				12

*Direct dischargers production ranges have been withheld because the information on which they are based has been claimed to be confidential.

Table III-3

SUMMARY OF PRIMARY AND SECONDARY TIN SUBCATEGORY
PROCESSES AND ASSOCIATED WASTE STREAMS

Process and Waste Streams	Number of Plants With Process or Waste Stream	Number of Plants Reporting Generation of Wastewater*
Tin Smelting	1	
- Smelter SO_2 scrubber	1	1
Alkaline Detinning	10	
- Dealuminizing rinse	1	1
- Tin mud acid neutralization filtrate	1	1
Electrowinning	8	
- Tin hydroxide wash	1	1
- Spent electrowinning solution from new scrap	8	7
- Spent electrowinning solution from municipal solid waste	1	1
Tin Hydroxide Precipitation	2	
- Supernatant from scrap	1	1
- Supernatant from spent plating solutions	2	2
- Supernatant from sludge solids	1	1
- Tin hydroxide filtrate	1	1
Reduction to Tin Metal	1	

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

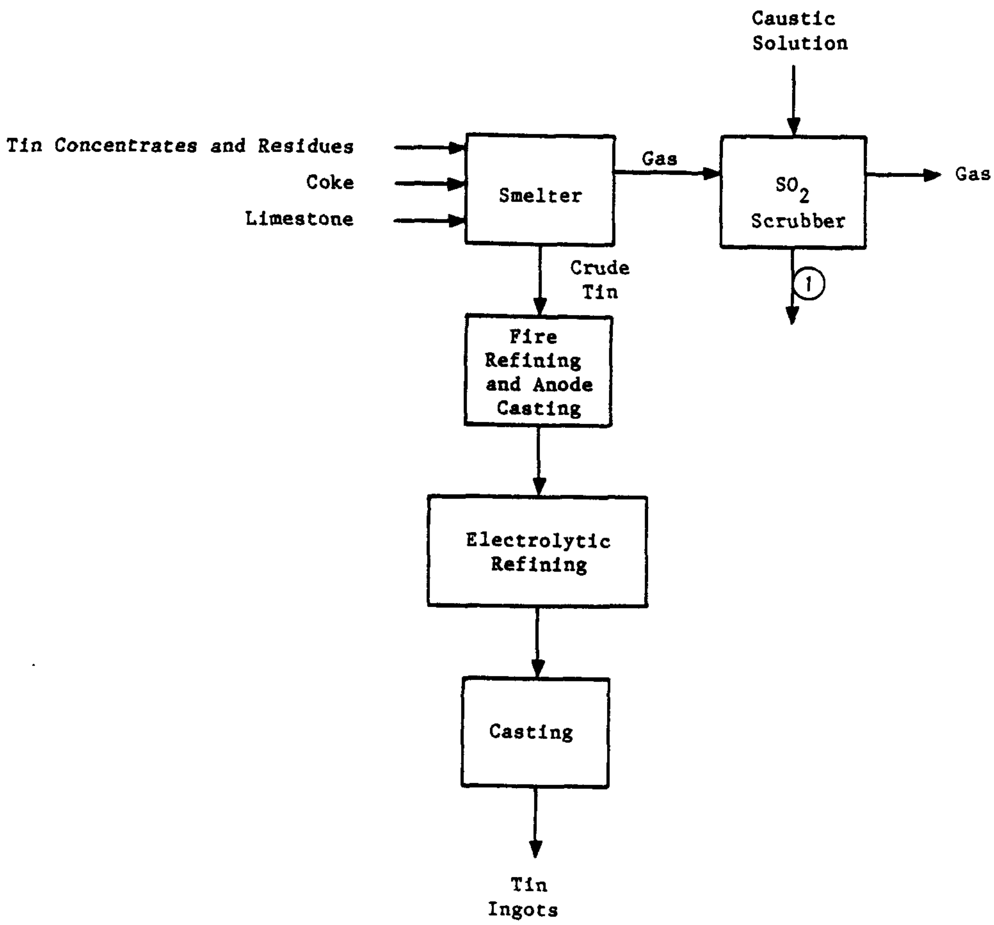

Figure III-1

PRIMARY TIN PRODUCTION PROCESS

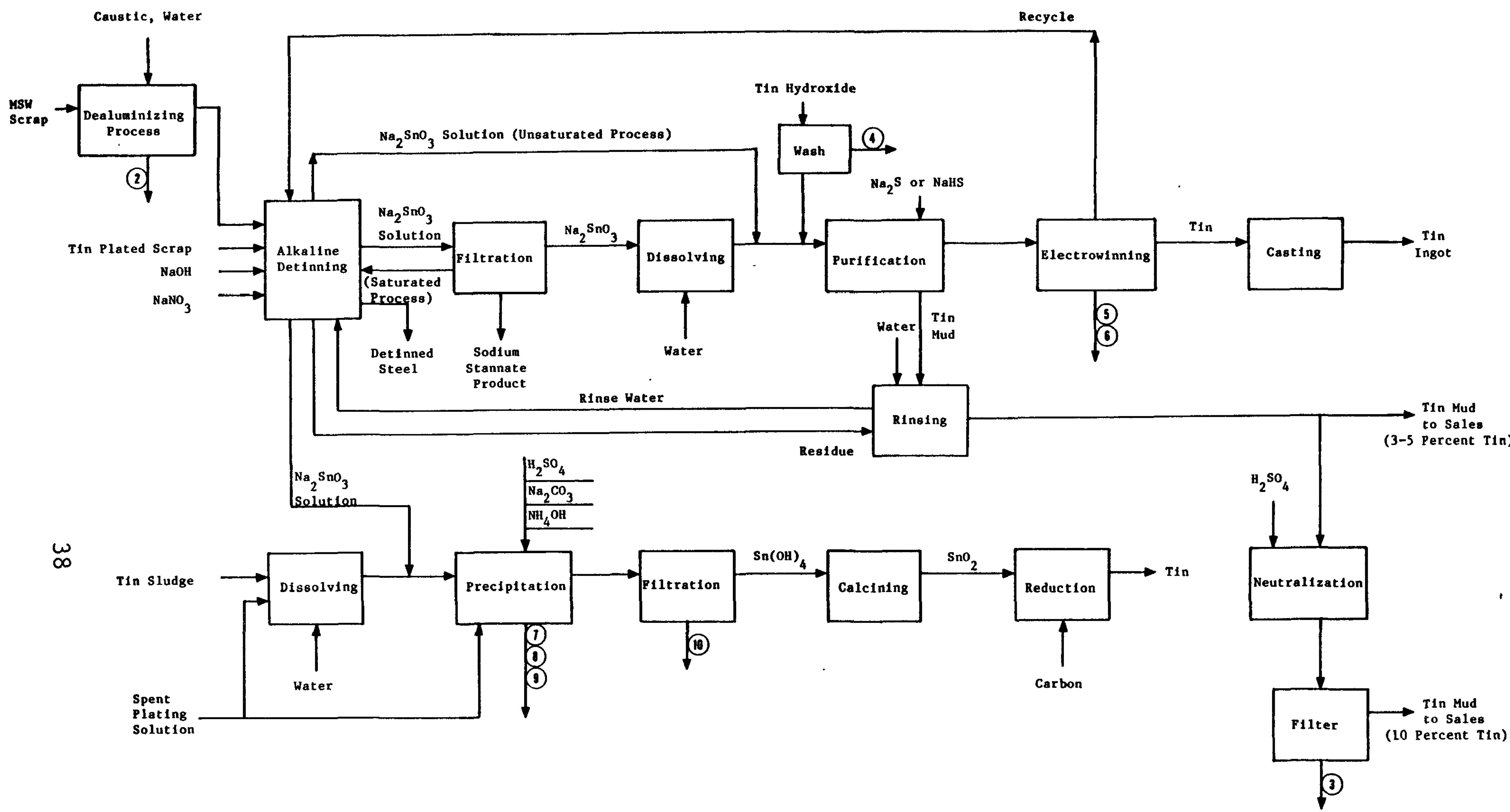

Figure III-2

SECONDARY TIN PRODUCTION PROCESSES

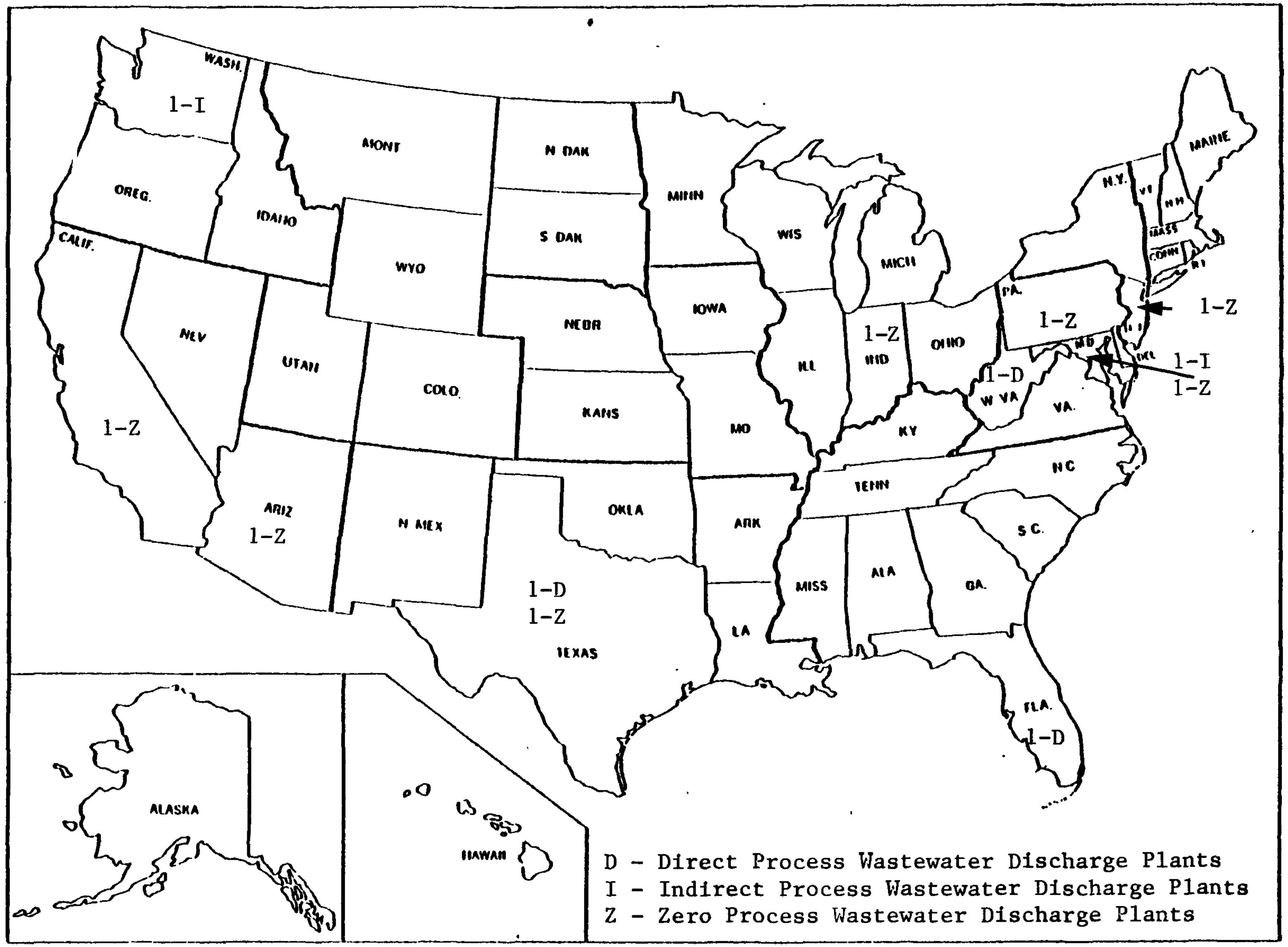

Figure III-3

GEOGRAPHIC LOCATIONS OF THE PRIMARY AND SECONDARY TIN SUBCATEGORY PLANTS

PRIMARY AND SECONDARY TIN 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 and secondary tin subcategory and its related subdivisions.

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 and secondary tin subcategory. Three factors were particularly important in establishing these classifications: the type of metal produced, the nature of raw materials 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 (phase II) category was divided into 21 subcategories, one of them being primary and secondary tin.

FACTORS CONSIDERED IN SUBDIVIDING THE PRIMARY AND SECONDARY TIN SUBCATEGORY

The factors listed previously were each evaluated when considering subdivision of the primary and secondary tin 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 and secondary tin 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 and secondary tin 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. Tin smelter SO_2 scrubber,
2. Dealuminizing rinse,
3. Tin mud acid neutralization filtrate,
4. Tin hydroxide wash,
5. Spent electrowinning solution fron new scrap,
6. Spent electrowinning solution from municipal solid waste,
7. Tin hydroxide supernatant from scrap,
8. Tin hydroxide supernatant from spent plating solutions.
9. Tin hydroxide supernatant from sludge solids, and
10. Tin hydroxide filtrate.

These subdivisions follow directly from differences within the five distinct production processes which may be used in the production of primary or secondary tin: tin smelting, alkaline detinning, electrowinning, precipitation and reduction.

The smelting of tin gives rise to the first subdivision. The control of sulfur dioxide emissions from smelter flue gases is accomplished through the use of a wet caustic scrubbing system. Blowdown of caustic scrubbing solution comprises the wastewater stream associated with this subdivision.

Although alkaline detinning is a net consumer of water because of evaporation losses, a number of wastewater streams may be generated. When tin scrap containing aluminum is used, the scrap is leached with a sodium hydroxide solution prior to entering the detinning tanks. The aluminum dissolves in the caustic solution and the scrap is then rinsed with water. The spent caustic leaching solution and rinse water are discharged as a waste stream.

Another wastewater stream associated with alkaline detinning is tin mud acid neutralization filtrate. Tin mud may consist of residues from the detinning tanks, precipitates formed when sodium sulfide or sodium hydrosulfide is added to the sodium stannate solution to precipitate base metal impurities, or a combination of the two. This "detinners mud" typically contains from 3 to 5 percent tin by weight. The mud is rinsed with fresh water to recover soluble tin compounds which are returned to the detinning tanks. The rinsed mud is filtered and eventually sold to smelters. One producer neutralizes this mud with sulfuric acid prior to dewatering in a pressure filter. The filtrate cannot be returned to the detinning tanks and is therefore discharged as a waste stream. The mud has been upgraded to a product that is approximately 10 percent tin.

Electrowinning is the principal means of recovering tin from the sodium stannate solution which is generated in alkaline detinning operations. One producer reported the use of tin hydroxide as an additional raw material to the electrowinning solution. Prior to being dissolved in the sodium stannate solution the tin hydroxide is washed with water to remove impurities. The wash water is then discharged as a wastewater stream. The most significant wastewater stream associated with electrowinning is spent electrowinning solution. The partially depleted sodium stannate solution is recycled to the detinning tanks where additional tin is taken into solution. A bleed stream is required, however, in order to control the buildup of impurities, particularly aluminum and carbonates, in the solution. This bleed stream comprises a wastewater stream associated with the electrowinning operation.

When municipal solid waste is used as a raw material to alkaline detinning operations, a much larger discharge of spent electrowinning solution results. This larger blowdown stream is necessitated by impurities which are introduced into the sodium stannate solution by the raw material. Consequently, spent electrowinning solution from municipal solid waste processing is identified as a separate subdivision.

As an alternative to electrowinning, tin may be precipitated from solution as tin hydroxide. The tin hydroxide sludge is dewatered in a filter press, dried and sold or calcined to tin oxide in a furnace, and reduced with carbon in a reduction furnace to produce tin metal. The supernatant and filtrate streams associated with tin hydroxide precipitation comprise wastewater streams associated with this operation.

The flow rates and characteristics of the tin hydroxide supernatant stream vary significantly depending on the raw materials used. Because of this, separate subdivisions have been identified for tin hydroxide supernatant from each of the three possible raw materials: tin plated steel scrap, spent plating solutions, and tin plating sludge solids. Tin hydroxide filtrate from dewatering the precipitated tin hydroxide is also designated as a separate subdivision.

OTHER FACTORS

The other factors considered in this evaluation either support the establishment of the 10 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 tin product, intermediate or raw material processed will be used as the PNP. Thus, the PNPs for the ten subdivisions are as follows:

	Subdivision	PNP
1.	Tin smelter SO_2 scrubber	kkg of tin metal produced
2.	Dealuminizing rinse	kkg of dealuminized scrap produced
3.	Tin mud acid neutralization filtrate	kkg of neutralized, dewatered tin mud produced
4.	Tin hydroxide wash	kkg of tin hydroxide washed
5.	Spent electrowinning solution from new scrap	kkg of cathode tin produced
6.	Spent electrowinning solution from municipal solid waste	kkg of MSW scrap used as raw material
7.	Tin hydroxide supernatant from scrap	kkg of tin metal recovered from scrap
8.	Tin hydroxide supernatant from	kkg of tin metal recovered

	spent plating solutions	from spent plating solutions
9.	Tin hydroxide supernatant from sludge solids	kkg of tin metal recovered from sludge solids
10.	Tin hydroxide filtrate	kkg of tin metal produced

PRIMARY AND SECONDARY TIN SUBCATEGORY

SECTION V

WATER USE AND WASTEWATER CHARACTERISTICS

This section describes the characteristics of the wastewaters associated with the primary and secondary tin 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 informaiton breifly, 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 and secondary tin 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 wastewater in the primary and secondary tin subcategory. In general, the samples were anlayzed for cyanide and 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 and secondary tin subcategory has been split into 10 subdivisions or wastewater sources, so that the proposed regulation contains mass discharge limitations and standards for 10 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. Tin smelter SO_2 scrubber,
2. Dealuminizing rinse,
3. Tin mud acid neutralization filtrate,

4. Tin hydroxide wash,
5. Spent electrowinning solution from new scrap,
6. Spent electrowinning solution from municipal solid waste,
7. Tin hydroxide supernatant from scrap,
8. Tin hydroxide supernatant from spent plating solutions,
9. Tin hydroxide supernatant from sludge solids, and
10. Tin hydroxide filtrate.

WASTEWATER FLOW RATES

Data supplied by dcp responses were evaluated, and two flow-to-production ratios, water use and wastewater discharge, were calculated for each stream. The two ratios are differentiated by the flow value used in the calculation. Water use is defined as the volume of water or other fluid required for a given process per mass of tin product and is therefore based on the sum of recycle and make-up flows to a given process to further treatment, disposal, or discharge per mass of tin 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, tin smelter SO_2 scrubber water flow is related to the production of tin metal. As such, the discharge rate is expressed in liters of scrubber water per metric ton of tin produced (gallons of scrubber water per ton of tin metal).

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-10 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 and secondary tin production come from two sources--data collection portfolios and analytical data from field sampling trips.

DATA COLLECTION PORTFOLIOS

In the data collection portfolios, the tin plants that discharge wastewater were asked to specify the presence or absence of toxic pollutants in their wastewater. Three of the five discharging plants responded. The responses are summarized below:

Pollutant	Known Present	Believed Present
antimony	1	2
arsenic	1	0
cadmium	1	0
chromium	1	0
copper	1	1
cyanide	1	0
lead	1	1
mercury	0	1
nickel	2	0
selenium	0	1
silver	1	0
zinc	1	1

FIELD SAMPLING DATA

In order to quantify the concentrations of pollutants present in wastewater from primary and secondary tin plants, wastewater samples were collected at four plants, which represent one-third of the primary and secondary tin plants in the United States. Diagrams indicating the sampling sites and contributing production processes are shown in Figures V-1 through V-4 (at the end of this section).

Raw wastewater data are summarized in Tables V-11 through V-15 (at the end of this section). Data from samples of treated and partially treated wastewater streams are presented in Tables V-16 through V-20. Note that the stream numbers listed in the tables correspond to those given in individual plant sampling site diagrams, Figures V-1 through V-4. 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 one of these pollutants 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 and secondary tin production involves 10 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.

TIN SMELTER SO_2 SCRUBBER

There is one facility which produces tin metal through the smelting of tin concentrates and residues. This facility reported the use of a wet scrubbing system to control SO_2 emissions in the smelter flue gas. The scrubber uses a recirculating caustic solution. A portion of the solution must be discharged in order to maintain effective SO_2 removal. The water use and wastewater discharge rates for this stream are shown in liters per metric ton of tin metal produced in Table V-1.

The one facility reporting this stream is a direct discharger after treatment consisting of chemical precipitation and sedimentation. There are no analytical data for this waste stream; however, it is expected to be similar to SO_2 scrubber blowdown which was sampled at a secondary lead facility with treatable concentrations of several toxic metals present. Also, the one facility reporting this waste stream indicated that nickel was known to be present in the waste stream and that copper, lead, zinc and antimony were believed to be present based on the raw materials and process chemicals used in the operation.

DEALUMINIZING RINSE

Aluminum present in tin plated steel scrap may be removed by leaching in a sodium hydroxide solution prior to alkaline detinning. The aluminum dissolves in the caustic solution and the scrap is then rinsed and charged to the alkaline detinning tanks. One plant reported this practice. A portion of their raw material is tin plated steel scrap separated from municipal solid waste. The spent caustic leaching solution and rinse water are discharged as a waste stream. The one facility reporting this waste stream is a direct discharger. The dealuminizing waste stream is treated with sodium sulfide to precipitate metals, chlorinated to destroy cyanide, and neutralized with sulfuric acid. Solids are removed from the neutralized stream in a sedimentation pond prior to discharge. The water use and discharge rates are presented in Table V-2 in liters per metric ton of dealuminized scrap produced.

There are no analytical data for this stream; however, it is expected to be similar to the spent electrowinning solution with a very alkaline pH and treatable levels of cyanide and certain toxic metals including arsenic, lead, nickel and selenium.

TIN MUD ACID NEUTRALIZATION FILTRATE

One facility reported neutralization of tin mud with sulfuric acid prior to dewatering in a filter press. The neutralized, dewatered mud is sold as a by-product. The filtrate from the dewatering step is discharged as a wastewater stream. Water use and discharge rates are presented in Table V-3 in liters per metric ton of neutralized, dewatered tin mud produced.

Although there are no analytical data for this specific stream, data are available for samples of tin mud pond supernatant which were collected at a facility which stores tin mud in open ponds prior to sale to a tin smelter. These data are presented in

Table V-15. The same pollutants found in the mud pond supernatant are expected to be present in the tin mud acid neutralization filtrate. It can be seen that treatable levels of toxic metals are present including antimony, arsenic, lead, nickel, thallium and zinc. Treatable levels of cyanide are also present. The one facility reporting this waste stream is an indirect discharger with no treatment in place.

TIN HYDROXIDE WASH

One facility reported the use of tin hydroxide, $Sn(OH)_4$, as a raw material in their electrolytic tin production process. The tin hydroxide is washed with water to remove impurities, dissolved in a sodium hydroxide solution and mixed with the tin solution from the alkaline detinning operation prior to entering the electrowinning cell. The tin hydroxide wash water is discharged as a waste stream. The one facility reporting this stream achieves zero discharge through the use of an evaporation pond. The water use and discharge rates are shown in liters per metric ton of tin hydroxide washed in Table V-4.

There are no analytical data available for this stream. It is expected to have an alkaline pH and a treatable level of total suspended solids. Also, some toxic metals may be present if they are present in the tin hydroxide.

SPENT ELECTROWINNING SOLUTION FROM NEW SCRAP

Electrowinning is the principal method for recovering tin from the alkaline detinning solution. After the tin has been plated onto the cathode and the solution has been depleted, the solution is either recycled to the detinning tank or discarded depending on the amount and type of impurities present. Of the 10 plants which practice alkaline detinning, eight recover tin from solution via electrowinning. Of these eight facilities, six achieve zero discharge through various combinations of recycle, evaporation, contractor disposal and sales. Of the two remaining plants one is a direct discharger; and the other is an indirect discharger. Water use and discharge rates are presented in Table V-5 in liters per metric ton of cathode tin produced.

Table V-11 summarizes the raw wastewater sampling data for the toxic and selected conventional and nonconventional pollutants. It can be seen that there are treatable concentrations of several toxic metals present including antimony, arsenic, lead, nickel, selenium, thallium and zinc. Also, treatable concentrations of cyanide are present. This wastewater stream has a very alkaline pH (approximately 12) and high concentrations of total suspended solids.

SPENT ELECTROWINNING SOLUTION FROM MUNICIPAL SOLID WASTE

When tin plated steel scrap which was recovered from municipal solid waste (MSW) is used as a raw material for alkaline detinning and electrowinning, a significantly larger discharge of spent electrowinning solution is necessary because of additional impurities introduced into the solution. There is currently one facility using MSW as a source of raw material. The water use and discharge rates for this stream are shown in Table V-6 in liters per metric ton of MSW scrap used as raw material. This flow rate is estimated using a procedure described in Section IX of this document.

The one facility reporting this extra discharge of spent electrowinning solution is a direct discharger after treatment consisting of chlorination, acid neutralization and sedimentation. The characteristics of this wastewater are assumed to be similar to the characteristics of spent electrowinning solution as discussed previously.

TIN HYDROXIDE SUPERNATANT FROM SCRAP

Tin may be recovered from solution by precipitation as tin hydroxide, $Sn(OH)_4$. Tin is present in solution as sodium stannate, Na_2SnO_3. Tin hydroxide will precipitate when the pH is lowered to 7.0 with sulfuric acid and sodium carbonate is added to pH 7.8. The characteristics and production normalized flow rates of the resultant supernatant stream are dependent upon the raw material used. The three possible raw materials are tin plated steel scrap, spent plating solutions, and plating sludge solids.

The water use and wastewater discharge rates for tin hydroxide supernatant from scrap are shown in Table V-7 in liters per metric ton of tin metal recovered from scrap. The one facility reporting this stream is a direct discharger after treatment by sedimentation. Table V-12 summarizes the raw wastewater sampling data for the toxic and selected conventional and nonconventional pollutants. It can be seen that treatable levels of toxic metals are present, particularly antimony at 4.4 mg/l. This waste stream has a pH of 8.3 and treatable levels of oil and grease and total suspended solids (TSS).

TIN HYDROXIDE SUPERNATANT FROM SPENT PLATING SOLUTIONS

Two plants reported the use of spent tin plating solutions as raw material. One facility recovers tin as tin hydroxide from both spent plating solutions and plating sludge solids. This facility dissolves tin from the sludge solids into the plating solution by adding additional water, while heating and lancing with air. Tin hydroxide is then precipitated from the resultant solution. The second facility uses only spent plating solutions. The liquids are decanted from the solids, which are rinsed and dried in an oven. Tin hydroxide is precipitated from the spent plating solution and rinse water by the addition of ammonia. Water use and discharge rates in liters per metric ton of tin metal recovered from spent plating solutions are presented in Table V-8.

Sampling data for tin hydroxide supernatant from tin plating solutions and sludges is presented in Table V-13. The samples were collected at the facility which uses both spent plating solutions and tin sludge solids as raw materials to tin hydroxide precipitation operations. The data are assumed to be representative of both tin hydroxide supernatant from spent plating solutions and tin hydroxide supernatant from plating sludge solids. It can be seen that treatable concentrations of toxic metals are present, particularly antimony which was detected at a maximum concentration of 3.1 mg/l. Cyanide is also present with a maximum observed concentration of 16 mg/l. Very high concentrations of fluoride are present in this wastewater with concentrations from 12,000 to 15,000 mg/l. This fluoride originates from tin fluoroborate and fluoroboric acid which are used in the tin plating baths. This wastewater has a nearly-neutral pH and treatable concentrations of suspended solids.

TIN HYDROXIDE SUPERNATANT FROM TIN PLATING SLUDGE SOLIDS

One facility reported the use of both tin plating sludge solids and spent plating solutions raw materials for tin hydroxide precipitation operations. Water use and discharge rates are presented in Table V-9 in liters per metric ton of tin recovered from sludge solids. The flow attributable to production of tin from tin sludge solids was calculated by subtracting the flow expected from tin production from spent plating solutions from the total tin hydroxide supernatant flow from both sludge solids and spent plating solution. This wastewater stream is characterized by treatable concentrations of antimony, cyanide, fluoride, and TSS.

TIN HYDROXIDE FILTRATE

When tin hydroxide slurry is separated from the supernatant stream, it may be further dewatered in a filter press prior to drying. The resultant filtrate is discharged as a wastewater stream. Water use and discharge rates are presented in Table V-10 in liters per metric ton of tin metal produced.

The one facility reporting this stream is a direct discharger after treatment by sedimentation. Table V-14 summarizes the sampling data for this waste stream. Treatable concentrations of cyanide and toxic metals are present including antimony at 2.4 mg/l. Treatable concentrations of fluoride and TSS are also present.

Table V-1

WATER USE AND DISCHARGE RATES
TIN SMELTER SO_2 SCRUBBER

(l/kkg of tin metal produced)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Rate
1118	50	43,340	21,670

Table V-2

WATER USE AND DISCHARGE RATES
DEALUMINIZING RINSE

(l/kkg of dealuminized scrap produced)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Rate
1047	0	35	35

Table V-3

WATER USE AND DISCHARGE RATES
TIN MUD ACID NEUTRALIZATION FILTRATE

(l/kkg of neutralized, dewatered tin mud produced)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Rate
1046	0	5,047	5,047

Table V-4

WATER USE AND DISCHARGE RATES
TIN HYDROXIDE WASH

(l/kkg of tin hydroxide washed)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Rate
1049	0	11,953	11,953

Table V-5

WATER USE AND DISCHARGE RATES
SPENT ELECTROWINNING SOLUTION FROM NEW SCRAP

(l/kkg of cathode tin produced)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Rate
1047	0	NR	NR
1049	0	24,069	24,069
1048	NR	NR	21,982
1054	0	16,609	16,609
1046	0	15,145	15,145
1056	0	12,489	12,489
1057	0	10,498	10,498
1144	NR	NR	NR

NR = Data not reported.

Table V-6

WATER USE AND DISCHARGE RATES
SPENT ELECTROWINNING SOLUTION FROM MUNICIPAL SOLID WASTE

(l/kkg of MSW scrap used as a raw material)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Rate
1047*	0	119	119

*Calculated from estimates of both MSW and scrap flow combined at plant.

Table V-7

WATER USE AND DISCHARGE RATES
TIN HYDROXIDE SUPERNATANT FROM SCRAP

(l/kkg of tin metal recovered from scrap)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Rate
1036	0	55,640	55,640

Table V-8

WATER USE AND DISCHARGE RATES
TIN HYDROXIDE SUPERNATANT FROM SPENT PLATING SOLUTIONS

(l/kkg of tin metal recovered from spent plating solutions)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Rate
1014	0	37,978	37,978
1036	0	NR	NR

NR = Data not reported.

Table V-9

WATER USE AND DISCHARGE RATES
TIN HYDROXIDE SUPERNATANT FROM SLUDGE SOLIDS

(l/kkg of tin metal recovered from sludge solids)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Rate
1036	0	166,362	166,362

Table V-10

WATER USE AND DISCHARGE RATES
TIN HYDROXIDE FILTRATE

(l/kkg of tin metal produced)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Rate
1036	0	25,044	25,044

Table V-11

SPENT ELECTROWINNING SOLUTION
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
2. acrolein	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
3. acrylonitrile	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
4. benzene	455	1	0.013	0.051		
	843	1	ND	0.047		
	856	1	ND	0.003		
5. benzidine	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
6. carbon tetrachloride	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
7. chlorobenzene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		

Table V-11 (Continued)

SPENT ELECTROWINNING SOLUTION
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
8. 1,2,4-trichlorobenzene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
9. acenaphthene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
10. acrolein	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
11. acrylonitrile	455	1	ND	0.066		
	843	1	ND	ND		
	856	1	ND	ND		
12. benzene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
13. 1,1-dichloroethane	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
14. 1,1,2-trichloroethane	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		

Table V-11 (Continued)

SPENT ELECTROWINNING SOLUTION
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
15. 1,1,2,2-tetrachloroethane	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
16. chloroethane	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
17. bis(chloromethyl)ether	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
18. bis(2-chloroethyl)ether	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
19. 2-chloroethyl vinyl ether	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
20. 2-chloronaphthalene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
21. 2,4,6-trichlorophenol	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		

Table V-11 (Continued)

SPENT ELECTROWINNING SOLUTION
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
22. p-chloro-m-cresol	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
23. chloroform	455	1	0.038	ND		
	843	1	ND	ND		
	856	1	0.037	ND		
24. 2-chlorophenol	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
25. 1,2-dichlorobenzene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
26. 1,3-dichlorobenzene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
27. 1,4-dichlorobenzene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
28. 3,3'-dichlorobenzidine	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		

Table V-11 (Continued)

SPENT ELECTROWINNING SOLUTION
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
29. 1,1-dichloroethylene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
30. 1,2-trans-dichloroethylene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
31. 2,4-dichlorophenol	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
32. 1,2-dichloropropane	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
33. 1,3-dichloropropene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
34. 2,4-dimethylphenol	455	1	ND	0.009		
	843	1	ND	ND		
	856	1	ND	ND		
35. 2,4-dinitrotoluene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		

Table V-11 (Continued)

SPENT ELECTROWINNING SOLUTION
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
36. 2,6-dinitrotoluene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
37. 1,2-diphenylhydrazine	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
38. ethylbenzene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
39. fluoranthene	455	1	ND	ND		
	843	1	ND	0.004		
	856	1	ND	ND		
40. 4-chlorophenyl phenyl ether	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
41. 4-bromophenyl phenyl ether	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
42. bis(2-chloroisopropyl)ether	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		

Table V-11 (Continued)

SPENT ELECTROWINNING SOLUTION
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
43. bis(2-chloroethoxy)methane	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
44. methylene chloride	455	1	0.019	0.031		
	843	1	ND	ND		
	856	1	0.021	0.025		
45. methyl chloride (chloromethane)	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
46. methyl bromide (bromomethane)	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
47. bromoform (tribromomethane)	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
48. dichlorobromomethane	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
49. trichlorofluoromethane	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		

Table V-11 (Continued)

SPENT ELECTROWINNING SOLUTION
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
50. dichlorodifluoromethane	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
51. chlorodibromomethane	455	1	0.002	ND		
	843	1	ND	ND		
	856	1	ND	ND		
52. hexachlorobutadiene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
53. hexachlorocyclopentadiene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
54. isophorone	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
55. naphthalene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
56. nitrobenzene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		

Table V-11 (Continued)

SPENT ELECTROWINNING SOLUTION
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
57. 2-nitrophenol	455	1	ND	ND		
	843	1	ND	0.060		
	856	1	ND	ND		
58. 4-nitrophenol	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
59. 2,4-dinitrophenol	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
60. 4,6-dinitro-o-cresol	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
61. N-nitrosodimethylamine	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
62. N-nitrosodiphenylamine	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
63. N-nitrosodi-n-propylamine	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		

Table V-11 (Continued)

SPENT ELECTROWINNING SOLUTION
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
64. pentachlorophenol	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
65. phenol	455	1	ND	0.017		
	843	1	ND	0.130		
	856	1	ND	0.020		
66. bis(2-ethylhexyl) phthalate	455	1	0.006	ND		
	843	1	0.054	ND		
	856	1	0.004	ND		
67. butyl benzyl phthalate	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
68. di-n-butyl phthalate	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
69. di-n-octyl phthalate	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
70. diethyl phthalate	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		

Table V-11 (Continued)

SPENT ELECTROWINNING SOLUTION
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
71. dimethyl phthalate	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
72. benzo(a)anthracene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
73. benzo(a)pyrene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
74. benzo(b)fluoranthene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
75. benzo(k)fluoranthene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
76. chrysene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
77. acenaphthylene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		

Table V-11 (Continued)

SPENT ELECTROWINNING SOLUTION
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
78. anthracene (a)	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
79. benzo(ghi)perylene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
80. fluorene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
81. phenanthrene (a)	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
82. dibenzo(a,h)anthracene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
83. indeno (1,2,3-c,d)pyrene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
84. pyrene	455	1	ND	ND		
	843	1	ND	0.003		
	856	1	ND	0.063		

Table V-11 (Continued)

SPENT ELECTROWINNING SOLUTION
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
85. tetrachloroethylene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	0.399		
86. toluene	455	1	0.001	0.018		
	843	1	0.093	0.017		
	856	1	0.005	0.005		
87. trichloroethylene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	0.007	0.009		
88. vinyl chloride (chloroethylene)	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
89. aldrin	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
90. dieldrin	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
91. chlordane	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		

Table V-11 (Continued)

SPENT ELECTROWINNING SOLUTION
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
92. 4,4'-DDT	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
93. 4,4'-DDE	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
94. 4,4'-DDD	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
95. alpha-endosulfan	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
96. beta-endosulfan	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
97. endosulfan sulfate	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
98. endrin	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		

Table V-11 (Continued)

SPENT ELECTROWINNING SOLUTION
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
99. endrin aldehyde	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
100. heptachlor	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
101. heptachlor epoxide	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
102. alpha-BHC	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
103. beta-BHC	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
104. gamma-BHC	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
105. delta-BHC	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		

Table V-11 (Continued)

SPENT ELECTROWINNING SOLUTION
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
106. PCB-1242 (b)	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
107. PCB-1254 (b)	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
108. PCB-1221 (b)	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
109. PCB-1232 (c)	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
110. PCB-1248 (c)	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
111. PCB-1260 (c)	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
112. PCB-1016 (c)	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		

Table V-11 (Continued)

SPENT ELECTROWINNING SOLUTION
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
113. toxaphene	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND		
114. antimony	455	1	0.001	5.0		
	843	1	<0.001	0.9		
	856	1	<0.001	0.41		
115. arsenic	455	1	0.002	2.0		
	843	1	0.008	1.9		
	856	1	0.007	6.6		
117. beryllium	455	1	<0.001	0.08		
	843	1	<0.001	0.005		
	856	1	<0.001	0.20		
118. cadmium	455	1	0.020	0.42		
	843	1	<0.001	0.34		
	856	1	0.001	0.29		
119. chromium (total)	455	1	0.003	0.94		
	843	1	0.003	0.30		
	856	1	0.004	0.56		
120. copper	455	1	0.008	0.50		
	843	1	0.14	0.30		
	856	1	0.016	0.41		

Table V-11 (Continued)

SPENT ELECTROWINNING SOLUTION
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
121. cyanide (total)	455	1	0.002	3.6		
	843	1	ND	ND		
	856	1	0.004	24		
122. lead	455	1	0.019	2.6		
	843	1	0.001	1.0		
	856	1	0.011	9.0		
123. mercury	455	1	<0.002	<0.002		
	843	1	<0.002	<0.002		
	856	1	0.007	0.026		
124. nickel	455	1	<0.001	2.5		
	843	1	0.001	4.1		
	856	1	0.003	3.7		
125. selenium	455	1	0.033	0.040		
	843	1	3.1	32		
	856	1	<0.005	<0.005		
126. silver	455	1	<0.001	0.40		
	843	1	0.02	0.35		
	856	1	<0.001	0.30		
127. thallium	455	1	0.14	3.1		
	843	1	<0.001	2.0		
	856	1	0.005	2.0		

Table V-11 (Continued)

SPENT ELECTROWINNING SOLUTION
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
128. zinc	455	1	0.08	29		
	843	1	0.06	1.1		
	856	1	0.24	0.24		
Nonconventional Pollutants						
alkalinity	455	1	60	220,000		
aluminum	455	1	1.90	13,000		
ammonia nitrogen	843	1	1.5	20		
	856	1	0.3	92		
calcium	455	1	11	<0.1		
chemical oxygen demand (COD)	455	1	4.0	3,600		
fluoride	455	1	1.2	0.5		
magnesium	455	1	5.5	0.04		
phenolics	455	1	0.011	1.4		
	843	1	0.002	0.006		
	856	1	0.001	0.11		

Table V-11 (Continued)

SPENT ELECTROWINNING SOLUTION
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
tin	455	1	1.6	760		
	843	1	0.28	2,600		
	856	1	1.7	8,800		
Conventional Pollutants						
total suspended solids (TSS)	455	1	1	23,000		
	843	1	19	50,000		
	856	1	9	5,100		
pH (standard units)	455	1	6.2	13.3		
	843	1	6.5	12.5		
	856	1	7			

†Sample Type Code: 1 - One-time grab

(a), (b), (c) Reported together.

Table V-12

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SCRAP)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	395	1	ND	ND		
2. acrolein	395	1	ND	ND		
3. acrylonitrile	395	1	ND	ND		
4. benzene	395	1	ND	ND		
5. benzidine	395	1	ND	ND		
6. carbon tetrachloride	395	1	ND	ND		
7. chlorobenzene	395	1	ND	ND		
8. 1,2,4-trichlorobenzene	395	1	ND	ND		
9. hexachlorobenzene	395	1	ND	ND		
10. 1,2-dichloroethane	395	1	ND	ND		
11. 1,1,1-trichloroethane	395	1	ND	ND		
12. hexachloroethane	395	1	ND	ND		
13. 1,1-dichloroethane	395	1	ND	ND		
14. 1,1,2-trichloroethane	395	1	ND	ND		

Table V-12 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SCRAP)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
15. 1,1,2,2-tetrachloroethane	395	1	ND	ND		
16. chloroethane	395	1	ND	ND		
17. bis(chloromethyl)ether	395	1	ND	ND		
18. bis(2-chloroethyl)ether	395	1	ND	ND		
19. 2-chloroethyl vinyl ether	395	1	ND	ND		
20. 2-chloronaphthalene	395	1	ND	ND		
21. 2,4,6-trichlorophenol	395	1	ND	ND		
22. p-chloro-m-cresol	395	1	ND	ND		
23. chloroform	395	1	ND	ND		
24. 2-chlorophenol	395	1	ND	ND		
25. 1,2-dichlorobenzene	395	1	ND	ND		
26. 1,3-dichlorobenzene	395	1	ND	ND		
27. 1,4-dichlorobenzene	395	1	ND	ND		
28. 3,3'-dichlorobenzidine	395	1	ND	ND		

Table V-12 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SCRAP)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
29. 1,1-dichloroethylene	395	1	<0.01	<0.01		
30. 1,2-trans-dichloroethylene	395	1	ND	ND		
31. 2,4-dichlorophenol	395	1	ND	ND		
32. 1,2-dichloropropane	395	1	ND	ND		
33. 1,3-dichloropropene	395	1	ND	ND		
34. 2,4-dimethylphenol	395	1	ND	ND		
35. 2,4-dinitrotoluene	395	1	ND	ND		
36. 2,6-dinitrotoluene	395	1	ND	ND		
37. 1,2-diphenylhydrazine	395	1	ND	<0.01		
38. ethylbenzene	395	1	ND	0.011		
39. fluoranthene	395	1	ND	ND		
40. 4-chlorophenyl phenyl ether	395	1	ND	ND		
41. 4-bromophenyl phenyl ether	395	1	ND	ND		
42. bis(2-chloroisopropyl)ether	395	1	ND	ND		

Table V-12 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SCRAP)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
43. bis(2-choroethoxy)methane	395	1	ND	ND		
44. methylene chloride	395	1	<0.01	<0.01		
45. methyl chloride (chloromethane)	395	1	ND	ND		
46. methyl bromide (bromomethane)	395	1	ND	ND		
47. bromoform (tribromomethane)	395	1	ND	ND		
48. dichlorobromomethane	395	1	ND	ND		
49. trichlorofluoromethane	395	1	ND	ND		
50. dichlorodifluoromethane	395	1	ND	ND		
51. chlorodibromomethane	395	1	ND	ND		
52. hexachlorobutadiene	395	1	ND	ND		
53. hexachlorocyclopentadiene	395	1	ND	ND		
54. isophorone	395	1	ND	ND		
55. naphthalene	395	1	ND	ND		
56. nitrobenzene	395	1	ND	ND		

Table V-12 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SCRAP)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
57. 2-nitrophenol	395	1	ND	0.031		
58. 4-nitrophenol	395	1	<0.01	0.026		
59. 2,4-dinitrophenol	395	1	ND	0.086		
60. 4,6-dinitro-o-cresol	395	1	ND	ND		
61. N-nitrosodimethylamine	395	1	ND	ND		
62. N-nitrosodiphenylamine	395	1	ND	ND		
63. N-nitrosodi-n-propylamine	395	1	ND	ND		
64. pentachlorophenol	395	1	ND	<0.01		
65. phenol	395	1	ND	ND		
66. bis(2-ethylhexyl) phthalate	395	1	<0.01	<0.01		
67. butyl benzyl phthalate	395	1	ND	ND		
68. di-n-butyl phthalate	395	1	ND	ND		
69. di-n-octyl phthalate	395	1	ND	ND		
70. diethyl phthalate	395	1	ND	ND		

Table V-12 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SCRAP)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
71. dimethyl phthalate	395	1	ND	ND		
72. benzo(a)anthracene	395	1	ND	ND		
73. benzo(a)pyrene	395	1	ND	ND		
74. benzo(b)fluoranthene	395	1	ND	ND		
75. benzo(k)fluoranthane	395	1	ND	ND		
76. chrysene	395	1	ND	ND		
77. acenaphthylene	395	1	ND	ND		
78. anthracene (a)	395	1	ND	ND		
79. benzo(ghi)perylene	395	1	ND	ND		
80. fluorene	395	1	ND	ND		
81. phenanthrene (a)	395	1	ND	ND		
82. dibenzo(a,h)anthracene	395	1	ND	ND		
83. indeno (1,2,3-c,d)pyrene	395	1	ND	ND		
84. pyrene	395	1	ND	ND		

Table V-12 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SCRAP)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
85. tetrachloroethylene	395	1	ND	ND		
86. toluene	395	1	ND	ND		
87. trichloroethylene	395	1	ND	<0.01		
88. vinyl chloride (chloroethylene)	395	1	ND	0.036		
89. aldrin	395	1	ND	ND		
90. dieldrin	395	1	ND	ND		
91. chlordane	395	1	ND	ND		
92. 4,4'-DDT	395	1	ND	ND		
93. 4,4'-DDE	395	1	ND	ND		
94. 4,4'-DDD	395	1	ND	ND		
95. alpha-endosulfan	395	1	ND	ND		
96. beta-endosulfan	395	1	ND	ND		
97. endosulfan sulfate	395	1	ND	ND		
98. heptachlor	395	1	ND	ND		

Table V-12 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SCRAP)
RAW WASTEWATER SAMPLING DATA

Pollutant		Stream Code	Sample Type†	Concentrations (mg/l)			
				Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)							
99. endrin aldehyde		395	1	ND	ND		
100. heptachlor		395	1	ND	ND		
101. heptachlor epoxide		395	1	ND	ND		
102. alpha-BHC		395	1	ND	ND		
103. beta-BHC		395	1	ND	ND		
104. gamma-BHC		395	1	ND	ND		
105. delta-BHC		395	1	ND	ND		
106. PCB-1242	(b)	395	1	ND	ND		
107. PCB-1254	(b)	395	1	ND	ND		
108. PCB-1221	(b)	395	1	ND	ND		
109. PCB-1232	(c)	395	1	ND	ND		
110. PCB-1248	(c)	395	1	ND	ND		
111. PCB-1260	(c)	395	1	ND	ND		
112. PCB-1016	(c)	395	1	ND	ND		

Table V-12 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SCRAP)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
113. toxaphene	395	1	ND	ND		
114. antimony	395	1	0.006	4.4		
115. arsenic	395	1	<0.001	0.135		
117. beryllium	395	1	<0.0005	0.001		
118. cadmium	395	1	<0.001	0.140		
119. chromium (total)	395	1	0.032	0.068		
120. copper	395	1	0.031	0.11		
121. cyanide (total)	395	1	0.040	0.48		
122. lead	395	1	0.12	0.30		
123. mercury	395	1	<0.0002	<0.0002		
124. nickel	395	1	<0.025	0.540		
125. selenium	395	1	<0.008	<0.008		
126. silver	395	1	0.001	0.065		
127. thallium	395	1	<0.001	0.590		

Table V-12 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SCRAP)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
128. zinc	395	1	0.05	0.210		
Nonconventional Pollutants						
alkalinity	395	1	77	2,200		
ammonia nitrogen	395	1	2	1.1		
calcium	395	1	17	0.16		
chemical oxygen demand (COD)	395	1	<1	170		
fluoride	395	1	0.94	320		
magnesium	395	1	7.2	0.80		
phenolics	395	1	0.026	0.002		
sulfate	395	1	29	2,000		
tin	395	1	<0.025	5.8		
total dissolved solids (TDS)	395	1	160	13,000		
Conventional Pollutants						
oil and grease	395	1	<1	87		

Table V-12 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SCRAP)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Conventional Pollutants (Continued)						
total suspended solids (TSS)	395	1	9	25		
pH (standard units)	395	1	7.3	8.3		

†Sample Type Code: 1 - One-time grab

(a), (b), (c) Reported together.

Table V-13

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
2. acrolein	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
3. acrylonitrile	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
4. benzene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
5. benzidine	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
6. carbon tetrachloride	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
7. chlorobenzene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
8. 1,2,4-trichlorobenzene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
9. hexachlorobenzene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
10. 1,2-dichloroethane	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
11. 1,1,1-trichloroethane	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
12. hexachloroethane	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
13. 1,1-dichloroethane	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
14. 1,1,2-trichloroethane	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
15. 1,1,2,2-tetrachloroethane	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
16. chloroethane	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
17. bis(chloromethyl)ether	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
18. bis(2-chloroethyl)ether	396	1	ND	ND	ND	
	399	1	ND	ND	ND	

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
19. 2-chloroethyl vinyl ether	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
20. 2-chloronaphthalene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
21. 2,4,6-trichlorophenol	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
22. p-chloro-m-cresol	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
23. chloroform	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
24. 2-chlorophenol	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
25. 1,2-dichlorobenzene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
26. 1,3-dichlorobenzene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
27. 1,4-dichlorobenzene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
28. 3,3'-dichlorobenzidine	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
29. 1,1-dichloroethylene	396	1	<0.01	ND	ND	
	399	1	<0.01	ND	ND	
30. 1,2-trans-dichloroethylene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
31. 2,4-dichlorophenol	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
32. 1,2-dichloropropane	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
33. 1,3-dichloropropene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
34. 2,4-dimethylphenol	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
35. 2,4-dinitrotoluene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
36. 2,6-dinitrotoluene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
37. 1,2-diphenylhydrazine	396	1	ND	ND	ND	
	399	1	ND	<0.01	ND	
38. ethylbenzene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
39. fluoranthene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
40. 4-chlorophenyl phenyl ether	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
41. 4-bromophenyl phenyl ether	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
42. bis(2-chloroisopropyl)ether	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
43. bis(2-choroethoxy)methane	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
44. methylene chloride	396	1	<0.01	1.724	ND	
	399	1	<0.01	<0.01	ND	
45. methyl chloride (chloromethane)	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
46. methyl bromide (bromomethane)	396	1	ND	ND	ND	
	399	1	ND	ND	ND	

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
47. bromoform (tribromomethane)	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
48. dichlorobromomethane	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
49. trichlorofluoromethane	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
50. dichlorodifluoromethane	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
51. chlorodibromomethane	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
52. hexachlorobutadiene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
53. hexachlorocyclopentadiene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
54. isophorone	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
55. naphthalene	396	1	ND	<0.01	<0.01	
	399	1	ND	<0.01	<0.01	

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
56. nitrobenzene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
57. 2-nitrophenol	396	1	ND	<0.01	ND	
	399	1	ND	ND	ND	
58. 4-nitrophenol	396	1	<0.01	<0.01	ND	
	399	1	<0.01	ND	ND	
59. 2,4-dinitrophenol	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
60. 4,6-dinitro-o-cresol	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
61. N-nitrosodimethylamine	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
62. N-nitrosodiphenylamine	396	1	ND	<0.01	<0.01	
	399	1	ND	<0.01	<0.01	
63. N-nitrosodi-n-propylamine	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
64. pentachlorophenol	396	1	ND	ND	ND	
	399	1	ND	ND	ND	

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
65. phenol	396	1	ND	<0.01	ND	
	399	1	ND	<0.01	ND	
66. bis(2-ethylhexyl) phthalate	396	1	<0.01	0.268	<0.01	
	399	1	<0.01	<0.01	<0.01	
67. butyl benzyl phthalate	396	1	ND	0.025	0.011	
	399	1	ND	0.012	<0.01	
68. di-n-butyl phthalate	396	1	ND	<0.01	<0.01	
	399	1	ND	<0.01	<0.01	
69. di-n-octyl phthalate	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
70. diethyl phthalate	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
71. dimethyl phthalate	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
72. benzo(a)anthracene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
73. benzo(a)pyrene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
74. benzo(b)fluoranthene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
75. benzo(k)fluoranthane	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
76. chrysene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
77. acenaphthylene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
78. anthracene (a)	396	1	ND	ND	ND	
	399	1	ND	<0.01	ND	
79. benzo(ghi)perylene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
80. fluorene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
81. phenanthrene (a)	396	1	ND	ND	ND	
	399	1	ND	<0.01	ND	
82. dibenzo(a,h)anthracene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
83. indeno (1,2,3-c,d)pyrene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
84. pyrene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
85. tetrachloroethylene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
86. toluene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
87. trichloroethylene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
88. vinyl chloride (chloroethylene)	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
89. aldrin	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
90. dieldrin	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
91. chlordane	396	1	ND	ND	ND	
	399	1	ND	ND	ND	

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
92. 4,4'-DDT	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
93. 4,4'-DDE	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
94. 4,4'-DDD	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
95. alpha-endosulfan	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
96. beta-endosulfan	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
97. endosulfan sulfate	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
98. endrin	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
99. endrin aldehyde	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
100. heptachlor	396	1	ND	ND	ND	
	399	1	ND	ND	ND	

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
101. heptachlor epoxide	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
102. alpha-BHC	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
103. beta-BHC	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
104. gamma-BHC	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
105. delta-BHC	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
106. PCB-1242 (b)	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
107. PCB-1254 (b)	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
108. PCB-1221 (b)	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
109. PCB-1232 (c)	396	1	ND	ND	ND	
	399	1	ND	ND	ND	

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
110. PCB-1248 (c)	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
111. PCB-1260 (c)	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
112. PCB-1016 (c)	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
113. toxaphene	396	1	ND	ND	ND	
	399	1	ND	ND	ND	
114. antimony	396	1	0.006	0.40	3.1	
	399	1	0.006	0.75	2.2	
115. arsenic	396	1	<0.001	0.12	0.34	
	399	1	<0.001	0.13	0.30	
117. beryllium	396	1	<0.0005	<0.0005	0.001	
	399	1	<0.0005	0.02	<0.0005	
118. cadmium	396	1	<0.001	0.03	0.08	
	399	1	<0.001	0.10	0.08	
119. chromium (total)	396	1	0.032	0.020	0.032	
	399	1	0.032	0.031	0.028	

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES) RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
120. copper	396	1	0.031	0.05	0.12	
	399	1	0.031	0.13	0.16	
121. cyanide (total)	396	1	0.040	2.2	0.49	
	399	1	0.040	3.6	16.0	
122. lead	396	1	0.12	0.075	0.075	
	399	1	0.12	0.03	0.13	
123. mercury	396	1	<0.0002	<0.0002	<0.0002	
	399	1	<0.0002	<0.0002	<0.0002	
124. nickel	396	1	<0.025	0.16	0.35	
	399	1	<0.025	0.41	0.45	
125. selenium	396	1	<0.008	0.05	<0.008	
	399	1	<0.008	0.03	0.62	
126. silver	396	1	0.001	<0.0005	0.001	
	399	1	0.001	<0.0005	0.001	
127. thallium	396	1	<0.001	<0.001	<0.001	
	399	1	<0.001	0.33	0.28	
128. zinc	396	1	0.05	0.06	0.14	
	399	1	0.05	0.16	0.59	

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Nonconventional Pollutants						
alkalinity	396	1	77	38,200	30,000	
	399	1	77	39,000	31,000	
ammonia nitrogen	396	1	2	0.8	<0.01	
	399	1	2	1.1	<0.01	
calcium	396	1	17	0.27	0.59	
	399	1	17	0.57	0.64	
chemical oxygen demand (COD)	396	1	<1	34	110	
	399	1	<1	39	120	
fluoride	396	1	0.94	15,000	12,000	
	399	1	0.94	15,000	12,000	
magnesium	396	1	7.2	0.24	0.43	
	399	1	7.2	0.45	0.47	
phenolics	396	1	0.026	0.018	0.018	
	399	1	0.026	0.022	0.006	
sulfate	396	1	29	1,700	1,500	
	399	1	29	1,200	1,700	
tin	396	1	<0.025	60	18	
	399	1	<0.025	13	28	

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
total dissolved solids (TDS)	396	1	160	26,000	37,000	
	399	1	160	46,000	38,000	
Conventional Pollutants						
oil and grease	396	1	<1	2.9	51	
	399	1	<1	1.3	17	
total suspended solids (TSS)	396	1	9	26	50	
	399	1	9	61	35	
pH (standard units)	396	1	7.3	7.6	7.8	
	399	1	7.3	7.8	8.2	

†Sample Type Code: 1 - One-time grab

(a), (b), (c) Reported together.

Table V-14

TIN HYDROXIDE FILTRATE
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	398	1	ND	ND		
2. acrolein	398	1	ND	ND		
3. acrylonitrile	398	1	ND	ND		
4. benzene	398	1	ND	ND		
5. benzidine	398	1	ND	ND		
6. carbon tetrachloride	398	1	ND	ND		
7. chlorobenzene	398	1	ND	ND		
8. 1,2,4-trichlorobenzene	398	1	ND	ND		
9. hexachlorobenzene	398	1	ND	ND		
10. 1,2-dichloroethane	398	1	ND	ND		
11. 1,1,1-trichloroethane	398	1	0.003	ND		
12. hexachloroethane	398	1	ND	ND		
13. 1,1-dichloroethane	398	1	ND	ND		
14. 1,1,2-trichloroethane	398	1	ND	ND		

Table V-14 (Continued)

TIN HYDROXIDE FILTRATE
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
15. 1,1,2,2-tetrachloroethane	398	1	ND	ND		
16. chloroethane	398	1	ND	ND		
17. bis(chloromethyl)ether	398	1	ND	ND		
18. bis(2-chloroethyl)ether	398	1	ND	ND		
19. 2-chloroethyl vinyl ether	398	1	ND	ND		
20. 2-chloronaphthalene	398	1	ND	ND		
21. 2,4,6-trichlorophenol	398	1	ND	ND		
22. p-chloro-m-cresol	398	1	ND	ND		
23. chloroform	398	1	ND	ND		
24. 2-chlorophenol	398	1	ND	ND		
25. 1,2-dichlorobenzene	398	1	ND	ND		
26. 1,3-dichlorobenzene	398	1	ND	ND		
27. 1,4-dichlorobenzene	398	1	ND	ND		
28. 3,3'-dichlorobenzidine	398	1	ND	ND		

Table V-14 (Continued)

TIN HYDROXIDE FILTRATE
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
29. 1,1-dichloroethylene	398	1	<0.01	ND		
30. 1,2-trans-dichloroethylene	398	1	ND	ND		
31. 2,4-dichlorophenol	398	1	ND	ND		
32. 1,2-dichloropropane	398	1	ND	ND		
33. 1,3-dichloropropene	398	1	ND	ND		
34. 2,4-dimethylphenol	398	1	ND	ND		
35. 2,4-dinitrotoluene	398	1	ND	ND		
36. 2,6-dinitrotoluene	398	1	ND	ND		
37. 1,2-diphenylhydrazine	398	1	ND	ND		
38. ethylbenzene	398	1	ND	ND		
39. fluoranthene	398	1	ND	ND		
40. 4-chlorophenyl phenyl ether	398	1	ND	ND		
41. 4-bromophenyl phenyl ether	398	1	ND	ND		
42. bis(2-chloroisopropyl)ether	398	1	ND	ND		

Table V-14 (Continued)

TIN HYDROXIDE FILTRATE
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
43. bis(2-choroethoxy)methane	398	1	ND	ND		
44. methylene chloride	398	1	ND	ND		
45. methyl chloride (chloromethane)	398	1	ND	ND		
46. methyl bromide (bromomethane)	398	1	ND	ND		
47. bromoform (tribromomethane)	398	1	ND	ND		
48. dichlorobromomethane	398	1	ND	ND		
49. trichlorofluoromethane	398	1	ND	ND		
50. dichlorodifluoromethane	398	1	ND	ND		
51. chlorodibromomethane	398	1	ND	ND		
52. hexachlorobutadiene	398	1	ND	ND		
53. hexachlorocyclopentadiene	398	1	ND	ND		
54. isophorone	398	1	ND	ND		
55. naphthalene	398	1	ND	ND		
56. nitrobenzene	398	1	ND	ND		

Table V-14 (Continued)

TIN HYDROXIDE FILTRATE
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
57. 2-nitrophenol	398	1	ND	0.010		
58. 4-nitrophenol	398	1	<0.01	0.025		
59. 2,4-dinitrophenol	398	1	ND	0.033		
60. 4,6-dinitro-o-cresol	398	1	ND	ND		
61. N-nitrosodimethylamine	398	1	ND	ND		
62. N-nitrosodiphenylamine	398	1	ND	<0.010		
63. N-nitrosodi-n-propylamine	398	1	ND	ND		
64. pentachlorophenol	398	1	ND	ND		
65. phenol	398	1	ND	ND		
66. bis(2-ethylhexyl) phthalate	398	1	<0.01	<0.010		
67. butyl benzyl phthalate	398	1	ND	<0.010		
68. di-n-butyl phthalate	398	1	ND	<0.010		
69. di-n-octyl phthalate	398	1	ND	ND		
70. diethyl phthalate	398	1	ND	ND		

Table V-14 (Continued)

TIN HYDROXIDE FILTRATE
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
71. dimethyl phthalate	398	1	ND	ND		
72. benzo(a)anthracene	398	1	ND	ND		
73. benzo(a)pyrene	398	1	ND	ND		
74. benzo(b)fluoranthene	398	1	ND	ND		
75. benzo(k)fluoranthane	398	1	ND	ND		
76. chrysene	398	1	ND	ND		
77. acenaphthylene	398	1	ND	ND		
78. anthracene (a)	398	1	ND	ND		
79. benzo(ghi)perylene	398	1	ND	ND		
80. fluorene	398	1	ND	ND		
81. phenanthrene (a)	398	1	ND	ND		
82. dibenzo(a,h)anthracene	398	1	ND	ND		
83. indeno (1,2,3-c,d)pyrene	398	1	ND	ND		
84. pyrene	398	1	ND	ND		

Table V-14 (Continued)

TIN HYDROXIDE FILTRATE
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
85. tetrachloroethylene	398	1	ND	ND		
86. toluene	398	1	ND	ND		
87. trichloroethylene	398	1	ND	ND		
88. vinyl chloride (chloroethylene)	398	1	ND	ND		
89. aldrin	398	1	ND	ND		
90. dieldrin	398	1	ND	ND		
91. chlordane	398	1	ND	ND		
92. 4,4'-DDT	398	1	ND	ND		
93. 4,4'-DDE	398	1	ND	ND		
94. 4,4'-DDD	398	1	ND	ND		
95. alpha-endosulfan	398	1	ND	ND		
96. beta-endosulfan	398	1	ND	ND		
97. endosulfan sulfate	398	1	ND	ND		
98. heptachlor	398	1	ND	ND		

Table V-14 (Continued)

TIN HYDROXIDE FILTRATE
RAW WASTEWATER SAMPLING DATA

Pollutant		Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)							
99. endrin aldehyde		398	1	ND	ND		
100. heptachlor		398	1	ND	ND		
101. heptachlor epoxide		398	1	ND	ND		
102. alpha-BHC		398	1	ND	ND		
103. beta-BHC		398	1	ND	ND		
104. gamma-BHC		398	1	ND	ND		
105. delta-BHC		398	1	ND	ND		
106. PCB-1242	(b)	398	1	ND	ND		
107. PCB-1254	(b)	398	1	ND	ND		
108. PCB-1221	(b)	398	1	ND	ND		
109. PCB-1232	(c)	398	1	ND	ND		
110. PCB-1248	(c)	398	1	ND	ND		
111. PCB-1260	(c)	398	1	ND	ND		
112. PCB-1016	(c)	398	1	ND	ND		

Table V-14 (Continued)

TIN HYDROXIDE FILTRATE
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
113. toxaphene	398	1	ND	ND		
114. antimony	398	1	0.006	2.4		
115. arsenic	398	1	<0.001	0.024		
117. beryllium	398	1	<0.0005	0.002		
118. cadmium	398	1	<0.001	0.002		
119. chromium (total)	398	1	0.032	0.04		
120. copper	398	1	0.031	0.280		
121. cyanide (total)	398	1	0.040	10.0		
122. lead	398	1	0.12	0.037		
123. mercury	398	1	<0.0002	<0.0002		
124. nickel	398	1	<0.025	0.380		
125. selenium	398	1	<0.008	0.430		
126. silver	398	1	0.001	0.012		
127. thallium	398	1	<0.001	0.320		

Table V-14 (Continued)

TIN HYDROXIDE FILTRATE
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
128. zinc	398	1	0.05	0.220		
Nonconventional Pollutants						
alkalinity	398	1	77	34,000		
ammonia nitrogen	398	1	2	<0.01		
calcium	398	1	17	0.46		
chemical oxygen demand (COD)	398	1	<1	180		
fluoride	398	1	0.94	17,000		
magnesium	398	1	7.2	0.49		
phenolics	398	1	0.26	0.32		
sulfate	398	1	29	2,000		
tin	398	1	<0.025	7.8		
total dissolved solids (TDS)	398	1	160	50,000		
Conventional Pollutants						
oil and grease	398	1	<1	56		

Table V-14 (Continued)

TIN HYDROXIDE FILTRATE
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Conventional Pollutants (Continued)						
total suspended solids (TSS)	398	1	9	32		
pH (standard units)	398	1	7.3	8.1		

†Sample Type Code: 1 - One-time grab

(a), (b), (c) Reported together.

Table V-15

MUD POND SUPERNATANT
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	456	1	ND	ND		
2. acrolein	456	1	ND	ND		
3. acrylonitrile	456	1	ND	ND		
4. benzene	456	1	0.013	0.008		
5. benzidine	456	1	ND	ND		
6. carbon tetrachloride	456	1	ND	ND		
7. chlorobenzene	456	1	ND	ND		
8. 1,2,4-trichlorobenzene	456	1	ND	ND		
9. hexachlorobenzene	456	1	0.015	0.004		
10. 1,2-dichloroethane	456	1	ND	ND		
11. 1,1,1-trichloroethane	456	1	ND	0.003		
12. hexachloroethane	456	1	ND	ND		
13. 1,1-dichloroethane	456	1	ND	ND		
14. 1,1,2-trichloroethane	456	1	ND	ND		

Table V-15 (Continued)

MUD POND SUPERNATANT
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
15. 1,1,2,2-tetrachloroethane	456	1	ND	ND		
16. chloroethane	456	1	ND	ND		
17. bis(chloromethyl)ether	456	1	ND	ND		
18. bis(2-chloroethyl)ether	456	1	ND	ND		
19. 2-chloroethyl vinyl ether	456	1	ND	ND		
20. 2-chloronaphthalene	456	1	ND	ND		
21. 2,4,6-trichlorophenol	456	1	ND	ND		
22. p-chloro-m-cresol	456	1	ND	ND		
23. chloroform	456	1	0.038	0.005		
24. 2-chlorophenol	456	1	ND	ND		
25. 1,2-dichlorobenzene	456	1	ND	ND		
26. 1,3-dichlorobenzene	456	1	ND	ND		
27. 1,4-dichlorobenzene	456	1	ND	ND		
28. 3,3'-dichlorobenzidine	456	1	ND	ND		

Table V-15 (Continued)

MUD POND SUPERNATANT
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
29. 1,1-dichloroethylene	456	1	ND	ND		
30. 1,2-*trans*-dichloroethylene	456	1	ND	ND		
31. 2,4-dichlorophenol	456	1	ND	ND		
32. 1,2-dichloropropane	456	1	ND	ND		
33. 1,3-dichloropropene	456	1	ND	ND		
34. 2,4-dimethylphenol	456	1	ND	0.004		
35. 2,4-dinitrotoluene	456	1	ND	ND		
36. 2,6-dinitrotoluene	456	1	ND	ND		
37. 1,2-diphenylhydrazine	456	1	ND	ND		
38. ethylbenzene	456	1	ND	ND		
39. fluoranthene	456	1	ND	ND		
40. 4-chlorophenyl phenyl ether	456	1	ND	ND		
41. 4-bromophenyl phenyl ether	456	1	ND	ND		
42. bis(2-chloroisopropyl)ether	456	1	ND	ND		

Table V-15 (Continued)

MUD POND SUPERNATANT
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
43. bis(2-choroethoxy)methane	456	1	ND	ND		
44. methylene chloride	456	1	0.190	0.005		
45. methyl chloride (chloromethane)	456	1	ND	ND		
46. methyl bromide (bromomethane)	456	1	ND	ND		
47. bromoform (tribromomethane)	456	1	ND	ND		
48. dichlorobromomethane	456	1	ND	ND		
49. trichlorofluoromethane	456	1	ND	ND		
50. dichlorodifluoromethane	456	1	ND	ND		
51. chlorodibromomethane	456	1	0.002	ND		
52. hexachlorobutadiene	456	1	ND	ND		
53. hexachlorocyclopentadiene	456	1	ND	ND		
54. isophorone	456	1	ND	ND		
55. naphthalene	456	1	ND	ND		
56. nitrobenzene	456	1	ND	ND		

Table V-15 (Continued)

MUD POND SUPERNATANT
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
57. 2-nitrophenol	456	1	ND	0.020		
58. 4-nitrophenol	456	1	ND	ND		
59. 2,4-dinitrophenol	456	1	ND	ND		
60. 4,6-dinitro-o-cresol	456	1	ND	ND		
61. N-nitrosodimethylamine	456	1	ND	ND		
62. N-nitrosodiphenylamine	456	1	ND	ND		
63. N-nitrosodi-n-propylamine	456	1	ND	ND		
64. pentachlorophenol	456	1	ND	ND		
65. phenol	456	1	ND	0.003		
66. bis(2-ethylhexyl) phthalate	456	1	0.006	0.002		
67. butyl benzyl phthalate	456	1	ND	ND		
68. di-n-butyl phthalate	456	1	ND	ND		
69. di-n-octyl phthalate	456	1	ND	ND		
70. diethyl phthalate	456	1	ND	ND		

Table V-15 (Continued)

MUD POND SUPERNATANT
RAW WASTEWATER SAMPLING DATA

Pollutant		Stream Code	Sample Type†	Concentrations (mg/l)			
				Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)							
71. dimethyl phthalate		456	1	ND	ND		
72. benzo(a)anthracene		456	1	ND	ND		
73. benzo(a)pyrene		456	1	ND	ND		
74. benzo(b)fluoranthene		456	1	ND	ND		
75. benzo(k)fluoranthane		456	1	ND	ND		
76. chrysene		456	1	ND	ND		
77. acenaphthylene		456	1	ND	ND		
78. anthracene	(a)	456	1	ND	ND		
79. benzo(ghi)perylene		456	1	ND	ND		
80. fluorene		456	1	ND	ND		
81. phenanthrene	(a)	456	1	ND	ND		
82. dibenzo(a,h)anthracene		456	1	ND	ND		
83. indeno (1,2,3-c,d)pyrene		456	1	ND	ND		
84. pyrene		456	1	ND	ND		

Table V-15 (Continued)

MUD POND SUPERNATANT
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
85. tetrachloroethylene	456	1	ND	ND		
86. toluene	456	1	0.001	0.004		
87. trichloroethylene	456	1	ND	ND		
88. vinyl chloride (chloroethylene)	456	1	ND	ND		
89. aldrin	456	1	ND	ND		
90. dieldrin	456	1	ND	ND		
91. chlordane	456	1	ND	ND		
92. 4,4'-DDT	456	1	ND	ND		
93. 4,4'-DDE	456	1	ND	ND		
94. 4,4'-DDD	456	1	ND	ND		
95. alpha-endosulfan	456	1	ND	ND		
96. beta-endosulfan	456	1	ND	ND		
97. endosulfan sulfate	456	1	ND	ND		
98. heptachlor	456	1	ND	ND		

Table V-15 (Continued)

MUD POND SUPERNATANT
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
99. endrin aldehyde	456	1	ND	ND		
100. heptachlor	456	1	ND	ND		
101. heptachlor epoxide	456	1	ND	ND		
102. alpha-BHC	456	1	ND	ND		
103. beta-BHC	456	1	ND	ND		
104. gamma-BHC	456	1	ND	ND		
105. delta-BHC	456	1	ND	ND		
106. PCB-1242 (b)	456	1	ND	ND		
107. PCB-1254 (b)	456	1	ND	ND		
108. PCB-1221 (b)	456	1	ND	ND		
109. PCB-1232 (c)	456	1	ND	ND		
110. PCB-1248 (c)	456	1	ND	ND		
111. PCB-1260 (c)	456	1	ND	ND		
112. PCB-1016 (c)	456	1	ND	ND		

Table V-15 (Continued)

MUD POND SUPERNATANT
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
113. toxaphene	456	1	ND	ND		
114. antimony	456	1	0.001	12		
115. arsenic	456	1	0.002	3.4		
117. beryllium	456	1	<0.001	0.064		
118. cadmium	456	1	0.02	0.40		
119. chromium (total)	456	1	0.003	0.004		
120. copper	456	1	0.008	0.52		
121. cyanide (total)	456	1	0.0022	1.900		
122. lead	456	1	0.019	11		
123. mercury	456	1	<0.0002	0.0004		
124. nickel	456	1	<0.001	2.1		
125. selenium	456	1	0.033	0.050		
126. silver	456	1	<0.001	0.40		
127. thallium	456	1	0.14	2.5		

Table V-15 (Continued)

MUD POND SUPERNATANT
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
128. zinc	456	1	0.08	190		
Nonconventional Pollutants						
alkalinity	456	1	60	90,000		
aluminum	456	1	1.90	30,000		
ammonia nitrogen	456	1	0.18			
calcium	456	1	11	<0.1		
chemical oxygen demand (COD)	456	1	4.0	5,700		
fluoride	456	1	1.2	0.4		
magnesium	456	1	5.5	0.12		
phenolics	456	1	0.011	0.011		
tin	456	1	1.6	240		
Conventional Pollutants						
oil and grease	456	1	<1			

Table V-15 (Continued)

MUD POND SUPERNATANT
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Conventional Pollutants (Continued)						
total suspended solids (TSS)	456	1	1	400		
pH (standard units)	456	1	6.2	13.4		

†Sample Type Code: 1 - One-time grab

(a), (b), (c) Reported together.

Table V-16

ELECTROWINNING SOLUTION AFTER CHLORINATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	849	1	ND	0.001		
2. acrolein	849	1	ND	ND		
3. acrylonitrile	849	1	ND	ND		
4. benzene	849	1	ND	ND		
5. benzidine	849	1	ND	ND		
6. carbon tetrachloride	849	1	ND	ND		
7. chlorobenzene	849	1	ND	ND		
8. 1,2,4-trichlorobenzene	849	1	ND	ND		
9. hexachlorobenzene	849	1	ND	ND		
10. 1,2-dichloroethane	849	1	ND	ND		
11. 1,1,1-trichloroethane	849	1	ND	ND		
12. hexachloroethane	849	1	ND	ND		
13. 1,1-dichloroethane	849	1	ND	ND		
14. 1,1,2-trichloroethane	849	1	ND	ND		

Table V-16 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
15. 1,1,2,2-tetrachloroethane	849	1	ND	ND		
16. chloroethane	849	1	ND	ND		
17. bis(chloromethyl)ether	849	1	ND	ND		
18. bis(2-chloroethyl)ether	849	1	ND	ND		
19. 2-chloroethyl vinyl ether	849	1	ND	ND		
20. 2-chloronaphthalene	849	1	ND	ND		
21. 2,4,6-trichlorophenol	849	1	ND	ND		
22. p-chloro-m-cresol	849	1	ND	ND		
23. chloroform	849	1	ND	ND		
24. 2-chlorophenol	849	1	ND	ND		
25. 1,2-dichlorobenzene	849	1	ND	ND		
26. 1,3-dichlorobenzene	849	1	ND	ND		
27. 1,4-dichlorobenzene	849	1	ND	ND		
28. 3,3'-dichlorobenzidine	849	1	ND	ND		

Table V-16 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
29. 1,1-dichloroethylene	849	1	ND	ND		
30. 1,2-*trans*-dichloroethylene	849	1	ND	ND		
31. 2,4-dichlorophenol	849	1	ND	ND		
32. 1,2-dichloropropane	849	1	ND	ND		
33. 1,3-dichloropropene	849	1	ND	ND		
34. 2,4-dimethylphenol	849	1	ND	ND		
35. 2,4-dinitrotoluene	849	1	ND	ND		
36. 2,6-dinitrotoluene	849	1	ND	ND		
37. 1,2-diphenylhydrazine	849	1	ND	ND		
38. ethylbenzene	849	1	ND	ND		
39. fluoranthene	849	1	ND	0.003		
40. 4-chlorophenyl phenyl ether	849	1	ND	ND		
41. 4-bromophenyl phenyl ether	849	1	ND	ND		
42. bis(2-chloroisopropyl)ether	849	1	ND	ND		

Table V-16 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
43. bis(2-choroethoxy)methane	849	1	ND	ND		
44. methylene chloride	849	1	ND	0.015		
45. methyl chloride (chloromethane)	849	1	ND	ND		
46. methyl bromide (bromomethane)	849	1	ND	ND		
47. bromoform (tribromomethane)	849	1	ND	ND		
48. dichlorobromomethane	849	1	ND	ND		
49. trichlorofluoromethane	849	1	ND	ND		
50. dichlorodifluoromethane	849	1	ND	ND		
51. chlorodibromomethane	849	1	ND	ND		
52. hexachlorobutadiene	849	1	ND	ND		
53. hexachlorocyclopentadiene	849	1	ND	ND		
54. isophorone	849	1	ND	ND		
55. naphthalene	849	1	ND	0.002		
56. nitrobenzene	849	1	ND	ND		

Table V-16 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
57. 2-nitrophenol	849	1	ND	0.020		
58. 4-nitrophenol	849	1	ND	ND		
59. 2,4-dinitrophenol	849	1	ND	ND		
60. 4,6-dinitro-o-cresol	849	1	ND	ND		
61. N-nitrosodimethylamine	849	1	ND	ND		
62. N-nitrosodiphenylamine	849	1	ND	ND		
63. N-nitrosodi-n-propylamine	849	1	ND	ND		
64. pentachlorophenol	849	1	ND	ND		
65. phenol	849	1	ND	0.08		
66. bis(2-ethylhexyl) phthalate	849	1	0.054	ND		
67. butyl benzyl phthalate	849	1	ND	ND		
68. di-n-butyl phthalate	849	1	ND	ND		
69. di-n-octyl phthalate	849	1	ND	ND		
70. diethyl phthalate	849	1	ND	ND		

Table V-16 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant		Stream Code	Sample Type†	Concentrations (mg/l)			
				Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)							
71. dimethyl phthalate		849	1	ND	ND		
72. benzo(a)anthracene		849	1	ND	ND		
73. benzo(a)pyrene		849	1	ND	ND		
74. benzo(b)fluoranthene		849	1	ND	ND		
75. benzo(k)fluoranthane		849	1	ND	ND		
76. chrysene		849	1	ND	ND		
77. acenaphthylene		849	1	ND	ND		
78. anthracene	(a)	849	1	ND	ND		
79. benzo(ghi)perylene		849	1	ND	ND		
80. fluorene		849	1	ND	ND		
81. phenanthrene	(a)	849	1	ND	ND		
82. dibenzo(a,h)anthracene		849	1	ND	ND		
83. indeno (1,2,3-c,d)pyrene		849	1	ND	ND		
84. pyrene		849	1	ND	0.003		

Table V-16 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
85. tetrachloroethylene	849	1	ND	ND		
86. toluene	849	1	0.093	0.001		
87. trichloroethylene	849	1	ND	0.016		
88. vinyl chloride (chloroethylene)	849	1	ND	ND		
89. aldrin	849	1	ND	ND		
90. dieldrin	849	1	ND	ND		
91. chlordane	849	1	ND	ND		
92. 4,4'-DDT	849	1	ND	ND		
93. 4,4'-DDE	849	1	ND	ND		
94. 4,4'-DDD	849	1	ND	ND		
95. alpha-endosulfan	849	1	ND	ND		
96. beta-endosulfan	849	1	ND	ND		
97. endosulfan sulfate	849	1	ND	ND		
98. heptachlor	849	1	ND	ND		

Table V-16 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
99. endrin aldehyde	849	1	ND	ND		
100. heptachlor	849	1	ND	ND		
101. heptachlor epoxide	849	1	ND	ND		
102. alpha-BHC	849	1	ND	ND		
103. beta-BHC	849	1	ND	ND		
104. gamma-BHC	849	1	ND	ND		
105. delta-BHC	849	1	ND	ND		
106. PCB-1242 (b)	849	1	ND	ND		
107. PCB-1254 (b)	849	1	ND	ND		
108. PCB-1221 (b)	849	1	ND	ND		
109. PCB-1232 (c)	849	1	ND	ND		
110. PCB-1248 (c)	849	1	ND	ND		
111. PCB-1260 (c)	849	1	ND	ND		
112. PCB-1016 (c)	849	1	ND	ND		

Table V-16 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
113. toxaphene	849	1	ND	ND		
114. antimony	849	1	<0.001	<0.001		
115. arsenic	849	1	0.008	1.8		
117. beryllium	849	1	<0.001	0.012		
118. cadmium	849	1	<0.001	0.32		
119. chromium (total)	849	1	0.003	0.31		
120. copper	849	1	0.14	0.26		
121. cyanide (total)	849	1	0.005	4.6		
122. lead	849	1	0.001	0.98		
123. mercury	849	1	<0.002	<0.002		
124. nickel	849	1	0.001	4.3		
125. selenium	849	1	3.1	39		
126. silver	849	1	0.02	0.30		
127. thallium	849	1	<0.001	1.9		

Table V-16 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
128. zinc	849	1	0.06	1.1		
Nonconventional Pollutants						
ammonia nitrogen	849	1	1.5	20		
phenolics	849	1	0.002	0.003		
tin	849	1	0.28	2,300		
Conventional Pollutants						
oil and grease	849	1	5.6	ND		
total suspended solids (TSS)	849	1	19	25,000		
pH (standard units)	849	1	6.5	13		

†Sample Type Code: 1 - One-time grab

(a), (b), (c) Reported together.

Table V-17

ELECTROWINNING SOLUTION AFTER CHLORINATION AND NEUTRALIZATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	850	1	ND	ND		
2. acrolein	850	1	ND	ND		
3. acrylonitrile	850	1	ND	ND		
4. benzene	850	1	ND	0.001		
5. benzidine	850	1	ND	ND		
6. carbon tetrachloride	850	1	ND	ND		
7. chlorobenzene	850	1	ND	ND		
8. 1,2,4-trichlorobenzene	850	1	ND	ND		
9. hexachlorobenzene	850	1	ND	ND		
10. 1,2-dichloroethane	850	1	ND	ND		
11. 1,1,1-trichloroethane	850	1	ND	ND		
12. hexachloroethane	850	1	ND	ND		
13. 1,1-dichloroethane	850	1	ND	ND		
14. 1,1,2-trichloroethane	850	1	ND	ND		

Table V-17 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION AND NEUTRALIZATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
15. 1,1,2,2-tetrachloroethane	850	1	ND	ND		
16. chloroethane	850	1	ND	ND		
17. bis(chloromethyl)ether	850	1	ND	ND		
18. bis(2-chloroethyl)ether	850	1	ND	ND		
19. 2-chloroethyl vinyl ether	850	1	ND	ND		
20. 2-chloronaphthalene	850	1	ND	ND		
21. 2,4,6-trichlorophenol	850	1	ND	ND		
22. p-chloro-m-cresol	850	1	ND	ND		
23. chloroform	850	1	ND	ND		
24. 2-chlorophenol	850	1	ND	ND		
25. 1,2-dichlorobenzene	850	1	ND	ND		
26. 1,3-dichlorobenzene	850	1	ND	ND		
27. 1,4-dichlorobenzene	850	1	ND	ND		
28. 3,3'-dichlorobenzidine	850	1	ND	ND		

Table V-17 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION AND NEUTRALIZATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
29. 1,1-dichloroethylene	850	1	ND	ND		
30. 1,2-*trans*-dichloroethylene	850	1	ND	ND		
31. 2,4-dichlorophenol	850	1	ND	ND		
32. 1,2-dichloropropane	850	1	ND	ND		
33. 1,3-dichloropropene	850	1	ND	ND		
34. 2,4-dimethylphenol	850	1	ND	ND		
35. 2,4-dinitrotoluene	850	1	ND	ND		
36. 2,6-dinitrotoluene	850	1	ND	ND		
37. 1,2-diphenylhydrazine	850	1	ND	ND		
38. ethylbenzene	850	1	ND	ND		
39. fluoranthene	850	1	ND	ND		
40. 4-chlorophenyl phenyl ether	850	1	ND	ND		
41. 4-bromophenyl phenyl ether	850	1	ND	ND		
42. bis(2-chloroisopropyl)ether	850	1	ND	ND		

Table V-17 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION AND NEUTRALIZATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
43. bis(2-choroethoxy)methane	850	1	ND	ND		
44. methylene chloride	850	1	ND	0.045		
45. methyl chloride (chloromethane)	850	1	ND	ND		
46. methyl bromide (bromomethane)	850	1	ND	ND		
47. bromoform (tribromomethane)	850	1	ND	ND		
48. dichlorobromomethane	850	1	ND	ND		
49. trichlorofluoromethane	850	1	ND	ND		
50. dichlorodifluoromethane	850	1	ND	ND		
51. chlorodibromomethane	850	1	ND	ND		
52. hexachlorobutadiene	850	1	ND	ND		
53. hexachlorocyclopentadiene	850	1	ND	ND		
54. isophorone	850	1	ND	ND		
55. naphthalene	850	1	ND	ND		
56. nitrobenzene	850	1	ND	ND		

Table V-17 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION AND NEUTRALIZATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
57. 2-nitrophenol	850	1	ND	ND		
58. 4-nitrophenol	850	1	ND	ND		
59. 2,4-dinitrophenol	850	1	ND	ND		
60. 4,6-dinitro-o-cresol	850	1	ND	ND		
61. N-nitrosodimethylamine	850	1	ND	ND		
62. N-nitrosodiphenylamine	850	1	ND	ND		
63. N-nitrosodi-n-propylamine	850	1	ND	ND		
64. pentachlorophenol	850	1	ND	ND		
65. phenol	850	1	ND	0.035		
66. bis(2-ethylhexyl) phthalate	850	1	0.054	0.007		
67. butyl benzyl phthalate	850	1	ND	ND		
68. di-n-butyl phthalate	850	1	ND	ND		
69. di-n-octyl phthalate	850	1	ND	ND		
70. diethyl phthalate	850	1	ND	ND		

Table V-17 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION AND NEUTRALIZATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
71. dimethyl phthalate	850	1	ND	ND		
72. benzo(a)anthracene	850	1	ND	ND		
73. benzo(a)pyrene	850	1	ND	ND		
74. benzo(b)fluoranthene	850	1	ND	ND		
75. benzo(k)fluoranthane	850	1	ND	ND		
76. chrysene	850	1	ND	ND		
77. acenaphthylene	850	1	ND	ND		
78. anthracene (a)	850	1	ND	ND		
79. benzo(ghi)perylene	850	1	ND	ND		
80. fluorene	850	1	ND	ND		
81. phenanthrene (a)	850	1	ND	ND		
82. dibenzo(a,h)anthracene	850	1	ND	ND		
83. indeno (1,2,3-c,d)pyrene	850	1	ND	ND		
84. pyrene	850	1	ND	ND		

Table V-17 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION AND NEUTRALIZATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
85. tetrachloroethylene	850	1	ND	ND		
86. toluene	850	1	0.093	0.01		
87. trichloroethylene	850	1	ND	0.021		
88. vinyl chloride (chloroethylene)	850	1	ND	ND		
89. aldrin	850	1	ND	ND		
90. dieldrin	850	1	ND	ND		
91. chlordane	850	1	ND	ND		
92. 4,4'-DDT	850	1	ND	ND		
93. 4,4'-DDE	850	1	ND	ND		
94. 4,4'-DDD	850	1	ND	ND		
95. alpha-endosulfan	850	1	ND	ND		
96. beta-endosulfan	850	1	ND	ND		
97. endosulfan sulfate	850	1	ND	ND		
98. heptachlor	850	1	ND	ND		

Table V-17 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION AND NEUTRALIZATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant		Stream Code	Sample Type†	Concentrations (mg/l)			
				Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)							
99. endrin aldehyde		850	1	ND	ND		
100. heptachlor		850	1	ND	ND		
101. heptachlor epoxide		850	1	ND	ND		
102. alpha-BHC		850	1	ND	ND		
103. beta-BHC		850	1	ND	ND		
104. gamma-BHC		850	1	ND	ND		
105. delta-BHC		850	1	ND	ND		
106. PCB-1242	(b)	850	1	ND	ND		
107. PCB-1254	(b)	850	1	ND	ND		
108. PCB-1221	(b)	850	1	ND	ND		
109. PCB-1232	(c)	850	1	ND	ND		
110. PCB-1248	(c)	850	1	ND	ND		
111. PCB-1260	(c)	850	1	ND	ND		
112. PCB-1016	(c)	850	1	ND	ND		

Table V-17 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION AND NEUTRALIZATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
113. toxaphene	850	1	ND	ND		
114. antimony	850	1	<0.001	0.77		
115. arsenic	850	1	0.008	4.8		
117. beryllium	850	1	<0.001	0.007		
118. cadmium	850	1	<0.001	0.13		
119. chromium (total)	850	1	0.003	0.002		
120. copper	850	1	0.14	0.10		
121. cyanide (total)	850	1	0.005	4.70		
122. lead	850	1	0.001	0.51		
123. mercury	850	1	<0.002	<0.002		
124. nickel	850	1	0.001	2.0		
125. selenium	850	1	3.1	30		
126. silver	850	1	0.02	0.08		
127. thallium	850	1	<0.001	0.78		

Table V-17 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION AND NEUTRALIZATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
128. zinc	850	1	0.06	0.12		
Nonconventional Pollutants						
ammonia nitrogen	850	1	1.5	23		
phenolics	850	1	0.002	0.5		
tin	850	1	0.28	15		
Conventional Pollutants						
oil and grease	850	1	5.6	ND		
total suspended solids (TSS)	850	1	19	140,000		

†Sample Type Code: 1 - One-time grab

(a), (b), (c) Reported together.

Table V-18

ELECTROWINNING SOLUTION AFTER CHLORINATION, NEUTRALIZATION, AND SEDIMENTATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	845	1	ND	ND	ND	ND
2. acrolein	845	1	ND	ND	ND	ND
3. acrylonitrile	845	1	ND	ND	ND	ND
4. benzene	845	1	ND	ND	ND	ND
5. benzidine	845	1	ND	ND	ND	ND
6. carbon tetrachloride	845	1	ND	ND	ND	ND
7. chlorobenzene	845	1	ND	ND	ND	ND
8. 1,2,4-trichlorobenzene	845	1	ND	ND	ND	ND
9. hexachlorobenzene	845	1	ND	ND	ND	ND
10. 1,2-dichloroethane	845	1	ND	ND	ND	ND
11. 1,1,1-trichloroethane	845	1	ND	0.210	ND	ND
12. hexachloroethane	845	1	ND	ND	ND	ND
13. 1,1-dichloroethane	845	1	ND	ND	ND	ND
14. 1,1,2-trichloroethane	845	1	ND	ND	ND	ND

Table V-18 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION, NEUTRALIZATION, AND SEDIMENTATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
15. 1,1,2,2-tetrachloroethane	845	1	ND	ND	ND	ND
16. chloroethane	845	1	ND	ND	ND	ND
17. bis(chloromethyl)ether	845	1	ND	ND	ND	ND
18. bis(2-chloroethyl)ether	845	1	ND	ND	ND	ND
19. 2-chloroethyl vinyl ether	845	1	ND	ND	ND	ND
20. 2-chloronaphthalene	845	1	ND	ND	ND	ND
21. 2,4,6-trichlorophenol	845	1	ND	0.004	ND	ND
22. p-chloro-m-cresol	845	1	ND	ND	ND	ND
23. chloroform	845	1	ND	ND	ND	ND
24. 2-chlorophenol	845	1	ND	ND	ND	ND
25. 1,2-dichlorobenzene	845	1	ND	ND	ND	ND
26. 1,3-dichlorobenzene	845	1	ND	ND	ND	ND
27. 1,4-dichlorobenzene	845	1	ND	ND	ND	ND
28. 3,3'-dichlorobenzidine	845	1	ND	ND	ND	ND

Table V-18 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION, NEUTRALIZATION, AND SEDIMENTATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
29. 1,1-dichloroethylene	845	1	ND	ND	ND	ND
30. 1,2-trans-dichloroethylene	845	1	ND	ND	ND	ND
31. 2,4-dichlorophenol	845	1	ND	ND	ND	ND
32. 1,2-dichloropropane	845	1	ND	ND	ND	ND
33. 1,3-dichloropropene	845	1	ND	ND	ND	ND
34. 2,4-dimethylphenol	845	1	ND	ND	ND	ND
35. 2,4-dinitrotoluene	845	1	ND	ND	ND	ND
36. 2,6-dinitrotoluene	845	1	ND	ND	ND	ND
37. 1,2-diphenylhydrazine	845	1	ND	ND	ND	ND
38. ethylbenzene	845	1	ND	ND	ND	ND
39. fluoranthene	845	1	ND	0.006	0.005	0.004
40. 4-chlorophenyl phenyl ether	845	1	ND	ND	ND	ND
41. 4-bromophenyl phenyl ether	845	1	ND	ND	ND	ND
42. bis(2-chloroisopropyl)ether	845	1	ND	ND	ND	ND

Table V-18 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION, NEUTRALIZATION, AND SEDIMENTATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
43. bis(2-choroethoxy)methane	845	1	ND	ND	ND	ND
44. methylene chloride	845	1	ND	0.038	0.024	0.041
45. methyl chloride (chloromethane)	845	1	ND	ND	ND	ND
46. methyl bromide (bromomethane)	845	1	ND	ND	ND	ND
47. bromoform (tribromomethane)	845	1	ND	ND	ND	ND
48. dichlorobromomethane	845	1	ND	ND	ND	ND
49. trichlorofluoromethane	845	1	ND	ND	ND	ND
50. dichlorodifluoromethane	845	1	ND	ND	ND	ND
51. chlorodibromomethane	845	1	ND	ND	ND	ND
52. hexachlorobutadiene	845	1	ND	ND	ND	ND
53. hexachlorocyclopentadiene	845	1	ND	ND	ND	ND
54. isophorone	845	1	ND	ND	ND	ND
55. naphthalene	845	1	ND	ND	ND	ND
56. nitrobenzene	845	1	ND	ND	ND	ND

Table V-18 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION, NEUTRALIZATION, AND SEDIMENTATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
57. 2-nitrophenol	845	1	ND	ND	ND	ND
58. 4-nitrophenol	845	1	ND	ND	ND	ND
59. 2,4-dinitrophenol	845	1	ND	ND	ND	ND
60. 4,6-dinitro-o-cresol	845	1	ND	ND	ND	ND
61. N-nitrosodimethylamine	845	1	ND	ND	ND	ND
62. N-nitrosodiphenylamine	845	1	ND	ND	ND	ND
63. N-nitrosodi-n-propylamine	845	1	ND	ND	ND	ND
64. pentachlorophenol	845	1	ND	ND	ND	ND
65. phenol	845	1	ND	ND	ND	0.007
66. bis(2-ethylhexyl) phthalate	845	1	0.054	ND	ND	1.300
67. butyl benzyl phthalate	845	1	ND	ND	ND	0.710
68. di-n-butyl phthalate	845	1	ND	ND	ND	ND
69. di-n-octyl phthalate	845	1	ND	ND	ND	0.710
70. diethyl phthalate	845	1	ND	ND	ND	ND

Table V-18 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION, NEUTRALIZATION, AND SEDIMENTATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
71. dimethyl phthalate	845	1	ND	ND	ND	ND
72. benzo(a)anthracene	845	1	ND	ND	ND	0.013
73. benzc(a)pyrene	845	1	ND	ND	ND	ND
74. benzo(b)fluoranthene	845	1	ND	ND	ND	ND
75. benzo(k)fluoranthane	845	1	ND	ND	ND	ND
76. chrysene	845	1	ND	ND	ND	0.013
77. acenaphthylene	845	1	ND	ND	ND	ND
78. anthracene (a)	845	1	ND	ND	ND	ND
79. benzo(ghi)perylene	845	1	ND	ND	ND	ND
80. fluorene	845	1	ND	ND	ND	ND
81. phenanthrene (a)	845	1	ND	ND	ND	ND
82. dibenzo(a,h)anthracene	845	1	ND	ND	ND	ND
83. indeno (1,2,3-c,d)pyrene	845	1	ND	ND	ND	ND
84. pyrene	845	1	ND	0.009	0.004	ND

Table V-18 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION, NEUTRALIZATION, AND SEDIMENTATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
85. tetrachloroethylene	845	1	ND	ND	ND	ND
86. toluene	845	1	0.093	0.009	0.001	0.014
87. trichloroethylene	845	1	ND	0.015	ND	0.025
88. vinyl chloride (chloroethylene)	845	1	ND	ND	ND	ND
89. aldrin	845	1	ND	ND	ND	ND
90. dieldrin	845	1	ND	ND	ND	ND
91. chlordane	845	1	ND	ND	ND	ND
92. 4,4'-DDT	845	1	ND	ND	ND	ND
93. 4,4'-DDE	845	1	ND	ND	ND	ND
94. 4,4'-DDD	845	1	ND	ND	ND	ND
95. alpha-endosulfan	845	1	ND	ND	ND	ND
96. beta-endosulfan	845	1	ND	ND	ND	ND
97. endosulfan sulfate	845	1	ND	ND	ND	ND
98. heptachlor	845	1	ND	ND	ND	ND

Table V-18 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION, NEUTRALIZATION, AND SEDIMENTATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant		Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)							
99. endrin aldehyde		845	1	ND	ND	ND	ND
100. heptachlor		845	1	ND	ND	ND	ND
101. heptachlor epoxide		845	1	ND	ND	ND	ND
102. alpha-BHC		845	1	ND	ND	ND	ND
103. beta-BHC		845	1	ND	ND	ND	ND
104. gamma-BHC		845	1	ND	ND	ND	ND
105. delta-BHC		845	1	ND	ND	ND	ND
106. PCB-1242	(b)	845	1	ND	ND	ND	ND
107. PCB-1254	(b)	845	1	ND	ND	ND	ND
108. PCB-1221	(b)	845	1	ND	ND	ND	ND
109. PCB-1232	(c)	845	1	ND	ND	ND	ND
110. PCB-1248	(c)	845	1	ND	ND	ND	ND
111. PCB-1260	(c)	845	1	ND	ND	ND	ND
112. PCB-1016	(c)	845	1	ND	ND	ND	ND

Table V-18 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION, NEUTRALIZATION, AND SEDIMENTATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
113. toxaphene	845	1	ND	ND		
114. antimony	845	1	<0.001	<0.001	0.51	0.28
115. arsenic	845	1	0.008	3.3	4.4	6.0
117. beryllium	845	1	<0.001	0.014	0.001	0.004
118. cadmium	845	1	<0.001	0.28	0.23	0.17
119. chromium (total)	845	1	0.003	0.004	0.003	0.014
120. copper	845	1	0.14	0.26	0.25	0.16
121. cyanide (total)	845	1	0.005	1.6	0.81	0.85
122. lead	845	1	0.001	0.93	0.91	0.70
123. mercury	845	1	<0.0002	<0.0002	<0.0002	<0.0002
124. nickel	845	1	0.001	5.6	6.0	5.2
125. selenium	845	1	3.1	39	30	30
126. silver	845	1	0.02	0.22	0.20	0.10
127. thallium	845	1	<0.001	2.2	1.4	0.96

Table V-18 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION, NEUTRALIZATION, AND SEDIMENTATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
128. zinc	845	1	0.06	0.56	1.0	0.8
Nonconventional Pollutants						
ammonia nitrogen	845	1	1.5	3	1.6	1.3
phenolics	845	1	0.002	0.20	0.23	0.20
tin	845	1	0.28	19	22	16
Conventional Pollutants						
oil and grease	845	1	5.6	29	21	20
total suspended solids (TSS)	845	1	19	1,600	530	1,300
pH (standard units)	845	1	6.5	8.9	8.9	

†Sample Type Code: 1 - One-time grab

(a), (b), (c) Reported together.

Table V-19

FINAL EFFLUENT - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	844	1	ND	ND	ND	ND
2. acrolein	844	1	ND	ND	ND	ND
3. acrylonitrile	844	1	ND	ND	ND	ND
4. benzene	844	1	ND	ND	0.002	0.002
5. benzidine	844	1	ND	ND	ND	ND
6. carbon tetrachloride	844	1	ND	ND	ND	ND
7. chlorobenzene	844	1	ND	ND	ND	ND
8. 1,2,4-trichlorobenzene	844	1	ND	ND	ND	ND
9. hexachlorobenzene	844	1	ND	ND	ND	ND
10. 1,2-dichloroethane	844	1	ND	ND	ND	ND
11. 1,1,1-trichloroethane	844	1	ND	ND	ND	ND
12. hexachloroethane	844	1	ND	ND	ND	ND
13. 1,1-dichloroethane	844	1	ND	ND	ND	ND
14. 1,1,2-trichloroethane	844	1	ND	ND	ND	ND

Table V-19 (Continued)

FINAL EFFLUENT - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
15. 1,1,2,2-tetrachloroethane	844	1	ND	ND	ND	ND
16. chloroethane	844	1	ND	ND	ND	ND
17. bis(chloromethyl)ether	844	1	ND	ND	ND	ND
18. bis(2-chloroethyl)ether	844	1	ND	ND	ND	ND
19. 2-chloroethyl vinyl ether	844	1	ND	ND	ND	ND
20. 2-chloronaphthalene	844	1	ND	ND	ND	ND
21. 2,4,6-trichlorophenol	844	1	ND	ND	ND	ND
22. p-chloro-m-cresol	844	1	ND	ND	ND	ND
23. chloroform	844	1	ND	ND	ND	ND
24. 2-chlorophenol	844	1	ND	ND	ND	ND
25. 1,2-dichlorobenzene	844	1	ND	ND	ND	ND
26. 1,3-dichlorobenzene	844	1	ND	ND	ND	ND
27. 1,4-dichlorobenzene	844	1	ND	ND	ND	ND
28. 3,3'-dichlorobenzidine	844	1	ND	ND	ND	ND

Table V-19 (Continued)

FINAL EFFLUENT - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
29. 1,1-dichloroethylene	844	1	ND	ND	ND	ND
30. 1,2-*trans*-dichloroethylene	844	1	ND	ND	ND	ND
31. 2,4-dichlorophenol	844	1	ND	ND	ND	ND
32. 1,2-dichloropropane	844	1	ND	ND	ND	ND
33. 1,3-dichloropropene	844	1	ND	ND	ND	ND
34. 2,4-dimethylphenol	844	1	ND	ND	ND	ND
35. 2,4-dinitrotoluene	844	1	ND	ND	ND	ND
36. 2,6-dinitrotoluene	844	1	ND	ND	ND	ND
37. 1,2-diphenylhydrazine	844	1	ND	ND	ND	ND
38. ethylbenzene	844	1	ND	ND	ND	ND
39. fluoranthene	844	1	ND	ND	ND	ND
40. 4-chlorophenyl phenyl ether	844	1	ND	ND	ND	ND
41. 4-bromophenyl phenyl ether	844	1	ND	ND	ND	ND
42. bis(2-chloroisopropyl)ether	844	1	ND	ND	ND	ND

Table V-19 (Continued)

FINAL EFFLUENT - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
43. bis(2-choroethoxy)methane	844	1	ND	ND	ND	ND
44. methylene chloride	844	1	ND	ND	ND	ND
45. methyl chloride (chloromethane)	844	1	ND	ND	ND	ND
46. methyl bromide (bromomethane)	844	1	ND	ND	ND	ND
47. bromoform (tribromomethane)	844	1	ND	ND	ND	ND
48. dichlorobromomethane	844	1	ND	ND	ND	ND
49. trichlorofluoromethane	844	1	ND	ND	ND	ND
50. dichlorodifluoromethane	844	1	ND	ND	ND	ND
51. chlorodibromomethane	844	1	ND	ND	ND	ND
52. hexachlorobutadiene	844	1	ND	ND	ND	ND
53. hexachlorocyclopentadiene	844	1	ND	ND	ND	ND
54. isophorone	844	1	ND	ND	ND	ND
55. naphthalene	844	1	ND	ND	ND	ND
56. nitrobenzene	844	1	ND	ND	ND	ND

Table V-19 (Continued)

FINAL EFFLUENT - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
57. 2-nitrophenol	844	1	ND	ND	ND	ND
58. 4-nitrophenol	844	1	ND	0.004	ND	ND
59. 2,4-dinitrophenol	844	1	ND	0.001	ND	ND
60. 4,6-dinitro-o-cresol	844	1	ND	ND	ND	ND
61. N-nitrosodimethylamine	844	1	ND	ND	ND	ND
62. N-nitrosodiphenylamine	844	1	ND	ND	ND	ND
63. N-nitrosodi-n-propylamine	844	1	ND	ND	ND	ND
64. pentachlorophenol	844	1	ND	ND	ND	ND
65. phenol	844	1	ND	ND	ND	ND
66. bis(2-ethylhexyl) phthalate	844	1	0.054	0.003	0.084	0.045
67. butyl benzyl phthalate	844	1	ND	ND	ND	ND
68. di-n-butyl phthalate	844	1	ND	0.002	ND	ND
69. di-n-octyl phthalate	844	1	ND	ND	ND	ND
70. diethyl phthalate	844	1	ND	0.007	ND	ND

Table V-19 (Continued)

FINAL EFFLUENT - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
71. dimethyl phthalate	844	1	ND	ND	ND	ND
72. benzo(a)anthracene	844	1	ND	ND	ND	ND
73. benzo(a)pyrene	844	1	ND	ND	ND	ND
74. benzo(b)fluoranthene	844	1	ND	ND	ND	ND
75. benzo(k)fluoranthane	844	1	ND	ND	ND	ND
76. chrysene	844	1	ND	ND	ND	ND
77. acenaphthylene	844	1	ND	ND	ND	ND
78. anthracene (a)	844	1	ND	ND	ND	ND
79. benzo(ghi)perylene	844	1	ND	ND	ND	ND
80. fluorene	844	1	ND	ND	ND	ND
81. phenanthrene (a)	844	1	ND	ND	ND	ND
82. dibenzo(a,h)anthracene	844	1	ND	ND	ND	ND
83. indeno (1,2,3-c,d)pyrene	844	1	ND	ND	ND	ND
84. pyrene	844	1	ND	ND	ND	ND

Table V-19 (Continued)

FINAL EFFLUENT - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
85. tetrachloroethylene	845	1	ND	ND	ND	ND
86. toluene	845	1	0.093	ND	ND	0.008
87. trichloroethylene	845	1	ND	ND	ND	ND
88. vinyl chloride (chloroethylene)	845	1	ND	ND	ND	ND
89. aldrin	845	1	ND	ND	ND	ND
90. dieldrin	845	1	ND	ND	ND	ND
91. chlordane	845	1	ND	ND	ND	ND
92. 4,4'-DDT	845	1	ND	ND	ND	ND
93. 4,4'-DDE	845	1	ND	ND	ND	ND
94. 4,4'-DDD	845	1	ND	ND	ND	ND
95. alpha-endosulfan	845	1	ND	ND	ND	ND
96. beta-endosulfan	845	1	ND	ND	ND	ND
97. endosulfan sulfate	845	1	ND	ND	ND	ND
98. heptachlor	845	1	ND	ND	ND	ND

Table V-19 (Continued)

FINAL EFFLUENT - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
99. endrin aldehyde	844	1	ND	ND	ND	ND
100. heptachlor	844	1	ND	ND	ND	ND
101. heptachlor epoxide	844	1	ND	ND	ND	ND
102. alpha-BHC	844	1	ND	ND	ND	ND
103. beta-BHC	844	1	ND	ND	ND	ND
104. gamma-BHC	844	1	ND	ND	ND	ND
105. delta-BHC	844	1	ND	ND	ND	ND
106. PCB-1242 (b)	844	1	ND	ND	ND	ND
107. PCB-1254 (b)	844	1	ND	ND	ND	ND
108. PCB-1221 (b)	844	1	ND	ND	ND	ND
109. PCB-1232 (c)	844	1	ND	ND	ND	ND
110. PCB-1248 (c)	844	1	ND	ND	ND	ND
111. PCB-1260 (c)	844	1	ND	ND	ND	ND
112. PCB-1016 (c)	844	1	ND	ND	ND	ND

Table V-19 (Continued)

FINAL EFFLUENT - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
113. toxaphene	844	1	ND	ND		
114. antimony	844	1	<0.001	0.004	<0.001	<0.001
115. arsenic	844	1	0.008	0.068	0.021	0.061
117. beryllium	844	1	<0.001	<0.001	<0.001	<0.001
118. cadmium	844	1	<0.001	<0.001	<0.001	0.02
119. chromium (total)	844	1	0.003	0.002	0.002	0.003
120. copper	844	1	0.14	0.20	0.14	0.20
121. cyanide (total)	844	1	0.005	0.015	0.031	0.021
122. lead	844	1	0.001	0.015	0.010	0.015
123. mercury	844	1	<0.002	<0.002	<0.002	<0.002
124. nickel	844	1	0.001	0.10	0.04	0.023
125. selenium	844	1	3.1	1.8	2.7	3.0
126. silver	844	1	0.02	<0.001	<0.001	0.03
127. thallium	844	1	<0.001	0.008	<0.001	<0.001

Table V-19 (Continued)

FINAL EFFLUENT - PLANT C
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
128. zinc	844	1	0.06	0.05	0.04	<0.02
Nonconventional Pollutants						
ammonia nitrogen	844	1	1.5	0.5	0.6	0.8
phenolics	844	1	0.002	0.003	0.003	0.002
tin	844	1	0.28	0.95	0.85	1.4
Conventional Pollutants						
oil and grease	844	1	5.6	14	12	7.6
total suspended solids (TSS)	844	1	19	31	32	29
pH (standard units)	844	1	6.5	6.9	7.1	

†Sample Type Code: 1 - One-time grab

(a), (b), (c) Reported together.

Table V-20

ELECTROWINNING SOLUTION AFTER CARBONATION - PLANT D
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	858	1	ND	ND		
2. acrolein	858	1	ND	ND		
3. acrylonitrile	858	1	ND	ND		
4. benzene	858	1	ND	ND		
5. benzidine	858	1	ND	ND		
6. carbon tetrachloride	858	1	ND	ND		
7. chlorobenzene	858	1	ND	ND		
8. 1,2,4-trichlorobenzene	858	1	ND	ND		
9. hexachlorobenzene	858	1	ND	ND		
10. 1,2-dichloroethane	858	1	ND	ND		
11. 1,1,1-trichloroethane	858	1	ND	ND		
12. hexachloroethane	858	1	ND	ND		
13. 1,1-dichloroethane	858	1	ND	ND		
14. 1,1,2-trichloroethane	858	1	ND	ND		

Table V-20 (Continued)

ELECTROWINNING SOLUTION AFTER CARBONATION - PLANT D
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
15. 1,1,2,2-tetrachloroethane	858	1	ND	ND		
16. chloroethane	858	1	ND	ND		
17. bis(chloromethyl)ether	858	1	ND	ND		
18. bis(2-chloroethyl)ether	858	1	ND	ND		
19. 2-chloroethyl vinyl ether	858	1	ND	ND		
20. 2-chloronaphthalene	858	1	ND	ND		
21. 2,4,6-trichlorophenol	858	1	ND	ND		
22. p-chloro-m-cresol	858	1	ND	ND		
23. chloroform	858	1	0.037	ND		
24. 2-chlorophenol	858	1	ND	ND		
25. 1,2-dichlorobenzene	858	1	ND	ND		
26. 1,3-dichlorobenzene	858	1	ND	ND		
27. 1,4-dichlorobenzene	858	1	ND	ND		
28. 3,3'-dichlorobenzidine	858	1	ND	ND		

Table V-20 (Continued)

ELECTROWINNING SOLUTION AFTER CARBONATION - PLANT D
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
29. 1,1-dichloroethylene	858	1	ND	ND		
30. 1,2-*trans*-dichloroethylene	858	1	ND	ND		
31. 2,4-dichlorophenol	858	1	ND	ND		
32. 1,2-dichloropropane	858	1	ND	ND		
33. 1,3-dichloropropene	858	1	ND	ND		
34. 2,4-dimethylphenol	858	1	ND	ND		
35. 2,4-dinitrotoluene	858	1	ND	ND		
36. 2,6-dinitrotoluene	858	1	ND	ND		
37. 1,2-diphenylhydrazine	858	1	ND	ND		
38. ethylbenzene	858	1	ND	ND		
39. fluoranthene	858	1	ND	ND		
40. 4-chlorophenyl phenyl ether	858	1	ND	ND		
41. 4-bromophenyl phenyl ether	858	1	ND	ND		
42. bis(2-chloroisopropyl)ether	858	1	ND	ND		

Table V-20 (Continued)

ELECTROWINNING SOLUTION AFTER CARBONATION - PLANT D
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
43. bis(2-choroethoxy)methane	858	1	ND	ND		
44. methylene chloride	858	1	0.021	0.045		
45. methyl chloride (chloromethane)	858	1	ND	ND		
46. methyl bromide (bromomethane)	858	1	ND	ND		
47. bromoform (tribromomethane)	858	1	ND	ND		
48. dichlorobromomethane	858	1	ND	ND		
49. trichlorofluoromethane	858	1	ND	ND		
50. dichlorodifluoromethane	858	1	ND	ND		
51. chlorodibromomethane	858	1	ND	ND		
52. hexachlorobutadiene	858	1	ND	ND		
53. hexachlorocyclopentadiene	858	1	ND	ND		
54. isophorone	858	1	ND	ND		
55. naphthalene	858	1	ND	ND		
56. nitrobenzene	858	1	ND	ND		

Table V-20 (Continued)

ELECTROWINNING SOLUTION AFTER CARBONATION - PLANT D
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
57. 2-nitrophenol	858	1	ND	ND		
58. 4-nitrophenol	858	1	ND	ND		
59. 2,4-dinitrophenol	858	1	ND	ND		
60. 4,6-dinitro-o-cresol	858	1	ND	ND		
61. N-nitrosodimethylamine	858	1	ND	ND		
62. N-nitrosodiphenylamine	858	1	ND	ND		
63. N-nitrosodi-n-propylamine	858	1	ND	ND		
64. pentachlorophenol	858	1	ND	ND		
65. phenol	858	1	ND	0.028		
66. bis(2-ethylhexyl) phthalate	858	1	0.004	ND		
67. butyl benzyl phthalate	858	1	ND	ND		
68. di-n-butyl phthalate	858	1	ND	ND		
69. di-n-octyl phthalate	858	1	ND	ND		
70. diethyl phthalate	858	1	ND	ND		

Table V-20 (Continued)

ELECTROWINNING SOLUTION AFTER CARBONATION - PLANT D
TREATED WASTEWATER SAMPLING DATA

Pollutant		Stream Code	Sample Type†	Concentrations (mg/l)			
				Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)							
71. dimethyl phthalate		858	1	ND	ND		
72. benzo(a)anthracene		858	1	ND	ND		
73. benzo(a)pyrene		858	1	ND	ND		
74. benzo(b)fluoranthene		858	1	ND	ND		
75. benzo(k)fluoranthane		858	1	ND	ND		
76. chrysene		858	1	ND	ND		
77. acenaphthylene		858	1	ND	ND		
78. anthracene	(a)	858	1	ND	ND		
79. benzo(ghi)perylene		858	1	ND	ND		
80. fluorene		858	1	ND	ND		
81. phenanthrene	(a)	858	1	ND	ND		
82. dibenzo(a,h)anthracene		858	1	ND	ND		
83. indeno (1,2,3-c,d)pyrene		858	1	ND	ND		
84. pyrene		858	1	ND	ND		

Table V-20 (Continued)

ELECTROWINNING SOLUTION AFTER CARBONATION - PLANT D
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
85. tetrachloroethylene	858	1	ND	ND		
86. toluene	858	1	0.005	0.001		
87. trichloroethylene	858	1	0.007	0.027		
88. vinyl chloride (chloroethylene)	858	1	ND	ND		
89. aldrin	858	1	ND	ND		
90. dieldrin	858	1	ND	ND		
91. chlordane	858	1	ND	ND		
92. 4,4'-DDT	858	1	ND	ND		
93. 4,4'-DDE	858	1	ND	ND		
94. 4,4'-DDD	858	1	ND	ND		
95. alpha-endosulfan	858	1	ND	ND		
96. beta-endosulfan	858	1	ND	ND		
97. endosulfan sulfate	858	1	ND	ND		
98. heptachlor	858	1	ND	ND		

Table V-20 (Continued)

ELECTROWINNING SOLUTION AFTER CARBONATION - PLANT D
TREATED WASTEWATER SAMPLING DATA

Pollutant		Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)							
99. endrin aldehyde		858	1	ND	ND		
100. heptachlor		858	1	ND	ND		
101. heptachlor epoxide		858	1	ND	ND		
102. alpha-BHC		858	1	ND	ND		
103. beta-BHC		858	1	ND	ND		
104. gamma-BHC		858	1	ND	ND		
105. delta-BHC		858	1	ND	ND		
106. PCB-1242	(b)	858	1	ND	ND		
107. PCB-1254	(b)	858	1	ND	ND		
108. PCB-1221	(b)	858	1	ND	ND		
109. PCB-1232	(c)	858	1	ND	ND		
110. PCB-1248	(c)	858	1	ND	ND		
111. PCB-1260	(c)	858	1	ND	ND		
112. PCB-1016	(c)	858	1	ND	ND		

Table V-20 (Continued)

ELECTROWINNING SOLUTION AFTER CARBONATION - PLANT D
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
113. toxaphene	858	1	ND	ND		
114. antimony	858	1	<0.001	0.300		
115. arsenic	858	1	0.007	2.6		
117. beryllium	858	1	<0.001	0.003		
118. cadmium	858	1	0.001	0.20		
119. chromium (total)	858	1	0.004	0.37		
120. copper	858	1	0.016	0.15		
121. cyanide (total)	858	1	0.004	31,000		
122. lead	858	1	0.011	0.50		
123. mercury	858	1	0.0007	<0.0002		
124. nickel	858	1	0.003	2.4		
125. selenium	858	1	<0.005	<0.005		
126. silver	858	1	<0.001	0.14		
127. thallium	858	1	0.005	0.88		

Table V-20 (Continued)

ELECTROWINNING SOLUTION AFTER CARBONATION - PLANT D
TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
128. zinc	858	1	0.24	0.14		
Nonconventional Pollutants						
ammonia nitrogen	858	1	0.3	0.6		
phenolics	858	1	0.001	0.0003		
tin	858	1	1.7	26		
Conventional Pollutants						
total suspended solids (TSS)	858	1	9	25,000		

†Sample Type Code: 1 - One-time grab

(a), (b), (c) Reported together.

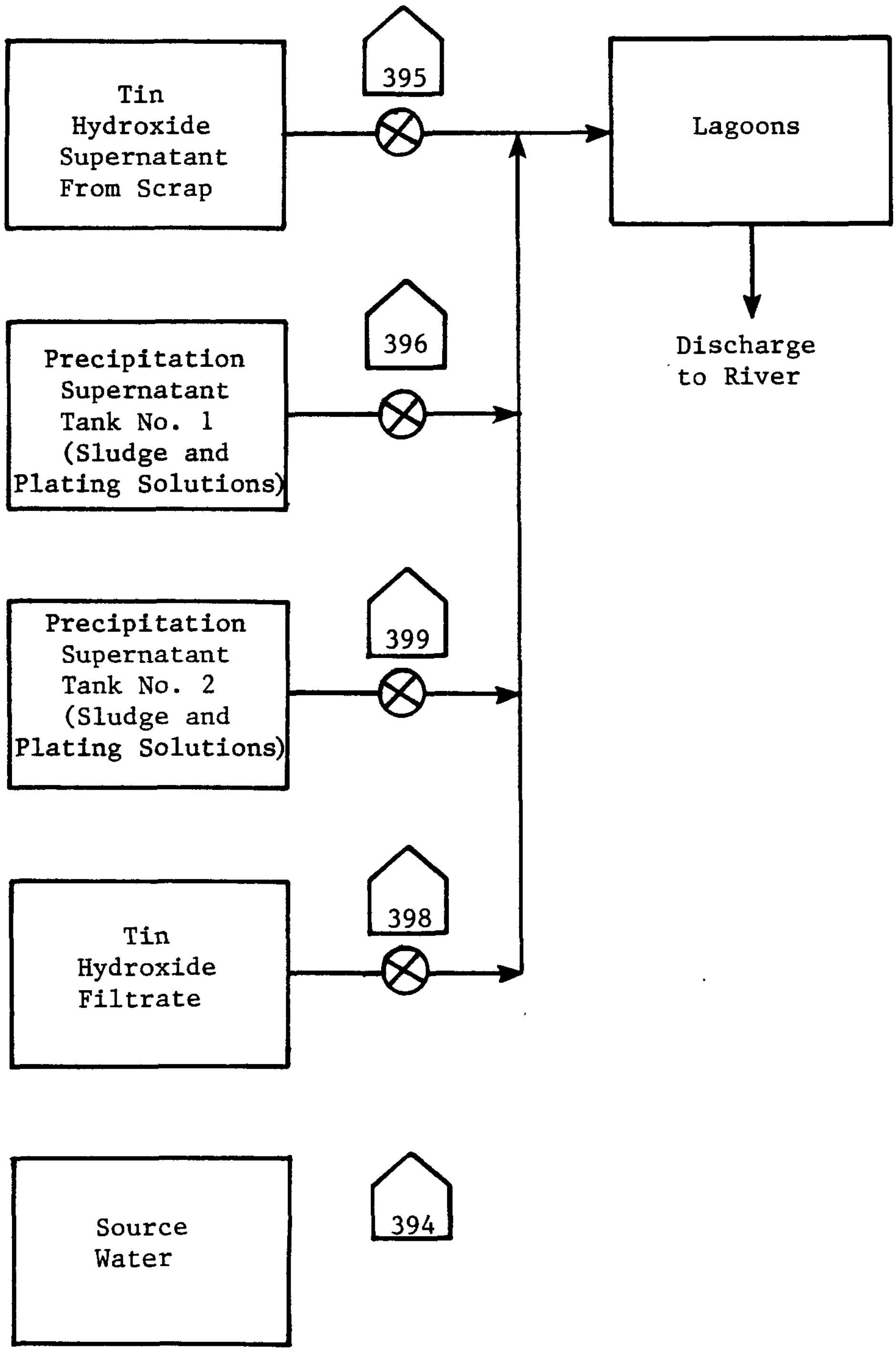

Figure V-1

SAMPLING SITES AT SECONDARY TIN PLANT A

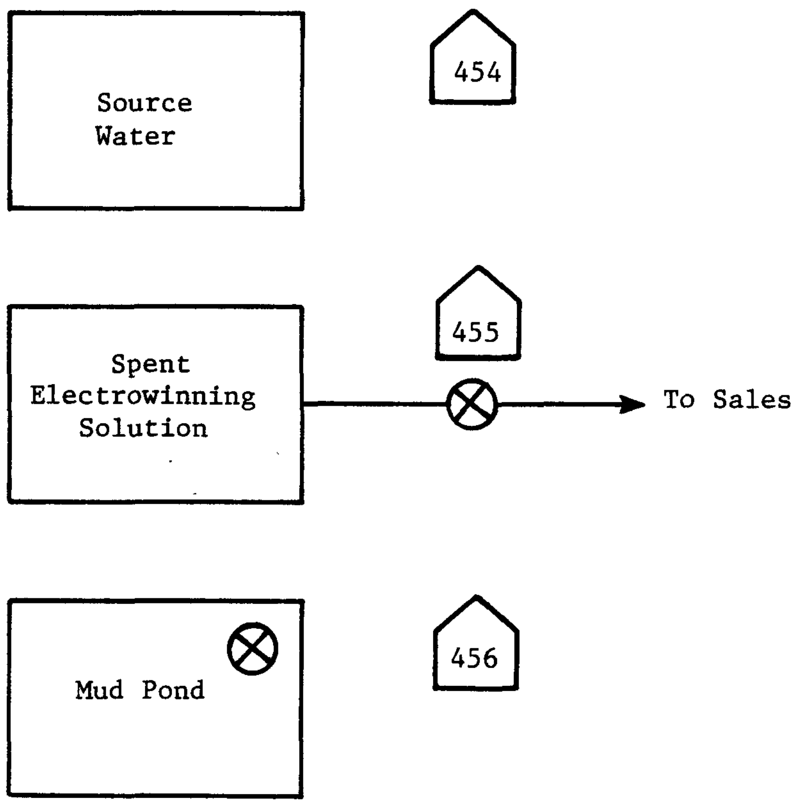

Figure V-2
SAMPLING SITES AT SECONDARY TIN PLANT B

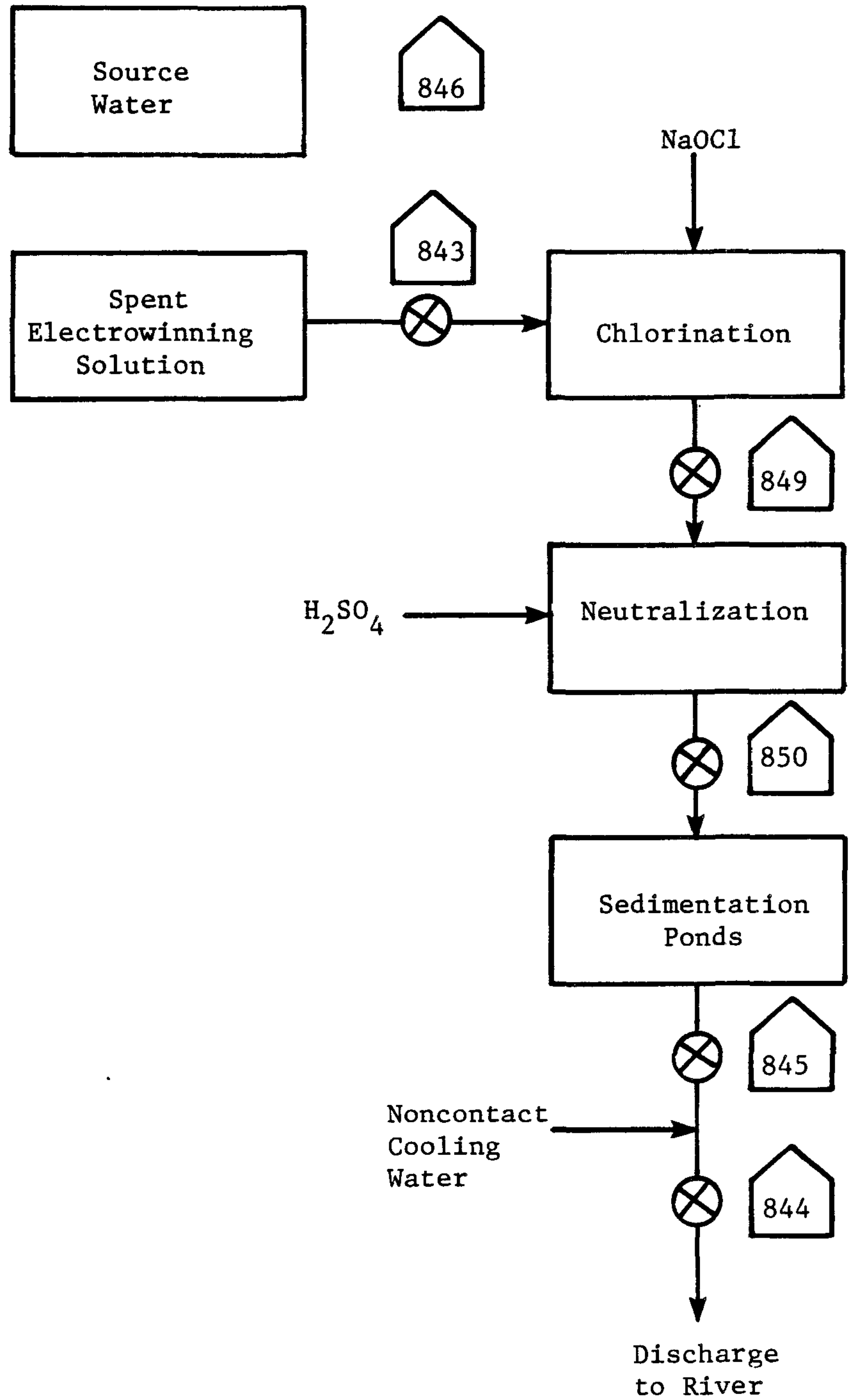

Figure V-3
SAMPLING SITES AT SECONDARY TIN PLANT C

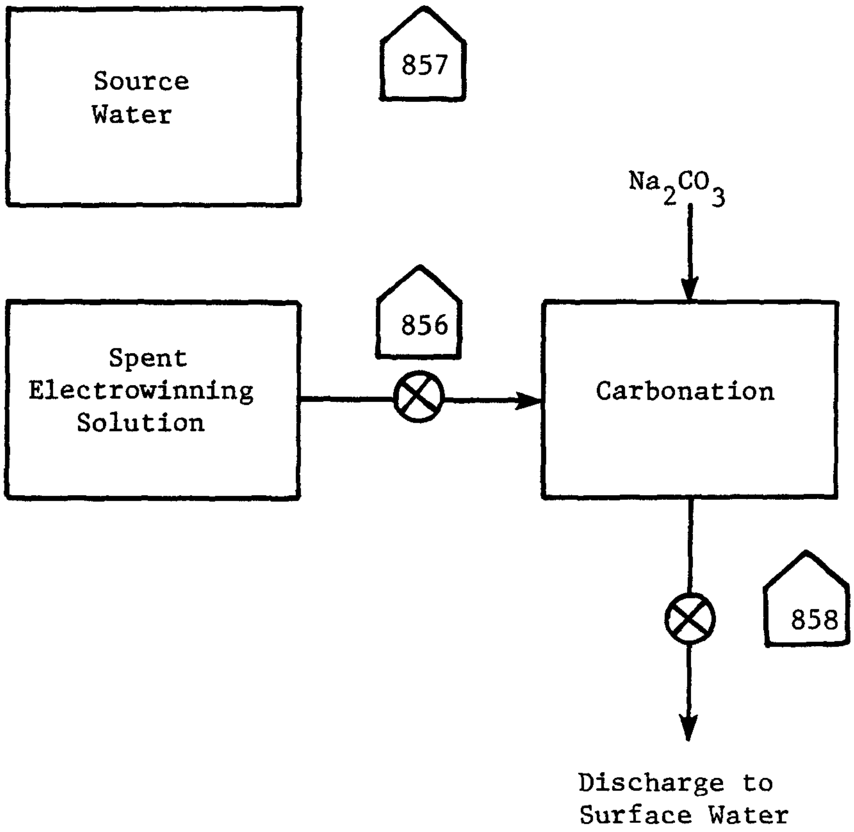

Figure V-4
SAMPLING SITES AT SECONDARY TIN PLANT D

PRIMARY AND SECONDARY TIN SUBCATEGORY

SECTION VI

SELECTION OF POLLUTANT PARAMETERS

Section V of this supplement presented data from primary and secondary tin plant sampling visits and subsequent chemical analyses. This section examines that data and discusses the selection or exclusion of pollutants for potential limitation.

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. 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 lime precipitation, sedimentation, and filtration (see Section VII Of the General Development Document - Combined Metals Data Base). The treatable concentrations used for the toxic organics were the long-term performance values achievable by carbon adsorption. Also, conventional and nonconventional pollutants and pollutant parameters are selected or excluded from limitation.

CONVENTIONAL AND NONCONVENTIONAL POLLUTANT PARAMETERS

This study examined samples from the primary and secondary tin subcategory for two conventional pollutant parameters (total suspended solids, and pH) and three nonconventional pollutant parameters, (ammonia, tin and fluoride). Fluoride is known to be present in certain of the raw materials used by secondary tin facilities and ammonia is used as a reagent in some tin recovery operations. Also, ammonia is generated in the alkaline tin dissolving reaction.

CONVENTIONAL AND NONCONVENTIONAL POLLUTANT PARAMETERS SELECTED

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

- ammonia
- fluoride

* tin
* total suspended solids (TSS)
* pH

Ammonia was found in six of the eight raw waste samples analyzed for this subcategory in concentrations ranging from 1.1 to 92 mg/l. One of the values recorded is well above the 32.2 mg/l concentration attainable by the available treatment technology. Also, one facility which uses ammonia to precipitate tin hydroxide supplied wastewater analytical data with their dcp response which indicated that 3,000 mg/l of ammonia nitrogen was present. Consequently, ammonia is selected for limitation in this subcategory.

Fluoride was detected in all eight raw wastewater samples analyzed for this study. Five of the eight values are equal to or greater than 12,000 mg/l. These high concentrations of fluoride are found in wastewaters associated with secondary tin production from tin plating solutions and sludges. The fluoride originates as tin fluoroborate or fluoroboric acid which are constituents of tin plating baths. For these reasons, fluoride is selected for limitation in this subcategory.

Tin was analyzed for in all ten raw waste samples, and was found in concentrations ranging from 5.8 mg/l to 8800 mg/l. All ten values are greater than the 0.80 mg/l concentration considered achievable by lime, settle and filter technology. Also, tin is expected to be present in the wastewaters from this subcategory because of its prevalence in the process and its solubility. For these reasons, tin is selected for limitation in this subcategory.

TSS concentrations ranging from 25 to 50,000 mg/l were observed in the 10 raw waste samples analyzed for this study. All 10 concentrations are well above the 2.6 mg/l treatable concentration. 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 eight pH values observed during this study ranged from 7.6 to 13.3. Two of the eight values were outside 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 from streams 455, 456, 395, 396, 398, 399, 843, and 856 (see Section V). These data provide the basis for the categorization of specific pollutants, as discussed below. Treatment plant samples were not considered in the frequency count.

TOXIC POLLUTANTS NEVER DETECTED

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

1. acenaphthene
2. acrolein
3. acrylonitrile
5. benzidene
6. carbon tetrachloride (tetrachloromethane)
7. chlorobenzene
8. 1,2,4-trichlorobenzene
10. 1,2-dichloroethane
12. hexachloroethane
13. 1,1-dichloroethane
14. 1,1,2-trichloroethane
15. 1,1,2,2-tetrachloroethane
16. chloroethane
17. bis (chloromethyl) ether (deleted)
18. bis (2-chloroethyl) ether
19. 2-chloroethyl vinyl ether
20. 2-chloronaphthalene
21. 2,4,6-trichlorophenol
22. parachlorometa cresol
24. 2-chlorophenol
25. 1,2-cichlorobenzene
26. 1,3-dichlorobenzene
27. 1,4-dichlorobenzene
28. 3,3'-dichlorobenzidine
30. 1,2-trans-dichloroethylene
31. 2,4-dichlorophenol
32. 1,2-dichloropropane
33. 1,2-dichloropropylene (1,3-dichloropropene)
35. 2,4-dinitrotoluene
36. 2,6-dinitrotoluene
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 (tribromomethane)

48. dichlorobromomethane
49. trichlorofluoromethane (deleted)
50. dichlorodifluoromethane (deleted)
51. chlorodibromomethane
52. hexachlorobutadiene
53. hexachlorocyclopentadiene
54. isophorone
56. nitrobenzene
60. 4,6-dinitro-o-cresol
61. N-nitrosodimethylamine
63. N-nitrosodi-n-propylamine
64. pentachlorophenol
69. di-n-octyl phthalate
70. diethyl phthalate
71. dimethyl phthalate
72. benzo(a)anthracene (1,2-benzanthracene)
73. benzo(a)pyrene (3,4-benzopyrene)
74. 3,4-benzofluoranthene
75. benzo(k)fluoranthene (11,12-benzofluoranthene)
76. chrysene
77. acenaphthylene
79. benzo(ghi)perylene (1,11-benzoperylene)
82. dibenzo(a,h)anthracene (1,2,5,6-dibenzanthracene)
83. indeno(1,2,3-cd)pyrene (w,e,-o-phenylenepyrene)
85. tetrachloroethylene
89. aldrin
90. dieldrin
91. chlordane (technical mixture and metabolites)
92. 4,4'-DDT
93. 4,4'-DDE(p,p'DDX)
94. 4,4'-DDD(p,p'TDE)
95. a-endosulfan-Alpha
96. b-endosulfan-Beta
97. endosulfan sulfate
98. endrin
99. endrin aldehyde
100. heptachlor
101. heptachlor epoxide
102. Alpha - BHC
103. Beta - BHC
104. Gamma - BHC (lindane)
105. Delta - BHC
106. PCB-1242 (Arochlor 1242)
107. PCB-1254 (Arochlor 1254)
108. PCB-1221 (Arochlor 1221)
109. PCB-1232 (Arochlor 1232)
110. PCB-1248 (Arochlor 1248)
111. PCB-1260 (Arochlor 1260)
112. PCB-1016 (Arochlor 1016)
113. toxaphene
116. asbestos
129. 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)

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.

9. hexachlorobenzene
11. 1,1,1-trichloroethane
23. chloroform
29. 1,1-dichloroethylene
34. 2,4-dimethylphenol
37. 1,2-diphenylhydrazine
39. fluoranthene
55. naphthalene
62. n-nitrosodimethylamine
68. di-n-butyl phthalate
78. anthracene
80. fluorene
81. phenanthrene
87. trichloroethylene

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
123. mercury

Beryllium was detected above its analytical quantification level (0.1 mg/l) in four out of 10 raw wastewater samples. The observed concentrations ranged from 0.02 mg/l to 0.20 mg/l. Three of these values are below the treatable concentration for beryllium (0.20 mg/l). One is right at the treatability concentration and would therefore not be reduced by available treatment technology. Beryllium is therefore not selected for limitation.

Mercury was detected in two out of 10 raw wastewater samples. The two observed concentrations are .026 mg/l and .0004 mg/l, both below the concentration considered achievable by identified treatment technology (.036 mg/l). Mercury is therefore not selected for limitation.

TOXIC POLLUTANTS DETECTED IN A SMALL NUMBER OF SOURCES

The following pollutants were not selected for limitation on the basis that 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
38. ethylbenzene
44. methylene chloride
57. 2-nitrophenol
58. 4-nitrophenol
59. 2,4-dinitrophenol
65. phenol
66. bis(2-ethylhexyl) phthalate
67. butyl benzyl phthalate
84. pyrene
86. toluene
88. vinyl chloride

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 level of 0.01 mg/l in two out of 10 raw wastewater samples. The observed treatable concentrations are .051 and .047 mg/l, just slightly higher than the treatability concentration. Because these values are only slightly higher than could be achieved by treatment and only two in 10 samples showed benzene at a treatable concentration, benzene is not selected for limitation.

Ethylbenzene was detected above its treatable concentration of 0.01 mg/l in only one out of ten raw wastewater samples. The observed treatable concentration is 0.011 mg/l. Because it was found at a treatable concentration in only one out of ten samples and because the observed value is only slightly above the treatable concentration, ethylbenzene is not selected for limitation.

Methylene chloride was found above its treatable concentration of 0.01 mg/l in three out of 10 raw wastewater samples. Methylene chloride is a common laboratory reagent often detected in blank and raw water samples. The treatable concentrations observed (0.031, 0.025 and 1.724 mg/l) are probably due to laboratory contamination. Methylene chloride is therefore not selected for limitation.

2-Nitrophenol was detected above the concentration considered achievable by identified treatment technology (.01 mg/l) in three out of 10 raw wastewater samples. The treatable concentrations observed were .031 mg/l, .06 mg/l and .02 mg/l. The Agency has no reason to believe that treatable concentrations of 2-nitrophenol should be present in primary and secondary tin wastewaters. For this reason, and because it was detected in such a small number of samples, 2-nitrophenol is not selected for limitation.

4-Nitrophenol was detected above its treatable concentration of 0.01 mg/l in two out of ten raw wastewater samples. The observed treatable concentrations are 0.026 and 0.025 mg/l. Because it was found at a treatable concentration in only two out of ten samples and because the Agency has no reason to believe that treatable concentrations of 4-nitrophenol should be present in primary and secondary tin wastewaters, 4-nitrophenol is not selected for regulation.

2,4-Dinitrophenol was detected above its treatable concentration of 0.01 mg/l in two out of 10 raw wastewater samples. The treatable concentrations observed are .033 mg/l and .086 mg/l. Because very little removal could be expected with treatment and because it was detected at treatable concentrations in only two out of 10 samples, 2,4-dinitrophenol is not selected for limitation.

Phenol was detected above the concentration considered achievable by available treatment technology (.01 mg/l) in three out of 10 raw wastewater samples. The observed treatable concentrations are 0.017, 0.02 and 0.13 mg/l. Because it was detected in only three of 10 samples, and because the Agency has no reason to believe that treatable concentrations of phenol should be present in primary and secondary tin wastewaters, phenol is not selected for limitation.

Bis(2-ethylhexyl) phthalate was detected above its treatability concentration of .01 mg/l in only one out of 10 raw wastewater samples. The observed treatable concentration is 0.268 mg/l. This compound is a plasticizer commonly used in laboratory and field sampling equipment, and is not used or formed as a by-product in this subcategory. For this reason and because it was detected at a treatable concentration in only one out of 10 raw wastewater samples, bis(2-ethylhexyl) phthalate is not selected for limitation.

Butyl benzyl phthalate was detected above the concentration considered achievable by available treatment technology (.01 mg/l) in three out of 10 raw wastewater samples. The observed concentrations are .011 mg/l, .012 mg/l, and .025 mg/l. This compound is a plasticizer commonly used in laboratory and field equipment, and is not used or formed as a by-product in this subcategory. For this reason, and because it was detected in only three out of 10 samples, butyl benzyl phthalate is not selected for limitation.

Pyrene was detected above its treatability concentration of .01 mg/l in only one out of 10 raw wastewater samples. The observed treatable concentration is .063 mg/l. The Agency has no reason to believe that treatable concentration of pyrene should be present in primary and secondary tin wastewaters. For this reason, and because it was detected at a treatable concentration in only one out of 10 samples, pyrene is not selected for limitation.

Toluene was detected above its treatable concentration of 0.01 mg/l in two out of ten raw wastewater samples. The observed treatable concentrations are 0.018 and 0.017 mg/l. Because toluene was detected in only two out of ten raw wastewater samples at concentrations only slightly above treatabilty and because it was detected in the source water sample at 0.093 mg/l, toluene is not selected for regulation.

Vinyl chloride was detected above the concentration considered achievable by identified treatment technology (.01 mg/l) in only one out of 10 raw wastewater samples. The treatable concentration observed is .036 mg/l. Because it was detected in only one out of 10 samples, vinyl chloride is not selected 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.

114. antimony
115. arsenic
118. cadmium
119. chromium
120. copper
121. cyanide
122. lead
124. nickel
125. selenium
126. silver
127. thallium
128. zinc

Antimony was detected above the concentration considered achievable by identified treatment technology (0.47 mg/l) in eight out of 10 raw wastewater samples. The treatable concentrations observed range from 0.9 mg/l to 12.0 mg/l. Antimony is therefore selected for further consideration for limitation.

Arsenic was detected above the concentration considered achievable by identified treatment technology (0.34 mg/l) in four out of 10 raw wastewater samples. The treatable concentrations observed range from 1.9 mg/l to 6.6 mg/l. Arsenic is therefore selected for further consideration for limitation.

Cadmium was detected above the concentration considered achievable by identified treatment technology (0.049 mg/l) in eight out of 10 raw wastewater samples. The treatable concentrations observed range from 0.08 mg/l to 0.42 mg/l. Cadmium is therefore selected for further consideration for limitation.

Chromium was detected above the concentration considered achievable by identified treatment technology (0.07 mg/l) in three out of 10 raw wastewater samples. The treatable concentrations observed range from 0.30 mg/l to 0.94 mg/l. Chromium is therefore selected for further consideration for limitation.

Copper was detected above the concentration considered achievable by identified treatment technology (0.39 mg/l) in three out of 10 raw wastewater samples. The treatable concentrations observed range from 0.41 mg/l to 0.52 mg/l. Copper is therefore selected for further consideration for limitation.

Cyanide was detected above the concentration considered achievable by identified treatment technology (0.047 mg/l) in all nine raw wastewater samples analyzed for this study. The treatable concentrations observed range from 0.22 mg/l to 24 mg/l. Cyanide is therefore selected for further consideration for limitation.

Lead was detected above the concentration considered achievable by identified treatment technology (0.08 mg/l) in six out of 10 raw wastewater samples. The treatable concentrations observed range from 1.0 mg/l to 11 mg/l. Lead is therefore selected for further consideration for limitation.

Nickel was detected above the concentration considered achievable by identified treatment technology (0.22 mg/l) in nine out of 10 raw wastewater samples. The treatable concentrations observed range from 0.35 mg/l to 4.1 mg/l. Nickel is therefore selected for further consideration for limitation.

Selenium was detected above the concentration considered achievable by identified treatment technology (0.07 mg/l) in three out of 10 raw wastewater samples. The treatable concentrations observed range from 0.43 mg/l to 32 mg/l. Selenium is therefore selected for further consideration for limitation. Selenium was detected at 3.1 mg/l in the source water sample associated with the wastewater sample in which selenium was observed at 32 mg/l.

Silver was detected above the concentration considered achievable by identified treatment technology (0.07 mg/l) in four out of 10 raw wastewater samples. The treatable concentrations observed range from 0.30 mg/l to 0.40 mg/l. Silver is therefore selected for further consideration for limitation.

Thallium was detected above the concentration considered achievable by identified treatment technology (0.34 mg/l) in five out of 10 raw wastewater samples. The treatable concentrations observed range from 0.59 mg/l t0 3.1 mg/l. Thallium is therefore selected for further consideration for limitation.

Zinc was detected above the concentration considered achievable by identified treatment technology (0.23 mg/l) in five out of 10 raw wastewater samples. The treatable concentrations observed range from 0.24 mg/l to 190 mg/l. Zinc is therefore selected for further consideration for limitation.

Table VI-1

FREQUENCY OF OCCURRENCE OF TOXIC POLLUTANTS
PRIMARY AND SECONDARY TIN 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	8	10	10			
2. acrolein	0.010	0.01	8	10	10			
3. acrylonitrile	0.010	0.01	8	10	10			
4. benzene	0.010	0.01	8	10	6	2		2
5. benzidine	0.010	0.01	8	10	10			
6. carbon tetrachloride	0.010	0.01	8	10	10			
7. chlorobenzene	0.010	0.01	8	10	10			
8. 1,2,4-trichlorobenzene	0.010	0.01	8	10	10			
9. hexachlorobenzene	0.010	0.01	8	10	8	2		
10. 1,2-dichloroethane	0.010	0.01	8	10	10			
11. 1,1,1-trichloroethane	0.010	0.01	8	10	8	2		
12. hexachloroethane	0.010	0.01	8	10	10			
13. 1,1-dichloroethane	0.010	0.01	8	10	10			
14. 1,1,2-trichloroethane	0.010	0.01	8	10	10			
15. 1,1,2,2-tetrachloroethane	0.010	0.01	8	10	10			
16. chloroethane	0.010	0.01	8	10	10			
17. bis(chloromethyl) ether	0.010	0.01	8	10	10			
18. bis(2-chloroethyl) ether	0.010	0.01	8	10	10			
19. 2-chloroethyl vinyl ether	0.010	0.01	8	10	10			
20. 2-chloronaphthalene	0.010	0.01	8	10	10			
21. 2,4,6-trichlorophenol	0.010	0.01	8	10	10			
22. parachlorometa cresol	0.010	0.01	8	10	10			
23. chloroform	0.010	0.01	8	10	8	2		
24. 2-chlorophenol	0.010	0.01	8	10	10			
25. 1,2-dichlorobenzene	0.010	0.01	8	10	10			
26. 1,3-dichlorobenzene	0.010	0.01	8	10	10			
27. 1,4-dichlorobenzene	0.010	0.01	8	10	10			
28. 3,3'-dichlorobenzidine	0.010	0.01	8	10	10			
29. 1,1-dichloroethylene	0.010	0.01	8	10	9	1		
30. 1,2-trans-dichloroethylene	0.010	0.01	8	10	10			
31. 2,4-dichlorophenol	0.010	0.01	8	10	10			
32. 1,2-dichloropropane	0.010	0.01	8	10	10			
33. 1,3-dichloropropylene	0.010	0.01	8	10	10			
34. 2,4-dimethylphenol	0.010	0.01	8	10	8	2		

Table VI-1 (Continued)

FREQUENCY OF OCCURRENCE OF TOXIC POLLUTANTS
PRIMARY AND SECONDARY TIN 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	8	10	10			
36. 2,6-dinitrotoluene	0.010	0.01	8	10	10			
37. 1,2-diphenylhydrazine	0.010	0.01	8	10	8	2		
38. ethylbenzene	0.010	0.01	8	10	9			1
39. fluoranthene	0.010	0.01	8	10	9	1		
40. 4-chlorophenyl phenyl ether	0.010	0.01	8	10	10			
41. 4-bromophenyl phenyl ether	0.010	0.01	8	10	10			
42. bis(2-chloroisopropyl) ether	0.010	0.01	8	10	10			
43. bis(2-chloroethoxy) methane	0.010	0.01	8	10	10			
44. methylene chloride	0.010	0.01	8	10	4	3		3
45. methyl chloride	0.010	0.01	8	10	10			
46. methyl bromide	0.010	0.01	8	10	10			
47. bromoform	0.010	0.01	8	10	10			
48. dichlorobromomethane	0.010	0.01	8	10	10			
49. trichlorofluoromethane	0.010	0.01	8	10	10			
50. dichlorodifluoromethane	0.010	0.01	8	10	10			
51. chlorodibromomethane	0.010	0.01	8	10	10			
52. hexachlorobutadiene	0.010	0.01	8	10	10			
53. hexachlorocyclopentadiene	0.010	0.01	8	10	10			
54. isophorone	0.010	0.01	8	10	10			
55. naphthalene	0.010	0.01	8	10	6	4		
56. nitrobenzene	0.010	0.01	8	10	10			
57. 2-nitrophenol	0.010	0.01	8	10	5	1	1	3
58. 4-nitrophenol	0.010	0.01	8	10	7	1		2
59. 2,4-dinitrophenol	0.010	0.01	8	10	8			2
60. 4,6-dinitro-o-cresol	0.010	0.01	8	10	10			
61. N-nitrosodimethylamine	0.010	0.01	8	10	10			
62. N-nitrosodiphenylamine	0.010	0.01	8	10	7	3		
63. N-nitrosodi-n-propylamine	0.010	0.01	8	10	10			
64. pentachlorophenol	0.010	0.01	8	10	10			
65. phenol	0.010	0.01	8	10	4	3		3
66. bis(2-ethylhexyl) phthalate	0.010	0.01	8	10	3	6		1
67. butyl benzyl phthalate	0.010	0.01	8	10	5	2		3
68. di-n-butyl phthalate	0.010	0.01	8	10	5	5		

Table VI-1 (Continued)

FREQUENCY OF OCCURRENCE OF TOXIC POLLUTANTS
PRIMARY AND SECONDARY TIN 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	8	10	10			
70. diethyl phthalate	0.010	0.01	8	10	10			
71. dimethyl phthalate	0.010	0.01	8	10	10			
72. benzo(a)anthracene	0.010	0.01	8	10	10			
73. benzo(a)pyrene	0.010	0.01	8	10	10			
74. 3,4-benzofluoranthene	0.010	0.01	8	10	10			
75. benzo(k)fluoranthene	0.010	0.01	8	10	10			
76. chrysene	0.010	0.01	8	10	10			
77. acenaphthylene	0.010	0.01	8	10	10			
78. anthracene (c)	0.010	0.01	8	10	9	1		
79. benzo(ghi)perylene	0.010	0.01	8	10	10			
80. fluorene	0.010	0.01	8	10	9	1		
81. phenanthrene (c)	0.010	0.01	8	10	9	1		
82. dibenzo(a,h)anthracene	0.010	0.01	8	10	10			
83. indeno(1,2,3-cd)pyrene	0.010	0.01	8	10	10			
84. pyrene	0.010	0.01	8	10	8	1		1
85. tetrachloroethylene	0.010	0.01	8	10	10			
86. toluene	0.010	0.01	8	10	6	2		2
87. trichloroethylene	0.010	0.01	8	10	8	2		
88. vinyl chloride	0.010	0.01	8	10	9			1
89. aldrin	0.005	0.01	8	10	10			
90. dieldrin	0.005	0.01	8	10	10			
91. chlordane	0.005	0.01	8	10	10			
92. 4,4'-DDT	0.005	0.01	8	10	10			
93. 4,4'-DDE	0.005	0.01	8	10	10			
94. 4,4'-DDD	0.005	0.01	8	10	10			
95. alpha-endosulfan	0.005	0.01	8	10	10			
96. beta-endosulfan	0.005	0.01	8	10	10			
97. endosulfan sulfate	0.005	0.01	8	10	10			
98. endrin	0.005	0.01	8	10	10			
99. endrin aldehyde	0.005	0.01	8	10	10			
100. heptachlor	0.005	0.01	8	10	10			
101. heptachlor epoxide	0.005	0.01	8	10	10			
102. alpha-BHC	0.005	0.01	8	10	10			
103. beta-BHC	0.005	0.01	8	10	10			

Table VI-1 (Continued)

FREQUENCY OF OCCURRENCE OF TOXIC POLLUTANTS PRIMARY AND SECONDARY TIN 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
104. gamma-BHC	0.005	0.01	8	10	10			
105. delta-BHC	0.005	0.01	8	10	10			
106. PCB-1242 (d)	0.005	0.01	8	10	10			
107. PCB-1254 (d)	0.005	0.01	8	10	10			
108. PCB-1221 (d)	0.005	0.01	8	10	10			
109. PCB-1232 (e)	0.005	0.01	8	10	10			
110. PCB-1248 (e)	0.005	0.01	8	10	10			
111. PCB-1260 (e)	0.005	0.01	8	10	10			
112. PCB-1016 (e)	0.005	0.01	8	10	10			
113. toxaphene	0.005	0.01	8	10	10			
114. antimony	0.100	0.47	8	10		2		8
115. arsenic	0.010	0.34	8	10		6		4
116. asbestos	10 MFL	10 MFL		0				
117. beryllium	0.010	0.20	8	10		6	4	
118. cadmium	0.002	0.049	8	10			1	9
119. chromium	0.005	0.07	8	10		1	6	3
120. copper	0.009	0.39	8	10			7	3
121. cyanide (f)	0.02	0.047	8	9				9
122. lead	0.020	0.08	8	10			4	6
123. mercury	0.0001	0.036	8	10		8	2	
124. nickel	0.005	0.22	8	10			1	9
125. selenium	0.01	0.20	8	10		3	4	3
126. silver	0.02	0.07	8	10		5	1	4
127. thallium	0.100	0.34	8	10		2	3	5
128. zinc	0.050	0.23	8	10			5	5
129. 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)				0				

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

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

(c), (d), (e) Reported together.

(f) 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 AND SECONDARY TIN SUBCATEGORY

SECTION VII

CONTROL AND TREATMENT TECHNOLOGIES

The preceding sections of this supplement discussed the sources, flows, and characteristics of the wastewaters generated in the primary and secondary tin subcategory. This section summarizes the description of these wastewaters and indicates the level of treatment which is currently practiced for each waste stream.

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 applied to each of the sources generating wastewater in this subcategory. As discussed in Section V, wastewater associated with the primary and secondary tin subcategory is characterized by the presence of the toxic metal pollutants, cyanide, ammonia, fluoride, tin and suspended solids. This analysis is supported by the raw (untreated) wastewater data presented for specific sources as well as combined waste streams in Section V. Generally, these pollutants are present in each of the waste streams at concentrations above treatability, and these waste streams are commonly combined for treatment. Construction of one wastewater treatment system for combined treatment allows plants to take advantage of economies of scale, and, in some instances, to combine streams of differing alkalinity to reduce treatment chemical requirements. Three plants in this subcategory currently have combined wastewater treatment systems. One has cyanide oxidation with chlorine, followed by acid neutralization and sedimentation. One has lime precipitation and sedimentation and one has sedimentation lagoons only. Two options have been selected for consideration for BPT, BAT, NSPS, and pretreatment in this subcategory, based on combined treatment of these compatible waste streams.

TIN SMELTER SO_2 SCRUBBER

The one plant which practices tin smelting from concentrates and residues uses a caustic scrubber to control SO_2 emissions from the smelting operations. The facility reported practicing 50 percent recycle of the scrubber liquor. The scrubber liquor contains treatable concentrations of toxic metals and suspended solids. This stream is directly discharged after treatment consisting of lime addition and sedimentation.

DEALUMINIZING RINSE

The one facility which reported the use of municipal solid waste as a raw material uses an alkaline leaching and rinsing process to remove aluminum from the scrap prior to detinning operations. The spent leachate and rinsewater have a very alkaline pH and contain treatable concentrations of cyanide and toxic metals. The one facility reporting this stream discharges it directly after treatment consisting of sulfide addition to precipitate aluminum, cyanide oxidation with sodium hypochlorite, acid neutralization, vacuum filtration and sedimentation.

TIN MUD ACID NEUTRALIZATION FILTRATE

Tin mud may be neutralized with sulfuric acid and dewatered in a filter press prior to sales to a tin smelter. The filtrate contains treatable concentrations of toxic metals and cyanide. The one facility reporting this waste stream is an indirect discharger with no treatment in place.

TIN HYDROXIDE WASH

The one facility which reported the use of tin hydroxide, $Sn(OH)_4$, as a raw material, washes the tin hydroxide with water prior to dissolving it in a caustic solution. This solution is then mixed with the sodium stannate solution from alkaline detinning and tin is recovered from the combined stream by electrowinning. The spent wash water contains treatable concentrations of toxic metals and suspended solids. The one facility reporting this waste stream achieves zero discharge through the use of evaporation ponds.

SPENT ELECTROWINNING SOLUTION FROM NEW SCRAP

New tin plated steel scrap is used as a raw material at 10 out of 11 secondary tin plants. After alkaline detinning, the tin is recovered by electrowinning and either all or a portion of the spent solution is discharged as a waste stream. The spent solution has a very alkaline pH and contains treatable concentrations of cyanide, toxic metals, and suspended solids. Of the eight plants which practice electrowinning, six achieve zero discharge by contractor disposal, sales or evaporation ponds. Of the two plants which discharge this stream, one is an indirect discharger with no treatment in place and the other is a direct discharger with treatment consisting of cyanide oxidation with chlorine, acid addition, vacuum filtration and sedimentation.

SPENT ELECTROWINNING SOLUTION FROM MUNICIPAL SOLID WASTE

The one facility which reported the use of municipal solid waste as a raw material to alkaline detinning and electrowinning discharges a spent electrowinning solution waste stream. This stream has a very alkaline pH and contains treatable concentrations of cyanide, toxic metals, and suspended solids. This stream is discharged directly after treatment consisting of cyanide oxidation with chlorine, acid addition, vacuum filtration and sedimentation.

TIN HYDROXIDE SUPERNATANT FROM SCRAP

Tin hydroxide may be precipitated from alkaline detinning solution as an alternative to electrowinning for tin recovery. Sulfuric acid and sodium carbonate are added to the sodium stannate solution and the tin hydroxide forms an insoluble precipitate which is separated from the liquid phase by sedimentation. The supernatant waste stream contains treatable concentations of cyanide and toxic metals. The one plant reporting this waste stream is a direct discharger after treatment in sedimentation lagoons.

TIN HYDROXIDE SUPERNATANT FROM SPENT PLATING SOLUTIONS

Tin hydroxide may be precipitated from spent plating solutions generated from tin plated steel manufacturing operations. Either sulfuric acid and sodium carbonate or ammonia is added to the solution and an insoluble precipitate of tin hydroxide is formed. The precipitate is separated from the liquid phase by sedimentation. The supernatant stream contains treatable concentrations of cyanide and toxic metals as well as high concentrations of fluoride. Treatable concentrations of ammonia may also be present if ammonia is used as the reagent causing the formation of tin hydroxide. Of the two plants reporting this waste stream, one is an indirect discharger with no treatment in place and the other is a direct discharger after treatment in sedimentation lagoons.

TIN HYDROXIDE SUPERNATANT FROM SLUDGE SOLIDS

Tin plating sludge solids are dissolved and the resultant solution is treated with sulfuric acid and sodium carbonate to precipitate tin hydroxide. The resultant supernatant waste stream contains treatable concentrations of antimony, cyanide, fluoride, and suspended solids. The one facility reporting this waste stream is a direct discharger after treatment in sedimentation lagoons.

TIN HYDROXIDE FILTRATE

Tin hydroxide slurry which has been separated from the supernatant stream may be further dewatered in a filter press prior to drying. The resultant filtrate waste stream contains treatable concentrations of antimony, cyanide, fluoride, and suspended solids. The one facility reporting this waste stream is a direct discharger after treatment in sedimentation lagoons.

CONTROL AND TREATMENT OPTIONS

The Agency examined two control and treatment technology alternatives that are applicable to the primary and secondary tin subcategory. The options selected for evaluation represent a combination of flow reduction, pretreatment technology applicable to individual waste streams, and end-of-pipe treatment technologies.

OPTION A

Option A for the primary and secondary tin subcategory requires treatment technologies to reduce pollutant mass. The Option A treatment scheme consists of ammonia steam stripping preliminary treatment applied to the tin hydroxide supernatant from spent plating solutions waste stream. Also, preliminary treatment consisting of cyanide precipitation is applied to the combined stream of dealuminizing rinse, spent electrowinning solution from new scrap and municipal solid waste, tin hydroxide supernatant from scrap, tin hydroxide supernatant from spent plating solution, tin hydroxide supernatant from sludge solids, tin hydroxide filtrate, and tin mud acid neutralization filtrate. Preliminary treatment is followed by chemical precipitation and sedimentation applied to the combined stream of cyanide precipitation effluent, tin smelter SO_2 scrubber and tin hydroxide wash. Chemical precipitation is used to remove metals and fluoride by the addition of lime or sulfuric acid followed by gravity sedimentation. Suspended solids are also removed by the process.

OPTION C

Option C for the primary and secondary tin subcategory consists of all control and treatment requirements of Option A (ammonia steam stripping, cyanide precipitation, chemical precipitation, and sedimentation) plus multimedia filtration technology added at the end of the Option A treatment scheme. Multimedia filtration is used to remove suspended solids, including precipitates of metals and fluoride, 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 as well. The addition of filters also provides consistent removal during periods in which there are rapid increases in flows or loadings of pollutants to the treatment system.

PRIMARY AND SECONDARY TIN SUBCATEGORY

SECTION VIII

COST OF WASTEWATER TREATMENT AND CONTROL

This section presents a summary of compliance costs for the primary and secondary tin subcategory and a description of the treatment options and subcategory-specific assumptions used to develop these estimates. Together with the estimated pollutant removals presented in Section IX, X, XI, and XII of this supplement, these cost estimates 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 and secondary tin subcategory.

TREATMENT OPTIONS FOR EXISTING SOURCES

As discussed in Section VII, two treatment options have been developed for existing primary and secondary tin sources. The treatment schemes for each option are summarized below and schematically presented in Figures X-1 and X-2.

OPTION A

Option A consists of preliminary treatment consisting of ammonia steam stripping and cyanide precipitation where required and chemical precipitation and sedimentation end-of-pipe technology.

OPTION C

Option C consists of Option A preliminary treatment consisting of ammonia steam stripping and cyanide precipitation where required and chemical precipitation and sedimentation with the addition of multimedia filtration to the end of the Option A treatment scheme.

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 documented in detail in the administrative record supporting this regulation. The costs developed for the proposed regulation are presented in Tables VIII-1 and VIII-2.

Each of the general assumptions used to develop compliance costs is presented in Section VIII of the General Development Document. Each subcategory also contains a unique set of waste streams requiring certain subcategory-specific assumptions to develop compliance costs. The five major assumptions specific to the primary and secondary tin subcategory are discussed briefly below.

(1) The generation of calcium fluoride (CaF_2) during chemical precipitation was accounted for in cases where significant amounts of fluoride were present. If the sludge resulting from chemical precipitation was mostly composed of CaF_2 (> 50 percent), it was assumed to be suitable for resale for use as a fluxing agent. Thus, annual costs for contract hauling of these sludges were not included in these instances.

(2) Ammonia removal costs were not included for treating the tin hydroxide supernatant from spent plating solutions waste stream, which contains treatable levels of ammonia. The ammonia is present as a precipitating agent for tin hydroxide; however it was assumed that sodium carbonate may be used instead of ammonia. It was further assumed that the transition to sodium carbonate can be accomplished at negligible costs.

(3) All sludges produced from wastewater treatment are considered to be nonhazardous except for those resulting from cyanide precipitation, which contain cyanide. Such cyanide bearing sludges are disposed separately based on hazardous waste contract hauling costs.

(4) The sampling values for TSS and aluminum concentration in spent electrowinning solutions were revised. It was assumed that the values reported were in error by a factor of 1000 based on conversations with personnel at one of the two sampled plants and evaluation of the reported data. The concentrations were revised as follows:

	Old	New
TSS	36,500 mg/l	36.5 mg/l
Al	28,700 mg/l	28.7 mg/l

(5) The lime and settle treatability value for tin is 1.07 mg/l, which is based on the average of two sampling values for the effluent at a particular plant.

(6) Cost estimates for cyanide precipitation for plants 1014, 1046, and 1047 do not include costs for a reaction tank and agitator. This was done because in each case the low total flow rates into the treatment system resulted in retention

(or holdup) times in the chemical precipitation tank large enough to allow both cyanide precipitation and chemical precipitation to occur without significantly increasing the tank size. For example, the retention time in the chemical precipitation tank for Plant 1014 was two days or 48 hours. Since the required batch duration for cyanide precipitation was 8.5 hr. and 16 hr. for chemical precipitation, both processes could be accomplished within the time available. The above procedure resulted in a significant reduction in capital investment. Information on the variation of retention times in the chemical precipitation unit operating at low flow rates, is contained in Section VIII of the general development document.

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 and secondary tin 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 Option A are estimated at 790,000 kWh/yr. Option C, which includes filtration, is estimated to increase energy consumption over Option A by approximately one percent. Further, the total energy requirement for Option C is approximately one percent of the estimated total plant 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 and secondary tin subcategory is due to the precipitation of metals as hydroxides and carbonates using lime. Sludges associated with the primary and secondary tin subcategory will necessary contain quantities of toxic metal pollutants. Sludges from primary operations 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. Wastes from secondary metal operations can be regulated as hazardous. However, the Agency examined the solid wastes that would be generaged at secondary nonferrous metals manufacturing plants by the suggested treatment technologies and believes they are not hazardous wastes under the Agency's regulations implementing Section 3001 of RCRA, with one exception. This judgment is based on the results of Extraction Procedure (EP) toxicity tests performed on similar sludges (i.e. toxic-metal-bearing lime 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 from both primary and secondary operations will not be EP toxic if the recommended technology is applied. The one exception is that sludges produced as a result of cyanide precipitation are expected to exhibit hazardous characteristics, and have been treated as such in our analysis.

Although it is the Agency's view that most of the 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 diposition. 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), and 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 Section 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.

It is estimated that 467 metric tons per year of sludge will be generated as a result of these proposed BAT and PSES regulations for the primary and secondary tin subcategory.

AIR POLLUTION

There is no reason to believe that any substantial air pollution problems will result from implementation of ammonia steam stripping, cyanide precipitation, chemical precipitation, sedimentation, and multimedia filtration. Ammonia steam stripping yields an aqueous ammonia stream. The other technologies transfer pollutants to solid waste and are not likely to transfer pollutants to air.

TABLE VIII-1

COST OF COMPLIANCE
FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY
DIRECT DISCHARGERS

Compliance costs for direct dischargers in this subcategory are not presented here because the data on which they are based has been claimed to be confidential.

TABLE VIII-2

COST OF COMPLIANCE
FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY
INDIRECT DISCHARGERS

(MARCH 1982 DOLLARS)

Option	Total Required Capital Cost	Total Annual Cost
A	333,400	112,200
C	341,700	119,900

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)(1)(A). BPT reflects the existing performance by plants of various sizes, ages, and manufacturing processes within the primary and secondary tin subcategory, as well as the established performance of the recommended BPT systems. Particular consideration is given to the treatment already in place at the 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 used, 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. 1976). BPT focuses on end-of-pipe treatment rather than process changes or internal controls, except where such practices are common industry practice.

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 and secondary tin subcategory has been subdivided into ten 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 ten subdivisions.

For each of the subdivisions, a specific approach was followed for the development of BPT mass limitations. The first requirement to calculate these limitations 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. 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 the BPT regualtory 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 chemical precipitation and sedimentation (lime and settle technology). Ammonia steam stripping is applied to streams with treatable concentrations of ammonia and cyanide precipitation is applied to streams with treatable concentrations of cyanide.

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 metric ton of production - mg/kkg) were calculated by multiplying the BPT regulatory flow (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 <u>Federal Register</u> 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 and secondary tin 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/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 effluent reduction benefits, 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 removals and compliance costs is discussed in Section X. Table X-1 shows the pollutant removal estimates for each treatment option for direct dischargers. Compliance costs for direct dischargers are presented in Table X-2.

BPT OPTION SELECTION

The technology basis for the proposed BPT limitations is Option A, chemical precipitation and sedimentation technology to remove metals, fluoride, and solids from combined wastewaters and to control pH, with preliminary treatment consisting of cyanide precipitation and ammonia steam stripping. Chemical precipitation and sedimentation technology is already in-place at two of the three direct dischargers in the subcategory. The pollutants specifically proposed for regulation at BPT are antimony, cyanide, lead, nickel, tin, ammonia, fluoride, TSS, and pH. The BPT treatment scheme is presented schematically in Figure IX-1.

Implementation of the proposed BPT limitations will remove annually an estimated 1,169 kg of toxic metals, 144 kg of cyanide, 237,220 kg of fluoride, and 58,600 kg of TSS. Capital and annual costs for achieving BPT are not presented here because the data on which they are based has been claimed to be confidential.

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

Ammonia steam stripping is demonstrated at seven facilities in the nonferrous metals manufacturing category. These facilities are treating ammonia-bearing wastewaters associated with the production of primary tungsten, primary columbium and tantalum, primary molybdenum, secondary tungsten and cobalt, secondary molybdenum and vanadium, and primary zirconium and hafnium. EPA believes that performance data from the iron and steel manufacturing category provide a valid measure of this technology's performance on nonferrous metals manufacturing category wastewater because raw wastewater concentrations of ammonia are of the same order of magnitude in the respective raw wastewater matrices.

Chemical analysis data were collected of raw waste (treatment influent) and treated waste (treatment effluent) from one coke plant of the iron and steel manufacturing category. A contractor for EPA, using EPA sampling and chemical analysis protocols, collected six paired samples in a two-month period. These data are the data base for determining the effectiveness of ammonia steam stripping technology and are contained within the public record supporting this document. Ammonia treatment at this coke plant consisted of two steam stripping columns in series with steam injected countercurrently to the flow of the wastewater. A lime reactor for pH adjustment separated the two stripping columns.

The Agency has verified the proposed steam stripping performance values using steam stripping data collected at a primary zirconium and hafnium plant which has raw ammonia levels as high as any in the nonferrous metals manufacturing category. Data collected by the plant represent almost two years of daily operations, and support the long-term mean used to establish treatment effectiveness.

We are transferring cyanide precipitation technology and performance to the primary and secondary tin subcategory from coil coating plants. We believe the technology is transferable to these subcategories because the raw wastewater concentrations are of the same order of magnitude as those observed in coil coating wastewater. In that cyanide precipitation converts all cyanide species to complex cyanides and that precipitation of the complexed cyanides is solubility related, we believe that the technology will achieve identical effluent concentrations in both categories.

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 dcp. The discharge rate is used with the achievable treatment concentrations 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 10 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 PNPs, are also listed in Table IX-1.

Section V of this document further describes the discharge flow rates and presents the water use and discharge flow rates for each plant by subdivision in Tables V-1 through V-10.

TIN SMELTER SO_2 SCRUBBER

The BPT wastewater discharge rate for tin smelter SO_2 scrubber water is 21,670 l/kkg (5,210 gal/ton) of tin metal produced. This rate is allocated only to those plants which use wet air pollution control to control SO_2 emissions from tin smelting operations. Only one facility reported tin smelting operations and the use of wet scrubbing. Water use and discharge rates are presented in Table V-1. This facility reports a recycle rate of 50 percent in their smelter scrubber. The BPT flow allowance is based on the wastewater discharge rate reported by this facility.

DEALUMINIZING RINSE

The BPT flow allowance for dealuminizing rinse wastewater is 35 l/kkg (9 gal/ton) of dealuminized scrap produced. This rate is allocated only to those plants which practice dealuminizing of tin bearing steel scrap prior to alkaline detinning. Only one facility reported this practice, which is apparently only necessary when municipal solid waste is used as a raw material. The water use and discharge rates reported by this facility are presented in Table V-2. The BPT flow rate is based on the wastewater discharge rate reported by this facility.

TIN MUD ACID NEUTRALIZATION FILTRATE

The BPT wastewater discharge rate for tin mud acid neutralization filtrate is 5,047 l/kkg (1,210 gal/ton) of neutralized, dewatered tin mud produced. This rate is allocated only to those facilities which neutralize tin mud with sulfuric acid and dewater the neutralized mud. One facility reported this practice. Water use and discharge rates are presented in Table V-3. The BPT flow rate is based on the production normalized flow reported by this facility.

TIN HYDROXIDE WASH

The BPT wastewater discharge rate for tin hydroxide wash water is 11,953 l/kkg (2,869 gal/ton) of tin hydroxide washed. This rate is only allocated to those facilities which use tin hydroxide as a raw material in tin electrowinning operations and wash the tin hydroxide prior to dissolution in a caustic solution. One plant reported this practice. The water use and wastewater discharge rates reported by this facility are presented in Table V-4. The BPT flow rate is based on the wastewater discharge rate reported by this facility.

SPENT ELECTROWINNING SOLUTION FROM NEW SCRAP

The BPT wastewater discharge rate for spent electrowinning solution from new scrap is 16,800 l/kkg (4,029 gal/ton) of cathode tin produced. This rate is allocated only to those plants which produce tin metal by electrowinning. There are eight facilities which produce tin by electrowinning. Six of these eight plants reported sufficient information to calculate a discharge rate from this process. The BPT flow allowance is based on the average of the production normalized flows reported by these six facilities (see Table V-5). These production normalized flows ranged from 10,498 l/kkg to 24,069 l/kkg.

SPENT ELECTROWINNING SOLUTION FROM MUNICIPAL SOLID WASTE

The BPT flow rate for spent electrowinning solution from municipal solid waste is 119 l/kkg (29 gal/ton) of MSW scrap used as a raw material in alkaline detinning operations. This rate is allocated only to those plants which recover secondary tin from municipal solid waste by alkaline detinning and electrowinning. One facility reported the use of municipal solid waste as a raw material in addition to new scrap. This facility discharges four to five times as much spent electrowinning solution per mass of electrolytic tin produced than the average of the other six plants which reported flows for this waste stream. The large flow is a direct result of impurities which are introduced into the electrowinning solution from the municipal solid waste.

This wastewater flow allowance for facilities which process municipal solid waste was calculated by subtracting the facility's BPT flow allowance for spent electrowinning solution from new scrap from the total spent electrowinning solution flow rate reported by the facility. The difference represents the flow due to municipal solid waste processing. This flow was divided by the amount of municipal solid waste scrap which the facility uses as a raw material to alkaline detinning operations.

The resultant production normalized flow rate is 119 l/kkg of municipal solid waste scrap used as a raw material, as shown in Table V-6.

TIN HYDROXIDE SUPERNATANT FROM SCRAP

The BPT wastewater discharge rate for tin hydroxide supernatant from scrap is 55,640 l/kkg (13,354 gal/ton) of tin metal recovered from scrap. This rate is allocated only to those facilities which precipitate tin hydroxide from tin solutions generated from alkaline detinning of tin plated steel scrap. One facility reported this practice. Water use and discharge rates are presented in Table V-7. The BPT flow rate is based on the production normalized flow rate at the one facility currently generating this waste stream.

TIN HYDROXIDE SUPERNATANT FROM SPENT PLATING SOLUTIONS

The BPT wastewater discharge rate for tin hydroxide supernatant from spent plating solutions is 37,978 l/kkg (9,115 gal/ton) of tin metal recovered from spent plating solutions. This rate is allocated only to those facilities which recover tin from spent plating solutions by precipitation of tin hydroxide.

Two facilities reported this practice. Water use and wastewater discharge rates are presented in Table V-8. Only one of the two facilities reported sufficient information to calculate a flow rate for this stream The BPT flow rate is based on the production normalized flow rate reported by this facility.

TIN HYDROXIDE SUPERNATANT FROM SLUDGE SOLIDS

The BPT wastewater discharge rate for tin hydroxide supernatant from sludge solids is 166,362 l/kkg (39,927 gal/ton) of tin metal recovered from sludge solids. This rate is allocated for those facilities which recover tin from tin plating sludge solids by dissolving and precipitating tin hydroxide. One facility reported this practice. Water use and discharge rates are presented in Table V-9. The BPT flow rate is based on the production normalized flow rate reported by this facility.

TIN HYDROXIDE FILTRATE

The BPT wastewater discharge rate for tin hydroxide filtrate is 25,044 l/kkg (6,011 gal/ton) of tin metal produced. This rate is allocated only for those plants which dewater tin hydroxide slurries from tin hydroxide precipitation operations in a filter press. There is currently only one plant which reported this practice. Water use and discharge rates are presented in Table V-10. The BPT wastewater discharge rate for tin hydroxide filtrate is based on the value reported by the one facility which currently generates this waste stream.

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 is presented in Sections VI and X. A total of nine pollutants or pollutant parameters are selected for limitation under BPT and are listed below:

114. antimony
121. cyanide
122. lead
124. nickel
     tin
     ammonia
     fluoride
     TSS
     pH

EFFLUENT LIMITATIONS

The treatable concentrations achievable by application of the proposed BPT are discussed in Section VII of the General Development Document and summarized there in Table VII-19. These treatable 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 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 AND SECONDARY TIN SUBCATEGORY

Wastewater Stream	BPT Normalized Discharge Rate 1/kkg	BPT Normalized Discharge Rate gal/ton	Production Normalizing Parameter
Tin smelter SO_2 scrubber	21,670	5,210	Tin metal produced
Dealuminizing rinse	35	9	Dealuminized scrap produced
Tin mud acid neutralization filtrate	5,047	1,210	Neutralized, dewatered tin mud produced
Tin hydroxide wash	11,953	2,869	Tin hydroxide washed
Spent electrowinning solution from new scrap	16,800	4,029	Cathode tin produced
Spent electrowinning solution from municipal solid waste	119	29	MSW scrap used as a raw material
Tin hydroxide supernatant from scrap	55,640	13,354	Tin metal recovered from scrap
Tin hydroxide supernatant from spent plating solutions	37,978	9,115	Tin metal recovered from spent plating solutions
Tin hydroxide supernatant from sludge solids	166,362	39,927	Tin metal recovered from sludge solids
Tin hydroxide filtrate	25,044	6,011	Tin metal produced

Table IX-2

BPT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(a) Tin Smelter SO_2 Scrubber

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal produced		
Antimony	62.190	27.740
Lead	9.102	4.334
Nickel	41.610	27.520
Cyanide (total)	6.284	2.600
Ammonia (as N)	2,889.000	1,270.000
Fluoride	758.500	433.400
Tin	106.600	47.240
Total suspended solids	888.500	422.600
pH	Within the range of 7.5 to 10.0 at all times	

(b) Dealuminizing Rinse

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of dealuminized scrap produced		
Antimony	0.101	0.045
Lead	0.015	0.007
Nickel	0.067	0.044
Cyanide (total)	0.010	0.004
Ammonia (as N)	4.666	2.051
Fluoride	1.225	0.700
Tin	0.172	0.076
Total suspended solids	1.435	0.683
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (continued)

BPT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(c) Tin Mud Acid Neutralization Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of neutralized dewatered tin mud produced		
Antimony	14.490	6.460
Lead	2.120	1.010
Nickel	9.690	6.410
Cyanide (total)	1.464	0.606
Ammonia (as N)	672.800	295.800
Fluoride	176.700	101.000
Tin	24.830	11.000
Total suspended solids	206.900	98.420
pH	Within the range of 7.5 to 10.0 at all times	

(d) Tin Hydroxide Wash

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin hydroxide washed		
Antimony	34.310	15.300
Lead	5.020	2.391
Nickel	22.950	15.180
Cyanide (total)	3.466	1.434
Ammonia (as N)	1,593.000	700.400
Fluoride	418.400	239.100
Tin	58.810	26.058
Total suspended solids	490.100	233.100
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (continued)

BPT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(e) Spent Electrowinning Solution from New Scrap

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of cathode tin produced		
Antimony	48.220	21.510
Lead	7.056	3.360
Nickel	32.260	21.340
Cyanide (total)	4.872	2.016
Ammonia (as N)	2,239.000	984.500
Fluoride	588.000	336.000
Tin	82.660	36.620
Total suspended solids	688.800	327.600
pH	Within the range of 7.5 to 10.0 at all times	

(f) Spent Electrowinning Solution from Municipal Solid Waste

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of MSW scrap used as raw material		
Antimony	0.342	0.152
Lead	0.050	0.024
Nickel	0.229	0.151
Cyanide (total)	0.035	0.014
Ammonia (as N)	15.860	6.973
Fluoride	4.165	2.380
Tin	0.585	0.259
Total suspended solids	4.879	2.321
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (continued)

BPT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(g) Tin Hydroxide Supernatant from Scrap

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from scrap		
Antimony	159.700	71.220
Lead	23.370	11.130
Nickel	106.800	70.660
Cyanide (total)	16.140	6.677
Ammonia (as N)	7,417.000	3,261.000
Fluoride	1,948.000	1,113.000
Tin	273.700	121.300
Total suspended solids	2,281.000	1,085.000
pH	Within the range of 7.5 to 10.0 at all times	

(h) Tin Hydroxide Supernatant from Spent Plating Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from spent plating solutions		
Antimony	109.000	48.610
Lead	15.950	7.596
Nickel	72.920	48.230
Cyanide (total)	11.010	4.557
Ammonia (as N)	5,062.000	2,226.000
Fluoride	1,329.000	759.600
Tin	186.900	82.790
Total suspended solids	1,557.000	740.600
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (continued)

BPT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(i) Tin Hydroxide Supernatant from Sludge Solids

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from sludge solids		
Antimony	477.500	213.000
Lead	69.870	33.270
Nickel	319.400	211.300
Cyanide (total)	48.240	19.960
Ammonia (as N)	22,180.000	9,749.000
Fluoride	5,823.000	3,327.000
Tin	818.500	362.700
Total suspended solids	6,821.000	3,244.000
pH	Within the range of 7.5 to 10.0 at all times	

(j) Tin Hydroxide Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal produced		
Antimony	71.880	32.060
Lead	10.520	5.009
Nickel	48.090	31.810
Cyanide (total)	7.263	3.005
Ammonia (as N)	3,338.000	1,468.000
Fluoride	876.600	500.900
Tin	123.200	54.600
Total suspended solids	1,027.000	488.400
pH	Within the range of 7.5 to 10.0 at all times	

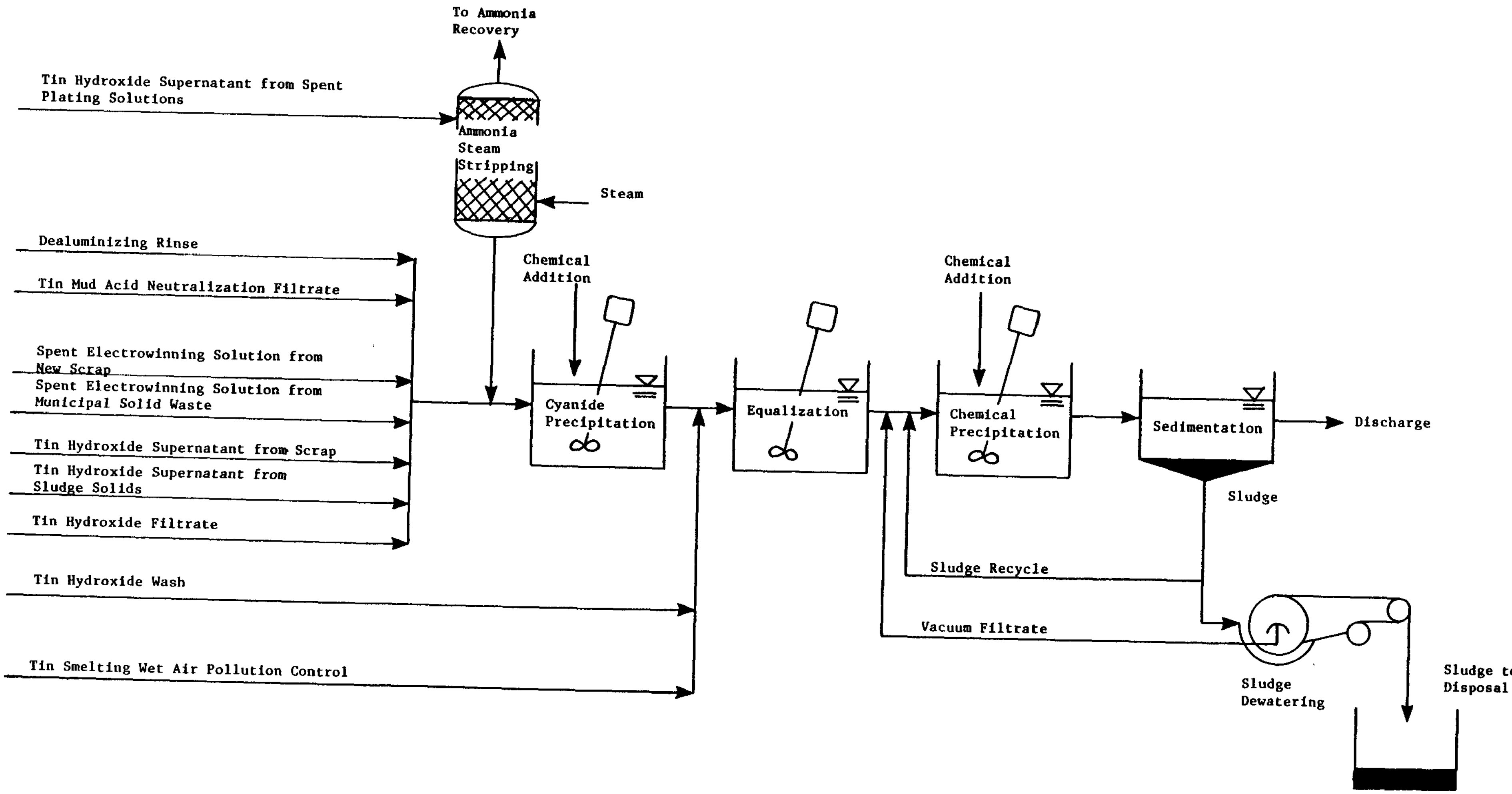

Figure IX-1

BPT TREATMENT SCHEME

PRIMARY AND SECONDARY TIN 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 industry 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 technology represents the best available technology at plants of various ages, sizes, processes, or other characteristics. As with BPT, 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 industry practice.

The statutory assessment of BAT considers costs, but does not require a balancing of costs against effluent reduction benefits (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 selected 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 two technology options which could be applied to the primary and secondary tin subcategory as treatment options 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 increase treatment effectiveness achievable with the more sophisticated BAT treatment technology.

In summary the treatment technologies considered for BAT are presented below:

Option A (Figure X-1) is based on

- Preliminary treatment with ammonia steam stripping and cyanide precipitation
- Chemical precipitation and sedimentation

Option C (Figure X-2) is based on

- Preliminary treatment with ammonia steam stripping and cyanide precipitation
- Chemical precipitation and sedimentation
- Multimedia filtration

The two options examined for BAT are discussed in greater detail below. The first option considered is the same as the BPT treatment which was presented in the previous section. The latter option represents substantial progress toward the prevention of polluting the environment above and beyond the progress achievable by BPT.

OPTION A

Option A for the primary and secondary tin 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, with ammonia steam stripping and cyanide precipitation preliminary treatment (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 C

Option C for the primary and secondary tin subcategory consists of all control and treatment requirements of Option A (ammonia steam stripping, cyanide precipitation, chemical precipitation and sedimentation) plus multimedia filtration technology added at the end of the Option A treatment scheme (see Figure X-2). Multimedia filtration is used to remove suspended solids, including precipitates of toxic metals, beyond the concentrations 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 as well.

INDUSTRY COST AND POLLUTANT REMOVAL ESTIMATES

As one means of evaluating each technology option, EPA developed estimates of the pollutant reduction 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, 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 and secondary tin 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 first 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. Finally, the mass of pollutant removed is the difference between the estimated mass of pollutant generated by each plant in the subcategory and the mass of pollutant discharged after application of the treatment option.

The pollutant removal estimates for the primary and secondary tin subcategory are presented in Table X-1, for direct dischargers.

COMPLIANCE COSTS

In estimating subcategory-wide compliance costs, the first step was to develop a cost model, relating the total costs associated with installation and operation of wastewater treatment technologies to plant process wastewater discharge. EPA applied the model on a per plant basis, a plant's costs - both capital, and operating and maintenance - being determined by what treatment it has in place and by its individual process wastewater discharge (from dcp). The final step was to annualize the capital costs, and to sum the annualized capital costs, and the operating and maintenance costs, yielding the cost of compliance for the subcategory (see Table X-2). 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 ammonia steam stripping and cyanide precipitation when required, and end-of-pipe treatment consisting of chemical precipitation and sedimentation, and polishing filtration.

The pollutants specifically limited under BAT are antimony, cyanide, lead, nickel, tin, ammonia, and fluoride. The toxic pollutants arsenic, cadmium, chromium, copper, selenium, silver, thallium and zinc 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 1,260 kg of toxic metals, which is 91 kg of toxic metals more than the estimated BPT discharge. Capital and annual costs for this subcategory are not presented here because the data on which they are based has been claimed to be confidential.

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 dcp. 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 wastewater sources were determined and are summarized in Table X-3. 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.

The BAT wastewater discharge rate equals the BPT wastewater discharge rate for all of the waste streams in the primary and secondary tin subcategory. Based on the available data, the Agency did not find that further flow reduction would be feasible for any of these wastewater sources. The rationale for determining these regulatory flows is presented in Section IX.

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)(Aand 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 pollutants and pollutant parameters for limitation. This examination and evaluation was presented in Section VI. The Agency, however, has chosen not to regulate all 12 toxic pollutants selected in this analysis.

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 wastewater 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 estimate analysis. The pollutants selected for specific limitation are listed below:

114. antimony
121. cyanide
122. lead
124. nickel
ammonia (as N)
fluoride
tin

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 lime 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 subcategory to control the dischargges of toxic metal pollutants are antimony, lead, and nickel. Cyanide is selected for limitation because the methods used to control antimony, lead, nickel and ammonia are not effective in the control of cyanide. The following toxic pollutants are excluded from limitation on the basis that they are effectively controlled by the limitations developed for antimony, lead and nickel.

115. arsenic
118. cadmium
119. chromium (Total)
120. copper
125. selenium
126. silver
127. thallium
128. zinc

EFFLUENT LIMITATIONS

The concentrations achievable by application of BAT are discussed in Section VII of the General Development Document and summarized there in Table VII-19. The treatability concentrations (both one day maximum and monthly average values) are multiplied by the BAT normalized discharge flows summarized in Table X-3 to calculate the mass of pollutants allowed to be discharged per mass of product. The results of these calculations in milligrams of pollutant per kilogram of product represent the BAT effluent limitations and are presented in Table X-4 for each waste stream.

Table X-1

PRIMARY AND SECONDARY TIN SUBCATEGORY POLLUTANT REMOVAL ESTIMATES
DIRECT DISCHARGERS

Pollutant	Raw Discharge (kg/yr)	Option A Discharge (kg/yr)	Option A Removed (kg/yr)	Option C Discharge (kg/yr)	Option C Removed (kg/yr)
Antimony	388.07	66.05	322.02	43.96	344.11
Arsenic	321.95	38.38	283.57	26.47	295.48
Cadmium	19.15	7.19	11.96	4.58	14.57
Chromium (total)	15.24	6.31	8.94	5.32	9.92
Copper	20.82	18.82	2.00	18.46	2.37
Cyanide (total)	144.87	1.04	143.84	1.01	143.87
Lead	79.65	9.61	70.03	6.79	72.85
Mercury	0	0	0	0	0
Nickel	250.64	56.47	194.17	20.17	230.48
Selenium	113.51	3.28	110.23	3.03	110.48
Silver	17.61	7.08	10.53	4.99	12.62
Thallium	148.38	37.93	110.46	26.70	121.68
Zinc	63.39	18.23	45.15	17.97	45.42
TOTAL TOXICS	1,583.29	270.40	1,312.89	179.45	1,403.85
Ammonia	145.37	107.84	37.54	107.64	37.74
Fluoride	237,583.39	361.56	237,221.83	233.45	237,349.94
Tin*	10,385.32	3.88	10,381.44	3.09	10,382.23
TOTAL NONCONVENTIONALS	237,728.77	469.40	237,259.36	341.09	237,387.68
TSS	59,731.39	1,132.29	58,599.11	243.17	59,488.22
Oil and Grease	2,187.11	1,659.08	528.03	1,570.01	617.10
TOTAL CONVENTIONALS	61,918.50	2,791.36	59,127.14	1,813.18	60,105.31
TOTAL POLLUTANTS	301,230.56	3,531.17	297,699.39	2,333.72	298,896.84

*Pollutant benefit is calculated but not included in the totals.

Table X-2

COST OF COMPLIANCE FOR THE PRIMARY AND
SECONDARY TIN SUBCATEGORY DIRECT DISCHARGERS

Compliance costs for direct dischargers in this subcategory are not presented here becuase the data on which they are based have been claimed to be confidential.

Table X-3

BAT WASTEWATER DISCHARGE RATES FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

Wastewater Stream	BAT Normalized Discharge Rate 1/kkg	BAT Normalized Discharge Rate gal/ton	Production Normalizing Parameter
Tin smelter SO_2 scrubber	21,670	5,210	Tin metal produced
Dealuminizing rinse	35	9	Dealuminized scrap produced
Tin mud acid neutralization filtrate	5,047	1,210	Neutralized, dewatered tin mud produced
Tin hydroxide wash	11,953	2,869	Tin hydroxide washed
Spent electrowinning solution from new scrap	16,800	4,029	Cathode tin produced
Spent electrowinning solution from municipal solid waste	119	29	MSW scrap used as a raw material
Tin hydroxide supernatant from scrap	55,640	13,354	Tin metal recovered from scrap
Tin hydroxide supernatant from spent plating solutions	37,978	9,115	Tin metal recovered from spent plating solutions
Tin hydroxide supernatant from sludge solids	166,362	39,927	Tin metal recovered from sludge solids
Tin hydroxide filtrate	25,044	6,011	Tin metal produced

Table X-4

BAT MASS LIMITATIONS FOR THE
PRIMARY AND SECONDARY TIN SUBCATEGORY

(a) Tin Smelter SO_2 Scrubber

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal produced		
Antimony	41.830	18.640
Lead	6.068	2.817
Nickel	11.920	8.018
Cyanide (total)	4.334	1.734
Ammonia (as N)	2,889.000	1,270.000
Fluoride	758.500	433.400
Tin	71.080	31.640

(b) Dealuminizing Rinse

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of dealuminized scrap produced		
Antimony	0.068	0.030
Lead	0.010	0.005
Nickel	0.019	0.013
Cyanide (total)	0.0070	0.0028
Ammonia (as N)	4.666	2.051
Fluoride	1.225	0.700
Tin	0.115	0.051

Table X-4 (continued)

BAT MASS LIMITATIONS FOR THE
PRIMARY AND SECONDARY TIN SUBCATEGORY

(c) Tin Mud Acid Neutralization Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of neutralized dewatered tin mud produced		
Antimony	9.741	4.341
Lead	1.413	0.656
Nickel	2.776	1.868
Cyanide (total)	1.009	0.404
Ammonia (as N)	672.800	295.800
Fluoride	176.700	101.000
Tin	16.550	7.370

(d) Tin Hydroxide Wash

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin hydroxide washed		
Antimony	23.070	10.280
Lead	3.347	1.554
Nickel	6.574	4.423
Cyanide (total)	2.391	0.956
Ammonia (as N)	1,593.000	700.400
Fluoride	418.400	239.100
Tin	39.210	17.450

Table X-4 (continued)

BAT MASS LIMITATIONS FOR THE
PRIMARY AND SECONDARY TIN SUBCATEGORY

(e) Spent Electrowinning Solution from New Scrap

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of cathode tin produced		
Antimony	32.430	14.450
Lead	4.704	2.184
Nickel	9.240	6.216
Cyanide (total)	3.360	1.344
Ammonia (as N)	2,239.000	984.500
Fluoride	588.000	336.000
Tin	55.100	24.530

(f) Spent Electrowinning Solution from Municipal Solid Waste

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of MSW scrap used as raw material		
Antimony	0.230	0.102
Lead	0.033	0.015
Nickel	0.065	0.044
Cyanide (total)	0.0238	0.0095
Ammonia (as N)	15.860	6.973
Fluoride	4.165	2.380
Tin	0.390	0.174

Table X-4 (continued)

BAT MASS LIMITATIONS FOR THE
PRIMARY AND SECONDARY TIN SUBCATEGORY

(g) Tin Hydroxide Supernatant from Scrap

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from scrap		
Antimony	107.400	47.850
Lead	15.580	7.233
Nickel	30.600	20.590
Cyanide (total)	11.130	4.451
Ammonia (as N)	7,417.000	3,261.000
Fluoride	1,948.000	1,113.000
Tin	182.500	81.230

(h) Tin Hydroxide Supernatant from Spent Plating Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from spent plating soultions		
Antimony	73.300	32.660
Lead	10.640	4.937
Nickel	20.890	14.050
Cyanide (total)	7.596	3.038
Ammonia (as N)	5,062.000	2,226.000
Fluoride	1,329.000	759.600
Tin	124.600	55.450

Table X-4 (continued)

BAT MASS LIMITATIONS FOR THE
PRIMARY AND SECONDARY TIN SUBCATEGORY

(i) Tin Hydroxide Supernatant from Sludge Solids

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from sludge solids		
Antimony	321.100	143.100
Lead	46.580	21.630
Nickel	91.500	61.560
Cyanide (total)	33.270	13.310
Ammonia (as N)	22,180.000	9,749.000
Fluoride	5,823.000	3,327.000
Tin	545.700	242.900

(j) Tin Hydroxide Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal produced		
Antimony	48.340	21.540
Lead	7.013	3.256
Nickel	13.780	9.266
Cyanide (total)	5.009	2.004
Ammonia (as N)	3,338.000	1,468.000
Fluoride	876.600	500.900
Tin	82.140	36.560

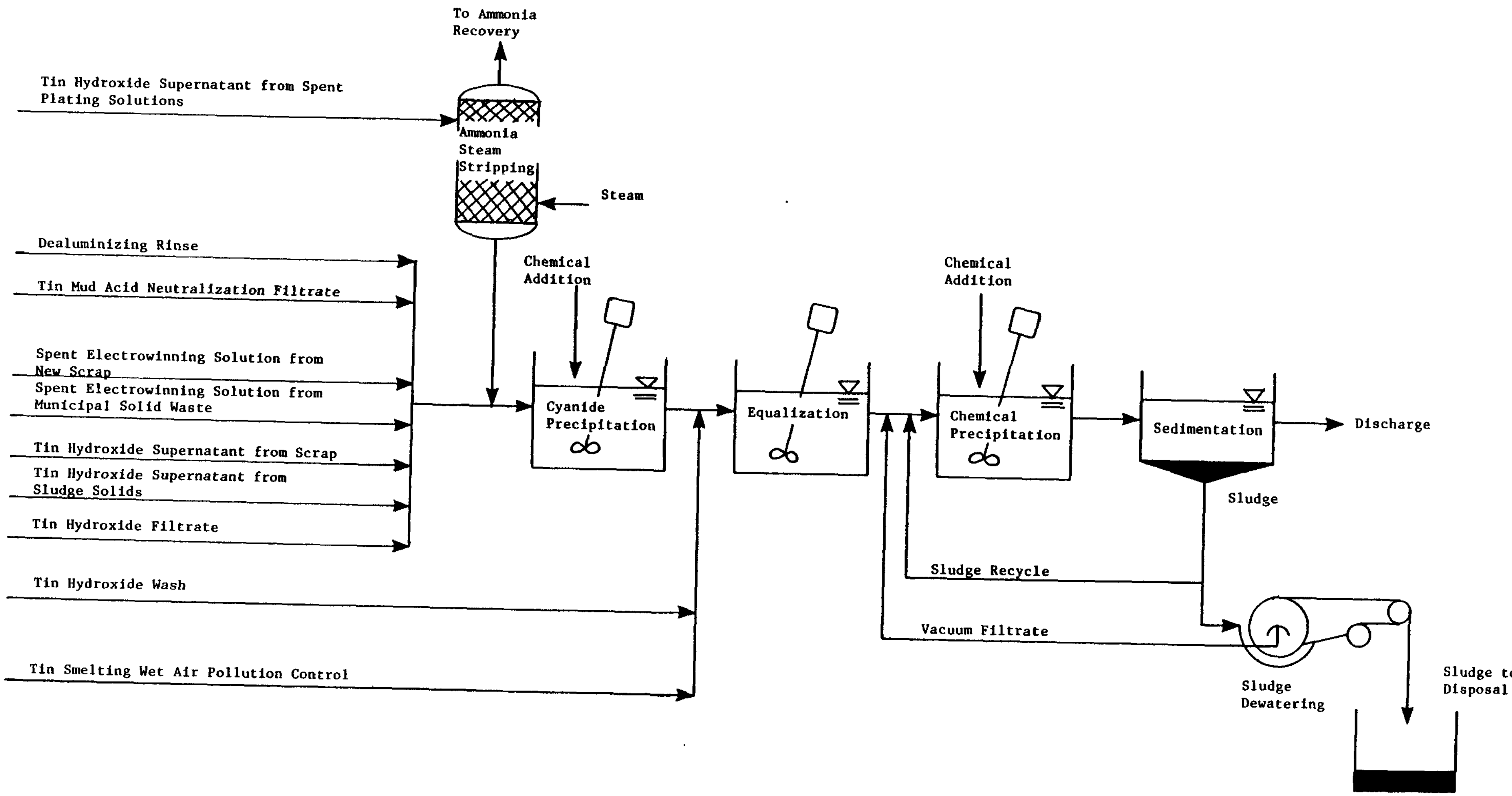

Figure X-1

BAT TREATMENT SCHEME FOR OPTION A

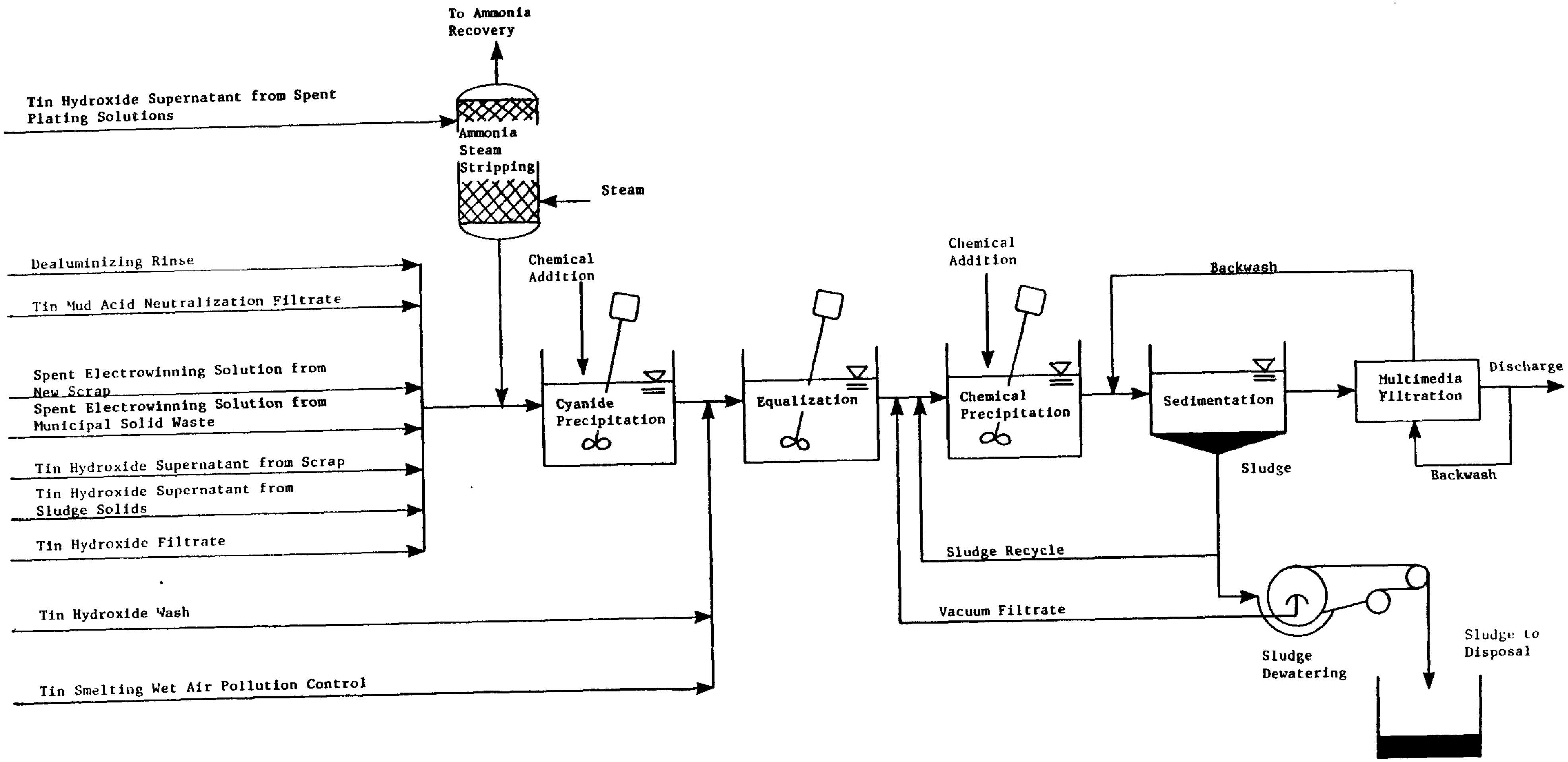

Figure X-2

BAT TREATMENT SCHEME FOR OPTION C

PRIMARY AND SECONDARY TIN 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 and secondary tin 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 and secondary tin plants. This result is a consequence of careful review by the Agency of a wide range of technology options for new source treatment systems which is discussed in Section XI of the General Development Document. This review of the primary and secondary tin 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 ammonia steam stripping and cyanide precipitation (where required)
- Chemical precipitation and sedimentation

OPTION C

- Preliminary treatment with ammonia steam stripping and cyanide precipitation (where required)
- Chemical precipitation and sedimentation
- 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 pose a barrier to 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 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 based upon the product of the appropriate treatable concentration (mg/l) and the production normalized wastewater discharge flows. 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 AND SECONDARY TIN SUBCATEGORY

Wastewater Stream	NSPS Normalized Discharge Rate 1/kkg	NSPS Normalized Discharge Rate gal/ton	Production Normalizing Parameter
Tin smelter SO_2 scrubber	21,670	5,210	Tin metal produced
Dealuminizing rinse	35	9	Dealuminized scrap produced
Tin mud acid neutralization filtrate	5,047	1,210	Neutralized, dewatered tin mud produced
Tin hydroxide wash	11,953	2,869	Tin hydroxide washed
Spent electrowinning solution from new scrap	16,800	4,029	Cathode tin produced
Spent electrowinning solution from municipal solid waste	119	29	MSW scrap used as a raw material
Tin hydroxide supernatant from scrap	55,640	13,354	Tin metal recovered from scrap
Tin hydroxide supernatant from spent plating solutions	37,978	9,115	Tin metal recovered from spent plating solutions
Tin hydroxide supernatant from sludge solids	166,362	39,927	Tin metal recovered from sludge solids
Tin hydroxide filtrate	25,044	6,011	Tin metal produced

Table XI-2

NSPS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(a) Tin Smelter SO_2 Scrubber

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal produced		
Antimony	41.830	18.640
Lead	6.068	2.817
Nickel	11.920	8.018
Cyanide (total)	4.334	1.734
Ammonia (as N)	2,889.000	1,270.000
Fluoride	758.500	433.400
Tin	71.080	31.640
Total suspended solids	325.100	260.100
pH	Within the range of 7.5 to 10.0 at all times	

(b) Dealuminizing Rinse

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of dealuminized scrap produced		
Antimony	0.068	0.030
Lead	0.010	0.005
Nickel	0.019	0.013
Cyanide (total)	0.0070	0.0028
Ammonia (as N)	4.666	2.051
Fluoride	1.225	0.700
Tin	0.115	0.051
Total suspended solids	0.525	0.420
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (continued)

NSPS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(c) Tin Mud Acid Neutralization Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of neutralized dewatered tin mud produced		
Antimony	9.741	4.341
Lead	1.413	0.656
Nickel	2.776	1.868
Cyanide (total)	1.009	0.404
Ammonia (as N)	672.800	295.800
Fluoride	176.700	101.000
Tin	16.550	7.370
Total suspended solids	75.710	60.570
pH	Within the range of 7.5 to 10.0 at all times	

(d) Tin Hydroxide Wash

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin hydroxide washed		
Antimony	23.070	10.280
Lead	3.347	1.554
Nickel	6.574	4.423
Cyanide (total)	2.391	0.956
Ammonia (as N)	1,593.000	700.400
Fluoride	418.400	239.100
Tin	39.210	17.450
Total suspended solids	179.300	143.500
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (continued)

NSPS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(e) Spent Electrowinning Solution from New Scrap

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of cathode tin produced		
Antimony	32.430	14.450
Lead	4.704	2.184
Nickel	9.240	6.216
Cyanide (total)	3.360	1.344
Ammonia (as N)	2,239.000	984.500
Fluoride	588.000	336.000
Tin	55.100	24.530
Total suspended solids	252.000	201.600
pH	Within the range of 7.5 to 10.0 at all times	

(f) Spent Electrowinning Solution from Municipal Solid Waste

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of MSW scrap used as raw material		
Antimony	0.230	0.102
Lead	0.033	0.015
Nickel	0.065	0.044
Cyanide (total)	0.0238	0.0095
Ammonia (as N)	15.860	6.973
Fluoride	4.165	2.380
Tin	0.390	0.174
Total suspended solids	1.785	1.428
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (continued)

NSPS FOR THE PRIMARY AND
SECONDARY TIN SUBCATEGORY

(g) Tin Hydroxide Supernatant from Scrap

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from scrap		
Antimony	107.400	47.850
Lead	15.580	7.233
Nickel	30.600	20.590
Cyanide (total)	11.130	4.451
Ammonia (as N)	7,417.000	3,261.000
Fluoride	1,948.000	1,113.000
Tin	182.500	81.230
Total suspended solids	834.600	667.700
pH	Within the range of 7.5 to 10.0 at all times	

(h) Tin Hydroxide Supernatant from Spent Plating Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from spent plating solutions		
Antimony	73.300	32.660
Lead	10.640	4.937
Nickel	20.890	14.050
Cyanide (total)	7.596	3.038
Ammonia (as N)	5,062.000	2,226.000
Fluoride	1,329.000	759.600
Tin	124.600	55.450
Total suspended solids	569.700	455.800
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (continued)

NSPS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(i) Tin Hydroxide Supernatant from Sludge Solids

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from sludge solids		
Antimony	321.100	143.100
Lead	46.580	21.630
Nickel	91.500	61.560
Cyanide (total)	33.270	13.310
Ammonia (as N)	22,180.000	9,749.000
Fluoride	5,823.000	3,327.000
Tin	545.700	242.900
Total suspended solids	2,496.000	1,997.000
pH	Within the range of 7.5 to 10.0 at all times	

(j) Tin Hydroxide Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal produced		
Antimony	48.340	21.540
Lead	7.013	3.256
Nickel	13.780	9.266
Cyanide (total)	5.009	2.004
Ammonia (as N)	3,338.000	1,468.000
Fluoride	876.600	500.900
Tin	82.140	36.560
Total suspended solids	375.700	300.500
pH	Within the range of 7.5 to 10.0 at all times	

PRIMARY AND SECONDARY TIN 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.

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

<u>TECHNICAL APPROACH TO PRETREATMENT</u>

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.

INDUSTRY COST AND POLLUTANT REMOVAL ESTIMATES

The industry cost and pollutant removal estimates of each treatment option were used to determine the most cost-effective option. The methodology applied in calculating pollutant removal estimates and plant compliance costs is discussed in Section X. Table XII-1 shows the estimated pollutant removals for indirect dischargers. Compliance costs for indirect dischargers are presented in Table XII-2.

PRETREATMENT STANDARDS FOR EXISTING AND NEW SOURCES

Options for pretreatment of wastewaters from both existing and 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 and PSES, therefore, are the same as the BAT options discussed in Section X.

A description of each option is presented in Section X, 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 and PSES options are:

OPTION A

- Preliminary treatment with ammonia steam stripping and cyanide precipitation (where required)
- Chemical precipitation and sedimentation

OPTION C

- Preliminary treatment with ammonia steam stripping and cyanide precipitation (where required)
- Chemical precipitation and sedimentation
- Multimedia filtration

PSNS AND PSES OPTION SELECTION

We are proposing PSES equal to BAT for this subcategory. It is necessary to propose PSES to prevent pass-through of antimony, cyanide, lead, nickel, tin, ammonia, and fluoride. The four toxic pollutants and fluoride are removed by a well-operated POTW achieving secondary treatment at an average of 17 percent while BAT technology removes approximately 97 percent.

The technology basis for PSES thus is chemical precipitation and sedimentation, with preliminary treatment consisting of ammonia steam stripping and cyanide precipitation, and filtration.

Implementation of the proposed PSES limitations would remove annually an estimated 152 kg of toxic metals, 6,282 kg of tin, 32 kg of cyanide and 25,105 kg of fluoride. Removals over estimated raw discharge are the same as removals over current discharge because neither of the indirect dischargers in this subcategory has any treatment in-place. Capital cost for achieving proposed PSES is $341,700, and annual cost is $119,900. The proposed PSES will not result in adverse economic impacts.

We are proposing PSNS equivalent to PSES, NSPS and BAT. The technology basis for proposed PSNS is identical to NSPS, PSES, and BAT. The same pollutants pass through at PSNS as at PSES, for the same reasons. We know of no economically feasible, demonstrated technology that is better than PSES technology. The PSNS flow allowances are identical to the flow allowances for BAT, NSPS, and PSES.

There would be no additional cost for PSNS above the costs estimated for 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 PSES and PSNS to prevent the pass-through of antimony, cyanide, lead, nickel, tin, fluoride, and ammonia, which are the limited pollutants.

PRETREATMENT STANDARDS

Pretreatment standards are based on the treatable concentrations from the selected treatment technology, (Option C), and the discharge rates determined in Section X for BAT. A mass of pollutant per mass of product (mg/kg) 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. The achievable treatment concentrations for BAT are identical to those for PSES and PSNS. These concentrations are listed in Tables XII-19 of the General Development Document. PSES and PSNS are presented in Tables XII-4 and XII-5.

Table XII-1

PRIMARY AND SECONDARY TIN SUBCATEGORY POLLUTANT REMOVAL ESTIMATES
INDIRECT DISCHARGERS

Pollutant	Raw Discharge (kg/yr)	Option A Discharge (kg/yr)	Option A Removed (kg/yr)	Option C Discharge (kg/yr)	Option C Removed (kg/yr)
Antimony	9.35	1.43	7.92	0.96	8.39
Arsenic	7.67	0.51	7.16	0.48	7.19
Cadmium	1.30	0.15	1.15	0.10	1.20
Chromium (total)	1.51	0.07	1.44	0.06	1.45
Copper	1.36	0.26	1.10	0.26	1.10
Cyanide (total)	32.21	0.14	32.07	0.10	32.12
Lead	4.81	0.17	4.64	0.16	4.65
Mercury	0	0	0	0	0
Nickel	13.36	0.77	12.59	0.45	12.91
Selenium	79.30	0.38	78.92	0.36	78.94
Silver	1.15	0.02	1.13	0.01	1.14
Thallium	7.74	0.38	7.36	0.35	7.39
Zinc	28.23	0.50	27.72	0.47	27.76
TOTAL TOXICS	187.99	4.77	183.21	3.76	184.23
Ammonia	87.07	4.29	82.78	4.29	82.78
Fluoride	25,123.17	26.95	25,096.22	17.98	25,105.18
Tin*	6,282.98	2.08	6,280.90	1.34	6,281.65
TOTAL NONCONVENTIONALS	25,210.24	31.24	25,179.00	22.28	25,187.96
TSS	570.45	24.50	545.96	5.31	565.15
Oil and Grease	41.01	18.85	22.15	18.85	22.15
TOTAL CONVENTIONALS	611.46	43.35	568.11	24.16	587.30
TOTAL POLLUTANTS	26,009.69	79.37	25,930.32	50.19	25,959.49

*Pollutant benefit is calculated but not included in the totals.

Table XII-2

COST OF COMPLIANCE FOR THE
PRIMARY AND SECONDARY TIN SUBCATEGORY
INDIRECT DISCHARGERS

(March, 1982 Dollars)

Option	Total Required Capital Cost	Total Annual Cost
A	333,400	112,200
C	341,700	119,900

Table XII-3

PSES AND PSNS WASTEWATER DISCHARGE RATES FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

Wastewater Stream	PSES and PSNS Normalized Discharge Rate 1/kkg	PSES and PSNS Normalized Discharge Rate gal/ton	Production Normalizing Parameter
Tin smelter SO_2 scrubber	21,670	5,210	Tin metal produced
Dealuminizing rinse	35	9	Dealuminized scrap produced
Tin mud acid neutralization filtrate	5,047	1,210	Neutralized, dewatered tin mud produced
Tin hydroxide wash	11,953	2,869	Tin hydroxide washed
Spent electrowinning solution from new scrap	16,800	4,029	Cathode tin produced
Spent electrowinning solution from municipal solid waste	119	29	MSW scrap used as a raw material
Tin hydroxide supernatant from scrap	55,640	13,354	Tin metal recovered from scrap
Tin hydroxide supernatant from spent plating solutions	37,978	9,115	Tin metal recovered from spent plating solutions
Tin hydroxide supernatant from sludge solids	166,362	39,927	Tin metal recovered from sludge solids
Tin hydroxide filtrate	25,044	6,011	Tin metal produced

Table XII-4

PSES FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(a) Tin Smelter SO_2 Scrubber

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal produced		
Antimony	41.830	18.640
Lead	6.068	2.817
Nickel	11.920	8.018
Cyanide (total)	4.334	1.734
Ammonia (as N)	2,889.000	1,270.000
Fluoride	758.500	433.400
Tin	71.080	31.640

(b) Dealuminizing Rinse

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of dealuminized scrap produced		
Antimony	0.068	0.030
Lead	0.010	0.005
Nickel	0.019	0.013
Cyanide (total)	0.0070	0.0028
Ammonia (as N)	4.666	2.051
Fluoride	1.225	0.700
Tin	0.115	0.051

Table XII-4 (continued)

PSES FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(c) Tin Mud Acid Neutralization Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of neutralized dewatered tin mud produced		
Antimony	9.741	4.341
Lead	1.413	0.656
Nickel	2.776	1.868
Cyanide (total)	1.009	0.404
Ammonia (as N)	672.800	295.800
Fluoride	176.700	101.000
Tin	16.550	7.370

(d) Tin Hydroxide Wash

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin hydroxide washed		
Antimony	23.070	10.280
Lead	3.347	1.554
Nickel	6.574	4.423
Cyanide (total)	2.391	0.956
Ammonia (as N)	1,593.000	700.400
Fluoride	418.400	239.100
Tin	39.210	17.450

Table XII-4 (continued)

PSES FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(e) Spent Electrowinning Solution from New Scrap

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of cathode tin produced		
Antimony	32.430	14.450
Lead	4.704	2.184
Nickel	9.240	6.216
Cyanide (total)	3.360	1.344
Ammonia (as N)	2,239.000	984.500
Fluoride	588.000	336.000
Tin	55.100	24.530

(f) Spent Electrowinning Solution from Municipal Solid Waste

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of MSW scrap used as raw material		
Antimony	0.230	0.102
Lead	0.033	0.015
Nickel	0.065	0.044
Cyanide (total)	0.0238	0.0095
Ammonia (as N)	15.860	6.973
Fluoride	4.165	2.380
Tin	0.390	0.174

Table XII-4 (continued)

PSES FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(g) Tin Hydroxide Supernatant from Scrap

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from scrap		
Antimony	107.400	47.850
Lead	15.580	7.233
Nickel	30.600	20.590
Cyanide (total)	11.130	4.451
Ammonia (as N)	7,417.000	3,261.000
Fluoride	1,948.000	1,113.000
Tin	182.500	81.230

(h) Tin Hydroxide Supernatant from Spent Plating Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from spent plating solutions		
Antimony	73.300	32.660
Lead	10.640	4.937
Nickel	20.890	14.050
Cyanide (total)	7.596	3.038
Ammonia (as N)	5,062.000	2,226.000
Fluoride	1,329.000	759.600
Tin	124.600	55.450

Table XII-4 (continued)

PSES FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(i) Tin Hydroxide Supernatant from Sludge Solids

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from sludge solids		
Antimony	321.100	143.100
Lead	46.580	21.630
Nickel	91.500	61.560
Cyanide (total)	33.270	13.310
Ammonia (as N)	22,180.000	9,749.000
Fluoride	5,823.000	3,327.000
Tin	545.700	242.900

(j) Tin Hydroxide Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal produced		
Antimony	48.340	21.540
Lead	7.013	3.256
Nickel	13.780	9.266
Cyanide (total)	5.009	2.004
Ammonia (as N)	3,338.000	1,468.000
Fluoride	876.600	500.900
Tin	82.140	36.560

Table XII-5

PSNS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(a) Tin Smelter SO_2 Scrubber

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal produced		
Antimony	41.830	18.640
Lead	6.068	2.817
Nickel	11.920	8.018
Cyanide (total)	4.334	1.734
Ammonia (as N)	2,889.000	1,270.000
Fluoride	758.500	433.400
Tin	71.080	31.640

(b) Dealuminizing Rinse

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of dealuminized scrap produced		
Antimony	0.068	0.030
Lead	0.010	0.005
Nickel	0.019	0.013
Cyanide (total)	0.0070	0.0028
Ammonia (as N)	4.666	2.051
Fluoride	1.225	0.700
Tin	0.115	0.051

Table XII-5 (continued)

PSNS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(c) Tin Mud Acid Neutralization Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of neutralized dewatered tin mud produced		
Antimony	9.741	4.341
Lead	1.413	0.656
Nickel	2.776	1.868
Cyanide (total)	1.009	0.404
Ammonia (as N)	672.800	295.800
Fluoride	176.700	101.000
Tin	16.550	7.370

(d) Tin Hydroxide Wash

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin hydroxide washed		
Antimony	23.070	10.280
Lead	3.347	1.554
Nickel	6.574	4.423
Cyanide (total)	2.391	0.956
Ammonia (as N)	1,593.000	700.400
Fluoride	418.400	239.100
Tin	39.210	17.450

Table XII-5 (continued)

PSNS FOR THE PRIMARY AND SECONDARY TIN SUBCATEGORY

(e) Spent Electrowinning Solution from New Scrap

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of cathode tin produced		
Antimony	32.430	14.450
Lead	4.704	2.184
Nickel	9.240	6.216
Cyanide (total)	3.360	1.344
Ammonia (as N)	2,239.000	984.500
Fluoride	588.000	336.000
Tin	55.100	24.530

(f) Spent Electrowinning Solution from Municipal Solid Waste

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of MSW scrap used as raw material		
Antimony	0.230	0.102
Lead	0.033	0.015
Nickel	0.065	0.044
Cyanide (total)	0.0238	0.0095
Ammonia (as N)	15.860	6.973
Fluoride	4.165	2.380
Tin	0.390	0.174

Table XII-5 (continued)

PSNS FOR THE PRIMARY AND SECONDARY
TIN SUBCATEGORY

(g) Tin Hydroxide Supernatant from Scrap

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from scrap		
Antimony	107.400	47.850
Lead	15.580	7.233
Nickel	30.600	20.590
Cyanide (total)	11.130	4.451
Ammonia (as N)	7,417.000	3,261.000
Fluoride	1,948.000	1,113.000
Tin	182.500	81.230

(h) Tin Hydroxide Supernatant from Spent Plating Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from spent plating solutions		
Antimony	73.300	32.660
Lead	10.640	4.937
Nickel	20.890	14.050
Cyanide (total)	7.596	3.038
Ammonia (as N)	5,062.000	2,226.000
Fluoride	1,329.000	759.600
Tin	124.600	55.450

Table XII-5 (continued)

PSNS FOR THE PRIMARY AND SECONDARY
TIN SUBCATEGORY

(i) Tin Hydroxide Supernatant from Sludge Solids

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal recovered from sludge solids		
Antimony	321.100	143.100
Lead	46.580	21.630
Nickel	91.500	61.560
Cyanide (total)	33.270	13.310
Ammonia (as N)	22,180.000	9,749.000
Fluoride	5,823.000	3,327.000
Tin	545.700	242.900

(j) Tin Hydroxide Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of tin metal produced		
Antimony	48.340	21.540
Lead	7.013	3.256
Nickel	13.780	9.266
Cyanide (total)	5.009	2.004
Ammonia (as N)	3,338.000	1,468.000
Fluoride	876.600	500.900
Tin	82.140	36.560

SECTION XIII

BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY

EPA is not proposing best conventional pollutant control technology (BCT) limitations for the primary and secondary tin subcategory at this time.