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**SEPA** 

Office of Water

# Development Document for Effluent Limitations Guidelines and Standards for the Nonferrous Metals Manufacturing Point Source Category

Volume VII
Primary Beryllium
Primary Nickel and Cobalt
Secondary Nickel
Secondary Tin



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#### ORGANIZATION OF THIS DOCUMENT

This development document for the nonferrous metals manufacturing category consists of a general development document which considers the general and overall aspects of the regulation and 31 subcategory specific supplements. These parts are organized into 10 volumes as listed below.

The information in the general document and in the supplements is organized by sections with the same type of information reported in the same section of each part. Hence to find information on any specific aspect of the category one would need only look in the same section of the general document and the specific supplements of interest.

The ten volumes contain contain the following subjects:

Volume I General Development Document

Volume II Bauxite Refining
Primary Aluminum Smelting
Secondary Aluminum Smelting

Volume III Primary Copper Smelting
Primary Electrolytic Copper Refining
Secondary Copper Refining
Metallurgical Acid Plants

Volume IV Primary Zinc
Primary Lead
Secondary Lead
Primary Antimony

Volume V Primary Precious Metals and Mercury Secondary Precious Metals Secondary Silver Secondary Mercury

Volume VI Primary Tungsten
Secondary Tungsten and Cobalt
Primary Molybdenum and Rhenium
Secondary Molybdenum and Vanadium

Volume VII Primary Beryllium
Primary Nickel and Cobalt
Secondary Nickel
Secondary Tin

Volume VIII Primary Columbium and Tantalum Secondary Tantalum Secondary Uranium

Volume IX Primary and Secondary Titanium Primary Zirconium and Hafnium

Volume X Primary and Secondary Germanium and Gallium Primary Rare Earth Metals Secondary Indium

#### DEVELOPMENT DOCUMENT

for

#### EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS

for the

#### NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY

VOLUME VII

Primary Beryllium Primary Nickel and Cobalt Secondary Nickel Secondary Tin

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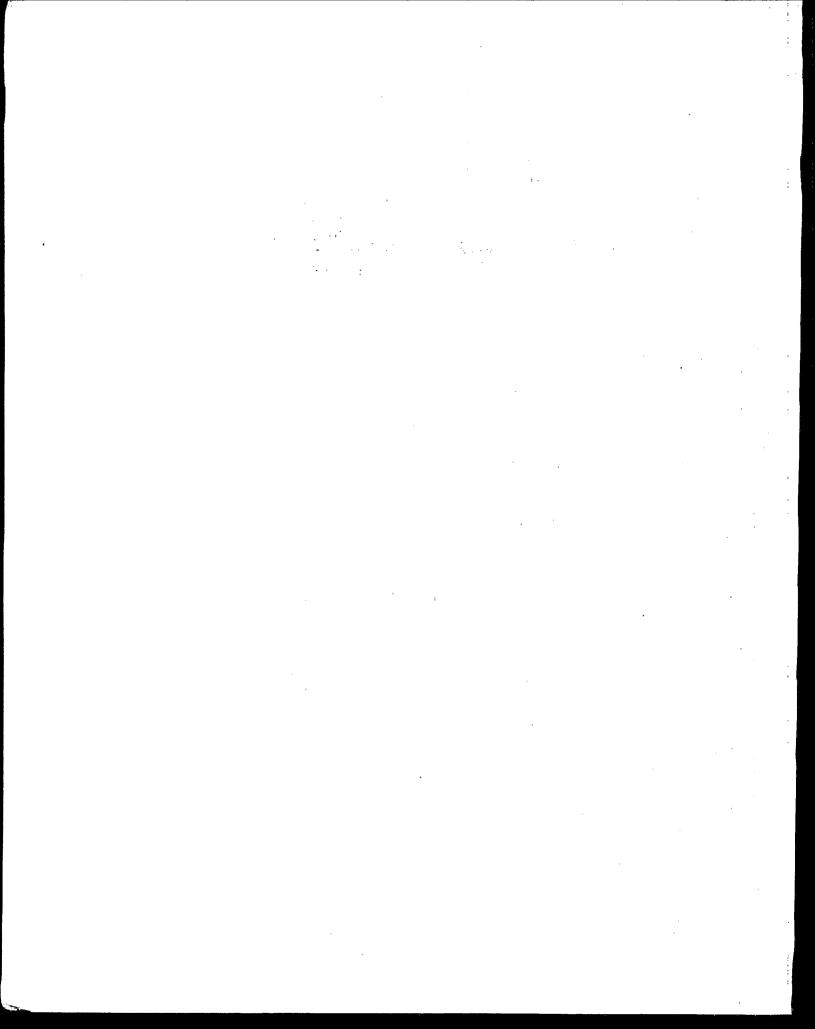


Thomas P. O'Farrell, Director Industrial Technology Division

Ernst P. Hall, P.E., Chief Metals Industry Branch and Technical Project Officer

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#### TABLE OF CONTENTS

Supplement	Page
Primary Beryllium	3605
Primary Nickel and Cobalt	3819
Secondary Nickel	3933
Secondary Tin	4019

For detailed contents see detailed contents list in individual supplement.

#### DEVELOPMENT DOCUMENT SUPPLEMENT

for the

Primary Beryllium Subcategory

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May 1989

U.S. Environmental Protection Agency
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## TABLE OF CONTENTS

Section		Page
I	SUMMARY	3615
II	CONCLUSIONS	3617
III	SUBCATEGORY PROFILE	3641
	Parameter 1	2041
	Description of Primary Beryllium Production Raw Materials	3641
	Production of Beryllium Hydroxide	3641
	Beryllium Oxide Production	3642
	Beryllium Metal Production	3643 3643
	Process Wastewater Sources	3644
	Other Wastewater Sources	3645
	Age, Production, and Process Profile	3645
IV	SUBCATEGORIZATION	3651
	Factors Considered in Subdividing the Primary Beryllium Subcategory	3651
	Other Factors	3652
6	Production Normalizing Parameters	3652
V	WATER USE AND WASTEWATER CHARACTERISTICS	3655
	Wastewater Flow Rates	3656
	Wastewater Characteristics Data	3656
	Data Collection Portfolios	3657
	Field Sampling Data	3657
	Wastewater Characteristics and Flows by Subdivision	3658
	Solvent Extraction Raffinate from Bertrandite	Ore3658
	Solvent Extraction Raffinate from Beryl Ore	3659
•	Beryllium Carbonate Filtrate	3659
	Beryllium Hydroxide Filtrate	3659
•	Beryllium Oxide Calcining Furnace Wet Air Pollution Control	3660
	Beryllium Hydroxide Supernatant	3660
	Process Water	3660
	Fluoride Furnace Scrubber	3661
	Chip Treatment Wastewater	3661
	Beryllium Pebble Plant Area Vent Wet Air Pollution Control	3662
	Additional Building Blocks	3662

## TABLE OF CONTENTS (Continued)

Section		Page
VI	SELECTION OF POLLUTANT PARAMETERS	3729
	Conventional and Nonconventional Pollutant Parameters	3729
	Conventional Pollutant Parameters Selected	3729
	Conventional Politicant larameters below the	3730
	Toxic Priority Pollutants Toxic Pollutants Never Detected	3731
	Toxic Pollutants Never Found Above Their	3731
	Analytical Quantification Concentration	
	Toxic Pollutants Present Below Concentrations	3731
	Achievable by Treatment Toxic Pollutants Detected in a Small Number	3731
	of Sources	3737
	Toxic Pollutants Selected for Further Consideration in Limitations and Standards	3,3,
VII	CONTROL AND TREATMENT TECHNOLOGIES	3745
	Tractices	3745
	Current Control and Treatment Practices	3745
	Beryllium Hydroxide Production	
	Beryllium Oxide and Beryllium Metal Production	0,10
	from Beryllium Hydroxide	3746
	Control and Treatment Options	3746
	Option A	3746
	Option C	5,10
VIII	COSTS, ENERGY, AND NONWATER QUALITY ASPECTS	3749
	Treatment Options for Existing Sources	3749
	Option A	3749
	Option C	3749
	Cost Methodology	3749
	Cost Methodology	3749
	Nonwater Quality Aspects	3750
	Energy Requirements	3750
	Solid Waste Air Pollution	3651

## TABLE OF CONTENTS (Continued)

Section		Page
IX	BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE	3753
	Technical Approach to BPT	3753
	Industry Cost and Pollutant Removal Estimates	3755
	BPT Option Selection Proposal	3755
	BPT Option Selection Promulgation	3756
	Wastewater Discharge Rates	3757
	Solvent Extraction Raffinate from Bertrandite	
	Solvent Extraction Raffinate from Beryl Ore	
		3758
	Beryllium Carbonate Filtrate	3758
	Beryllium Hydroxide Filtrate	3758
	Beryllium Oxide Calcining Furnace Wet Air Pollution Control	3759
	Beryllium Hydroxide Supernatant	3759
	Process Water	3759
•	Fluoride Furnace Scrubber	3759
	Chip Treatment Wastewater	3760
	Beryllium Pebble Plant Area Vent Wet Air	3761
	Pollution Control	
	Additional Building Blocks	3761
	Regulated Pollutant Parameters	3761
	Effluent Limitations	3762
Х	BEST AVAILABLE TECHNOLOGY ECONOMICALLY	3775
	ACHIEVABLE	
	Technical Approach to BAT	3775
	Option A	3776
	Option C	3776
•	Industry Cost and Pollutant Removal Estimates	3776
	Pollutant Removal Estimates	3776
	Compliance Costs	3777
	BAT Option Selection - Proposal	3778
	BAT Option Selection - Promulgation	3778
	Final Amendments to the Regulation	3778
	Wastewater Discharge Rates	3779
	Regulated Pollutant Parameters	
	Effluent Limitations	3779 3780
XI	NEW SOURCE PERFORMANCE STANDARDS	3793
	Technical Approach to NSPS	3793
	NSPS Option Selection - Proposal	3793
	NSPS Option Selection - Promulgation	3794
	Regulated Pollutant Parameters	3794
	New Source Performance Standards	3794
		7,72

## TABLE OF CONTENTS (Continued)

Section		Page
XII	PRETREATMENT STANDARDS	3805
	Technical Approach to Pretreatment Pretreatment Standards for New Sources PSNS Option Selection - Proposal PSNS Option Selection - Promulgation Regulated Pollutant Parameters Pretreatment Standards for New Sources	3805 3805 3806 3806 3806 3807
XIII	BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY	3817

## LIST OF TABLES

<u>Table</u>	<u>Title</u>	Page
V-1	Water Use and Discharge Rates for Solvent Extraction Raffinate from Bertrandite Ore	3663
V-2	Water Use and Discharge Rates for Solvent Extraction Raffinate from Beryl Ore	3663
V-3	Water Use and Discharge Rates for Beryllium Carbonate Filtrate	3663
V-4	Water Use and Discharge Rates for Beryllium Hydroxide Filtrate	3664
V-5	Water Use and Discharge Rates for Beryllium Oxide Calcining Furnace Wet Air Pollution Contro	3664 1
V-6	Water Use and Discharge Rates for Beryllium Hydroxide Supernatant	3664
V-7	Water Use and Discharge Rates for Process Water	3665
V-8	Water Use and Discharge Rates for Fluoride Furnace Scrubber	3665
V-9	Water Use and Discharge Rates for Chip Treatment Wastewater	3665
V-10	Water Use and Discharge Rates for Beryllium Pebble Plant Area Vent Wet Air Pollution Control	3666
V-11	Primary Beryllium Sampling Data Beryllium Oxide Calcining Furnace Wet Air Pollution Control Raw Wastewater	3667
V-12	Primary Beryllium Sampling Data Beryllium Hydroxide Supernatant Raw Wastewater	3672
V-13	Primary Beryllium Sampling Data Process Water Raw Wastewater	3676
V-14	Primary Beryllium Sampling Data Pebble Plant Area Vent Scrubber Raw Wastewater	3691

## LIST OF TABLES (Continued)

<u>Table</u>	<u>Title</u>	Page
V-15	Primary Beryllium Sampling Data Chip Treatment Raw Wastewater	3696
V-16	Primary Beryllium Sampling Data Triangular Lagoon Effluent	3700
V-17	Primary Beryllium Sampling Data Number 6 Lagoon Effluent	3705
V-18	Primary Beryllium Sampling Data Lime Tank Effluent	3715
V-19	Primary Beryllium Sampling Data Stripper Effluent	3719
V-20	Primary Beryllium Sampling Data Number 5 Lagoon	3723
VI-1	Frequency of Occurrence of Priority Pollutants Primary Beryllium Subcategory Raw Wastewater	3739
VI-2	Toxic Pollutants Never Protected	3742
VI-3	Toxic Pollutants Never Found Above Their Analytical Quantification Concentration	3744
VIII-1	Cost of Compliance for the Primary Beryllium Subcategory Direct Dischargers	3752
IX-1	BPT Wastewater Discharge Rates for the Primary Beryllium Subcategory	3763
IX-2	BPT Mass Limitations for the Primary Beryllium Subcategory	3765
<b>x-</b> 1	Pollutant Removal Estimates Primary Beryllium Subcategory	3781
x-2	Cost of Compliance for the Primary Beryllium Subcategory Direct Dischargers	3782
<b>x-</b> 3	BAT Wastewater Discharge Rates for the Primary Beryllium Subcategory	3782
X-4	BAT Mass Limitations for the Primary Beryllium Subcategory	3785

## LIST OF TABLES (Continued)

<u>Table</u>	<u> Title</u>	Page
XI-1	NSPS Wastewater Discharge Rates for the Primary Beryllium Subcategory	3796
XI-2	NSPS for the Primary Beryllium Subcategory	3798
XII-1	PSNS Wastewater Discharge Rates for the Primary Beryllium Subcategory	3808
XII-2	PSNS for the Primary Beryllium Subcategory	3810

#### LIST OF FIGURES

Figure	No. Title	Page
III-l	Beryllium Hydroxide Production Process	3646
III-2	Beryllium Oxide Production Process	3647
111-3	Beryllium Metal Production Process	3648
III-4	Geographic Locations of the Primary Beryllium Subcategory Plants	3649
<b>v</b> -1	Sampling Locations at Beryllium Plant A - Beryllium Oxide Production Area	3727
V-2	Sampling Locations at Beryllium Plant A - Beryllium Metal Production Area	3728
IX-1	Treatment Scheme	3773
X-1	BAT Treatment Scheme for Option A	3791
X-2	BAT Treatment Scheme for Option C	3792

#### SECTION I

#### SUMMARY

This document provides the technical basis for promulgating effluent limitations based on best practicable technology (BPT) and best available technology economically achievable (BAT) for existing direct dischargers, pretreatment standards for new indirect dischargers (PSNS), and standards of performance for new source direct dischargers (NSPS).

The primary beryllium subcategory consists of three plants. One discharges directly to a river or stream, and two achieve zero discharge of process wastewater.

EPA first studied the primary beryllium subcategory to determine differences in raw materials, final manufacturing processes, equipment, age and size of plants, and usage required the development of separate water effluent and standards for different segments limitations subcategory. This involved a detailed analysis of wastewater discharge and treated effluent characteristics, including the sources and volumes of water used, the processes used, sources of pollutants and wastewaters in the plant, constituents of wastewaters including priority pollutants. As a result, 16 subdivisions or building blocks have been identified for this subcategory that warrant separate effluent limitations. These include:

- a Solvent extraction raffinate from bertrandite ore,
- b Solvent extraction raffinate from beryl ore,
- c Beryllium carbonate filtrate,
- d Beryllium hydroxide filtrate,
- f Beryllium oxide calcining furnace wet air pollution control,
- g Beryllium hydroxide supernatant,
- h Process water,
- i Fluoride furnace scrubber,
- i Chip treatment wastewater,
- k Beryllium pebble plant area vent wet air pollution control,
- 1 Beryl ore gangue dewatering,
- m Bertrandite ore gangue dewatering,
- n Beryl ore processing,
- o AIS area wastewater,
- p Bertrandite ore leaching scrubber, and
- g Bertrandite ore counter current decantation scrubber.

EPA also identified several distinct control and treatment technologies (both in-plant and end-of-pipe) applicable to the primary beryllium 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 plant 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 in 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, the number of potential closures, number of employees affected, and impact on price were estimated. These results are reported in a separate document entitled "Economic Impact Analysis of Effluent Limitations and Standards for the Nonferrous Metals Manufacturing Industry."

After examining treatment technology being operated in the subcategory, the Agency has identified promulgated BPT as pollutant removal based on chemical precipitation and sedimentation technology, and ammonia steam stripping and cyanide precipitation pretreatment for selected waste streams. To meet the BPT effluent limitations based on this technology, the primary beryllium subcategory is estimated to incur a capital cost of \$226,500 and an annual cost of \$251,200.

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 beryllium subcategory is estimated to incur a capital cost of \$256,200 and an annual cost of \$265,600.

NSPS and PSNS are equivalent to BAT. In selecting NSPS and PSNS, EPA recognizes that new plants have the opportunity to implement the best and most efficient manufacturing processes and treatment technology. However, no such processes or treatment technology were considered to meet the NSPS or PSNS criteria. Therefore, the technology basis of BAT has been determined as the best demonstrated technology.

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

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

#### SECTION II

#### CONCLUSIONS

EPA has divided the primary beryllium subcategory into 16 subdivisions for the purpose of effluent limitations and standards. These subdivisions are:

- (a) Solvent extraction raffinate from bertrandite ore,
- (b) Solvent extraction raffinate from beryl ore,
- (c) Beryllium carbonate filtrate,
- (d) Beryllium hydroxide filtrate,
- (e) Beryllium oxide calcining furnace wet air pollution control,
- (f) Beryllium hydroxide supernatant,
- (g) Process water,
- (h) Fluoride furnace scrubber,
- (i) Chip treatment wastewater,
- (j) Beryllium pebble plant area vent wet air pollution control.
- (k) Beryl ore gangue dewatering,
- (1) Bertrandite ore gangue dewatering,
- (m) Beryl ore processing,
- (n) AIS area wastewater,

TSS

Hq

- (o) Bertrandite ore leaching scrubber, and
- (p) Bertrandite ore counter current decantation scrubber.

BPT is promulgated based on the performance achievable by the application of ammonia steam stripping and cyanide precipitation pretreatment for selected waste streams, followed by chemical precipitation and sedimentation (lime and settle) technology. The following BPT effluent limitations are promulgated:

#### (a) Solvent Extraction Raffinate from Bertrandite Ore

92,090,000

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
		yllium carbonate produced ore as beryllium
Beryllium Chromium (Total)	2,763.000 988.200	1,235.000 404.300
Copper	4,267.000	2,246.000
Cyanide (Total)	651.300	269.500
Ammonia (as N)	299,400.000	131,600.000
Fluoride	78,610.000	44,700.000

43,800.000

Within the range of 7.5 to 10.0 at all times

#### (b) Solvent Extraction Raffinate from Beryl Ore

(b) Solvent Extraction	<u>n Raffinate f</u>	rom Beryl Ore
Pollutant or	Maximum for	Maximum for
Pollutant Property		•
rollucance reoperty	my one bay	Monenty invertige
mg/kg (lb/million	lbs) of berv	llium carbonate produced
	m beryl ore a	
	<b>-</b>	
Beryllium	270.600	121.000
Chromium (Total)	96.800	
Copper	418.000	
Cyanide (Total)	63.800	26.400
Ammonia (as N)	29,330.000	12,890.000
Fluoride	7,700.000	
TSS		4,290.000
pH Within	the range of	7.5 to 10.0 at all times
(c) Beryllium Carbona	to Filtrate	
(c) <u>Beryfffum carbona</u>	CE IIICIACE	
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
	_	-
mg/kg (lb/million		llium carbonate produced
	as beryll	ium
Beryllium	263.800	
Chromium (Total)	94.380	
Copper '	407.600	
Cyanide (Total)	62.210	
Ammonia (as N) Fluoride	28,590.000 7,508.000	12,570.000
TSS	8,795.000	
		7.5 to 10.0 at all times
pii wiciiii	the range or	7.5 to 10.0 at all times
(d) Beryllium Hydroxi	de Filtrate	BPT
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/million		llium hydroxide produced
	as beryll	lum
Powellium	167 200	74 900
Beryllium Chromium (Total)	167.280 59.840	74.800 24.480
Copper	258.400	136.000
Cyanide (Total)	39.440	16.320
	18,128.800	7,969.600
Fluoride	4,760.000	2,652.000
TSS	5,576.000	2,652.000
	•	7.5 to 10.0 at all times
	<b>y</b>	

<sup>(</sup>e) Beryllium Oxide Calcining Furnace Wet Air Pollution Control BPT

Pollutant or	Maximum fo		
Pollutant Property			
Fortucant Property	Any One Da	ay Monthly Averag	je
ma/ka /lh/milli	on That of	hom:11:	
mg/kg (ID/mIIII	OIL IDS) OF	beryllium oxide prod	luced
Beryllium	324.4	100	
Chromium (Total)			
	116.0		
Copper	501.0		
Cyanide (Total)	76.4	170 31.64	10
Ammonia (as N)	35,150.0	15,450.00	0
Fluoride	9,230.0	5,248.00	
TSS	10,810.0		
pH Within		of 7.5 to 10.0 at al	1 timos
		01 7.5 co 10.0 at al	.r cimes
			<del></del>
(f) Beryllium Hydroxid	de Supernat	ant BPT	
Pollutant or	Maximum fo	r Maximum for	<del></del>
	Any One Da		10
F 7	y one bu	Monthly Averag	Æ
mg/kg (lb/million	lbs) of be	ryllium hydroxide pr	0011000
from scra	in and resid	dues as beryllium	oduced
	The wind repr	ddes as beryllium	
Beryllium	282.9	00 306 50	_
Chromium (Total)			
	101.2		
Copper	437.0		
Cyanide (Total)		00 27.60	0
Ammonia (as N)	30,660.00		0
Fluoride	160,300.00	00 71,200.00	
TSS	9,430.00		
pH Within	the range of	of 7.5 to 10.0 at al	l times
	· - ;	/.0 to 10.0 at al	T CIMES
		· · · · · · · · · · · · · · · · · · ·	
(g) Process Water			
	1		-
Pollutant or	Maximum for	r Maximum for	
·	Any One Day		
	y one bay	Monthly Average	<b>.</b>
mg/kg (lb/million	lhs) of he	eryllium pebbles prod	J., _ 3
	100) 01 00	silitium bennies biod	aucea
Beryllium	215.00	06 140	
Chromium (Total)			
Copper	76.91	_ '_	
	332.10		
Cyanide (Total)	50.69	<del>-</del>	
Ammonia (as N)	23,300.00	• • • • • • •	
Fluoride	6,118.00		
TSS	7,167.00		
pH Within		of 7.5 to 10.0 at all	times

#### (h) Fluoride Furnace Scrubber BPT

Chromium (Total)

Cyanide (Total)

Ammonia (as N)

Copper

TSS

pН

Fluoride

Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/millio	n lbs) of beryl	lium pebbles produced
Beryllium	0.000	0.000
Chromium (Total)	0.000	0.000
Copper	0.000	0.000
Cyanide (Total)	0.000	0.000
Ammonia (as N)	0.000	0.000
Fluoride	0.000	0.000
TSS	0.000	0.000
pH Within	the range of 7	.5 to 10.0 at all times
	·	
(i) Chip Treatment Was	stewater BPT	•
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/million	lbs) of beryll	ium scrap chips treated
Beryllium	9.533	4.263

3.410

2.248

271.300

317.800

Within the range of 7.5 to 10.0 at all times

14.730

1,033.000

1.395

7.750

0.930

154.200

151.100

454.200

# (j) $\frac{\text{Beryllium Pebble Plant Area Vent Wet Air Pollution}}{\text{Control BPT}}$

Pollutant or Pollutant Prope	Maximum for rty Any One Day	Maximum for Monthly Average
mg/kg (1b	/million lbs) of beryl	lium pebbles produced
Beryllium Chromium (Total Copper Cyanide (Total) Ammonia (as N) Fluoride TSS pH	0.000 0.000 0.000 0.000 0.000	0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

## (k) Beryl Ore Gangue Dewatering BPT

Pollutant or Pollutant Property	•		
mg/kg (pounds per	r million pounds)	of beryl ore proce	essed
Beryllium	1.283	0.574	-
Chromium (Total)	0.459	0.188	
Copper	1.982	1.043	-
Cyanide (Total)	0.302	0.125	
Ammonia (as N)	139.032	61.120	
Fluoride	36.505	20.756	
TSS	42.763	20.339	
pH Withi	in the range of 7	.5 to 10.0 at all t	imes
			<del></del>
(1) Bertrandite Ore	Gangue Dewaterin	a BPT	
(1) <u>Del clanated</u> <u>Ole</u>	Jangue Bewaterin		
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Maximum for Monthly Average	
			· .
mg/kg (pounds per	million pounds)	of bertrandite prod	esse
<b>D.</b> 13.	2 070	1.466	
Beryllium	3.279	1.466	
Chromium (Total)	1.173	0.480	
Copper	5.064	2.665	
Cyanide (Total)	0.773	0.320	
Ammonia (as N)	355.245	156.169	
Fluoride			
TSS	93.275	53.034	
	109.265	51.968	•
	109.265		imes
	109.265	51.968	imes
	109.265 in the range of 7	51.968	imes
(m) Beryl Ore Proces	109.265 in the range of 7 ssing BPT	51.968 .5 to 10.0 at all t	imes
pH Withi	109.265 in the range of 7	51.968	imes

Pollutant Property	Any One Day	Monthly Average
mg/kg (pounds per	million pounds)	of beryl ore processed
Beryllium	8.983	4.017
Chromium (Total)	3.213	1.315
Copper	13.876	7.303
Cyanide (Total)	2.118	0.876
Ammonia (as N)	973.490	427.956
Fluoride	255.605	145.330
TSS	299.423	142.409
pH Withir	the range of 7	.5 to 10.0 at all times

#### (n) Aluminum Iron Sludge (AIS) Area Wastewater BPT

Pollutant or	Maximum for	Maximum for	
Pollutant Property		Monthly Average	
rorracant fropercy	Any one bay	Monenty inverage	
mg/kg (pounds	per million pound	ds) of total berylliu	<del>n</del>
	bonate produced a		
Beryllium	575.640	247.400	
Chromium (Total)	205.920	84.240	
Copper	889.200		
Cyanide (Total)	135.720	56.160	
	62,384.400	27,424.800	
Fluoride	16,380.000	9,313.200	
TSS	19,188.000	9,126.000	
pH With	in the range of $7$	7.5 to 10.0 at all ti	nes
(o) Bertrandite Ore Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
	mg/kg of bertrand	dite ore	
Beryllium	1.859	0.831	
Chromium (Total)	0.665	0.272	
Copper	2.871	1.511	
Cyanide (Total)			
<del>-</del>	0.438	0.181	
Ammonia (as N)	201.416	88.545	
Fluoride	201.416 52.885	<b>88.</b> 5 <b>4</b> 5 30 <b>.</b> 069	
Fluoride TSS	201.416 52.885 61.951	88.545	

# $\begin{array}{cccc} \textbf{(p)} & \underline{\text{Bertrandite Ore}} & \underline{\text{Countercurrent}} & \underline{\text{and Decantation}} \\ \hline \textbf{(CCD)} & \underline{\text{Scrubber}} & \underline{\text{BPT}} \end{array}$

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average	
mg/k	g of bertrandite	ore processed	
Beryllium Chromium (Total) Copper Cyanide (Total) Ammonia (as N) Fluoride TSS pH Wit	0.124 0.044 0.192 0.029 13.463 3.535 4.141 hin the range of	0.056 0.018 0.101 0.012 5.919 2.010 1.970 7.5 to 10.0 at all	times

BAT is promulgated based on the performance achievable by the application of ammonia steam stripping and cyanide precipitation pretreatment for selected waste streams, followed by chemical precipitation, sedimentation, and multimedia filtration (lime, settle, and filter) technology. The following BAT effluent limitations are promulgated:

				1			
	\	<b>7</b> - 7 + L		Daffinata	£	Bertrandite Ore	77 R F
- 1	. A 1	SOLVent	EXERACTION	RATEIDATE	rrom	Referancise Ose	HQ'I'
				1100 T T T 1100 C C	T T OIL	Dererandree Ore	T- 1 T-

(a) Bolvene Exclaeete	M Kallinece Ilo	Dererandree Ore DAT
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	
		ium carbonate produced
from h	ertrandite ore	as beryllium
Beryllium	1,842.000	831.000
Chromium (Total)	831.000	336.900
Copper	2,875.000	1,370.000
Cyanide (Total)	449.200	179.700
Ammonia (as N)	299,400.000	131,600.000
Fluoride	78,610.000	44,700.000
·		-
(b) Solvent Extraction	n Paffinate fro	m Barul Ore BAT
(b) Bolvene Exclacele	M Rattinace Ito	m beryr ore bar
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/million	lbs) of beryll	ium carbonate produced
	om beryl ore as	
	· ·	<del>-</del>
Beryllium	180.400	81.400
Chromium (Total)	81.400	33.000
Copper	281.600	134.200
Cyanide (Total)	44.000	17.600
Ammonia (as N)	29,330.000	12,890.000
Fluoride	7,700.000	4,378.000
		_
(c) Beryllium Carbona	te Filtrate BA	${f T}$
7	Maximum for	
Pollutant or		Maximum for
Pollutant Property	Any One Day	Monthly Average
ma/ka /lb/million	lbg) of borull	ium carbonate produced
mg/kg (ID/mIIIIOn	as berylliu	
	as beryllid	
Beryllium	175.900	79.370
Chromium (Total)	79.370	32.180
Copper	274.600	130.800
Cyanide (Total)	42.900	17.160
Ammonia (as N)	28,590.000	12,570.000
Fluoride	7,508.000	4.269.000
	, = = = = = =	

## (d) Beryllium Hydroxide Filtrate BAT

· · · · · · · · · · · · · · · · · · ·		
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
	illian that of b	
mg/kg (Ib/m	produced as ber	peryllium hydroxide
	produced as ber	yırımı
Beryllium	111.520	50.320
Chromium (Total)	50.320	20.400
Copper	174.080	82.960
Cyanide (Total)	27.200	10.880
Ammonia (as N)	18,128.800	7,969.600
Fluoride	4,760.000	2,706.400
	· · · · · · · · · · · · · · · · · · ·	
	Calcining Furnac	ce Wet Air Pollution
Control BAT		
Dollar and	Wanimum East	Maximum for
Pollutant or	Maximum for	
Pollutant Property	Any One Day	Monthly Average
ma/ka (lh/mill	ion lbs) of hery	vllium oxide produced
g/g (12/=11	100. 122, 01 201	TITUM ONICO PIOGGOOG
Beryllium	216 200	97.570
Chromium (Total)	97.570	39.560
Copper	337.500	160.900
Cyanide (Total)	52.740	21.100
Ammonia (as N)	35,150.000	15,450.000
Fluoride	9,230.000	5,248.000
(f) Beryllium Hydrox	ide Supernatant	BAT
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
/1- /15 / 111 -	- 1b-1 -6 b11	:
		ium hydroxide produced
LIOM SC	rap and residues	as nerAttinu
Beryllium	188.600	85.100
Chromium (Total)	85.100	34.500
Copper	294.400	140.300
Cyanide (Total)	46.000	18.400
Ammonia (as N)	30,660.000	13,480.000
Fluoride	160,300.000	71,200.000
	•	

## (g) <u>Process</u> <u>Water</u>

and the second s		
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/milli	on lbs) of beryll	ium pebbles produced
Beryllium	143.300	64.680
Chromium (Total)	64.680	26.220
Copper	223.700	106.600
Cyanide (Total)	34.960	13.980
Ammonia (as N)	23,300.000	10,240.000
Fluoride	6,118.000	3,479.000
(h) Fluoride Furnace	Scrubber BAT	
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/millio	on lbs) of beryll	ium pebbles produced
Beryllium	0.000	0.000
Chromium (Total)	0.000	0.000
Copper	0.000	0.000
Cyanide (Total)	0.000	0.000
Ammonia (as N)	0.000	0.000
Fluoride	0.000	0.000
11401140		0.000
(i) <u>Chip Treatment</u> Wa	astewater BAT	
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/million	n lbs) of berylli	um scrap chips treated
Beryllium	6.355	2.868
Chromium (Total)	2.868	1.163
Copper	9.920	4.728
Cyanide (Total)	1.550	0.620
Ammonia (as N)	1,033.000	454.200
Fluoride	271.300	154.200

# (j) Beryllium Pebble Plant Area Vent Wet Air Pollution Control BAT

Pollutant for	Maximum for	Maximum for
	Any One Day	
	-	
mg/kg (lb/millio	on lbs) of bery:	llium pebbles produced
Beryllium	0.000	0.000
Chromium (Total)	0.000	0.000
Copper	0.000	0.000
Cyanide (Total)	0.000	0.000
Ammonia (as N)	0.000	0.000
Fluoride	0.000	0.000
(k) Beryl Ore Gangue	e <u>Dewatering</u> B	AT.
Pollutant or	Maximum for	Maximum for
Pollutant Property		Monthly Average
mg/kg (pounds per	million pounds	of beryl ore processed
Beryllium	0.855	0.386
Chromium (Total)	0.386	0.156
Copper	1.335	0.636
Cyanide (Total)	0.209	0.083
Ammonia (as N)	139.032	61.120
Fluoride	36.505	20.756
(1) Bertrandite Ore (	Gangue Dewaterin	ng вАт
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (pounds per mi	llion pounds) of	bertrandite ore process
Beryllium	2.185	0.986
Chromium (Total)	0.986	0.400
Copper	3.411	1.626
Cyanide (Total)	0.533	0.213
Ammonia (as N)	355.245	156.169
Fluoride	93.275	53.034

## (m) <u>Beryl</u> <u>Ore</u> <u>Processing</u> BAT

Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
		-611
mg/kg (pounds pe	r million pounds)	of beryl ore processed
Beryllium	5.988	2.702
Chromium (Total)	2.702	1.095
Copper	9.348	4.455
Cyanide (Total)	1.461	0.584
Ammonia (as N)	973.490	427.956
Fluoride	255.605	145.330
(n) Aluminum Iron S	ludge (AIS) Area	Wastewater BAT
Pollutant or	Maximum for	Maximum for
Pollutant Property		Monthly Average
ma/ka (pounds per m	illion pounds) of	total beryllium carbona
g,g (pound pound	produced as ber	
Beryllium	383.760	173.160
Chromium (Total)	173.160	70.200
Copper	599.040	285.480
Cyanide (Total)	93.600	37.440
Ammonia (as N)	62,384.400	27,424.800
Fluoride	16,380.000	9,313.200
(o) Bertrandite Ore	Leaching Scrubbe	er BAT
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg	of bertrandite o	ore processed
Beryllium	1.239	0.559
Chromium (Total)	0.559	0.227
Copper	1.934	0.922
Cyanide (Total)	0.302	0.121
Ammonia (as N)	201.416	88.545
Fluoride	52.885	30.069

# (p) $\frac{\text{Bertrandite Ore}}{(\text{CCD}) \ \text{Scrubber}} \frac{\text{Countercurrent and Decantation}}{\text{BAT}}$

Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg	of bertrandite or	e processed
Beryllium	0.083	0.037
Chromium (Total)	0.037	0.015
Copper	0.129	0.062
Cyanide (Total)	0.020	0.008
Ammonia (as N)	13.463	5.919
Fluoride	3.535	2.010

NSPS is promulgated based on the performance achievable by the application of ammonia steam stripping and cyanide precipitation pretreatment for selected waste streams, followed by chemical precipitation, sedimentation, and multimedia filtration (lime, settle, and filter) technology. The following effluent standards are promulgated for new sources:

## (a) Solvent Extraction Raffinate from Bertrandite Ore NSPS

	•	
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/millio	n lbs) of beryll	ium carbonate produced
from	bertrandite ore	as beryllium
	1,842.000	831.000
Chromium (Total)	831.000	336.900
Copper	2,875.000	1,370.000
Cyanide (Total)	449.200	179.700
Ammonia (as N)	299,400.000	131,600.000
Fluoride	78,610.000	44,700.000
TSS	33,690.000	26,950.000
pH Withi		.5 to 10.0 at all times

## (b) Solvent Extraction Raffinate from Beryl Ore NSPS

(-)	THE PROPERTY OF THE PROPERTY O	<u> </u>	*
Pollutant or	Maximum for	Maximum for	
Pollutant Property			
		lium carbonate prod	uced
fr	om beryl ore as	beryllium	
<b>.</b>			
Beryllium	180.400	81.400	
Chromium (Total)	81.400	33.000	•
Copper	281.600	134.200	
Cyanide (Total)	44.000	17.600	
	29,330.000	12,890.000	
Fluoride	7,700.000	4,378.000	
TSS	3,300.000		
pH Withi	n the range of	7.5 to 10.0 at all	times
(c) Beryllium Carbon	ato Filtrato M	EDC	
(c) Beryffidm Carbon	ace rilliace M	DE B	. =
Pollutant or	Maximum for	Maximum for	<del></del>
Pollutant Property		Monthly Average	
	<u>7</u>		
mg/kg (lb/millic	n lbs) of beryl.	lium carbonate prod	uced
	as berylli:	ım	
Beryllium	175.900	79.370	
Chromium (Total)	79.370		
Copper	274.600		
Cyanide (Total)	42.900		
Ammonia (as N)		12,570.000	-
Fluoride TSS		4,269.000 2,574.000	
		7.5 to 10.0 at all	Limoa
pH Withi	n the range or	7.5 to 10.0 at all	cimes
(d) Beryllium Hydrox	ide Filtrate NS	SPS	
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
mg/kg (lb/million lbs	) of beryllium h	ydroxide produced	as beryll:
Bown11ium	111 520	E0 330	
Beryllium	111.520	50.320	
Chromium (Total)	50.320	20.400	
Copper	174.080	82.960	
Cyanide (Total)	27.200	10.880	
Ammonia (as N) Fluoride	18,128.800	7,969.600	
TSS	4,760.000 2,040.000	2,706.400	
		1,632.000 7.5 to 10.0 at all	times
pH Withi	n the range of A	to to o at all	CTINGS

# (e) Beryllium Oxide Calcining Furnace Wet Air Pollution Control NSPS

	1		
Pollutant or	Maximum for	Maximum for	
Pollutant Property		Monthly Average	
	4, 4		
mg/kg (lb/milli	on lbs) of ber	yllium oxide produ	ced
		-	
Beryllium	216.200	97.570	
Chromium (Total)	97.570	39.560	
Copper	337.500	160.900	
Cyanide (Total)	52.740	21.100	
Ammonia (as N)	35,150.000	15,450.000	
Fluoride	9,230.000		
TSS	3,956.000		
pH Within	the range of	7.5 to 10.0 at all	times
• .	1		
(f) <u>Beryllium</u> <u>Hydroxi</u>	<u>de Supernatant</u>	NSPS NSPS	
			1.5
	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
(1 (11- (-:11:	71 - 1		3
		llium hydroxide prod	aucea
from ser	ap and residue	es as beryllium	*.
Beryllium	188.600	85.100	•
Chromium (Total)	85.10Q		,
Copper (10tal)	294.400		
Cyanide (Total)	46.000	*	
Ammonia (as N)	30,660.000		
Fluoride	160,300.000		
TSS	3,450.000	2,760.000	
		7.5 to 10.0 at all	times
Pii	che runge or	7.5 00 10.0 40 411	CIMCO
(g) Process Water NS	PS	+ _	
	e de la companya de La companya de la co		100
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
mg/kg (lb/millio	n lbs) of bery	vllium pebbles produ	ıced
Beryllium	143.300	64.680	
Chromium (Total)	64.68Q	26.220	
Copper	223.700	106.600	
Cyanide (Total)	34.960	13.980	
Ammonia (as N)	23,300.000	10,240.000	
Fluoride	6,118.000	3,479.000	
TSS	2,622.000	2,098.000	
pH Within	the range of	7.5 to 10.0 at all	times

## (h) Fluoride Furnace Scrubber NSPS

(h) <u>Fluoride Furnace</u>	Scrubber NSP	<b>5</b>	
Pollutant or	Maximum for	Maximum for	
Pollutant Property		Monthly Average	
	-		
mg/kg (lb/millio	n lbs) of bery	yllium pebbles produ	ced
Beryllium	0.000	0.000	
Chromium (Total)	0.000	0.000	
Copper	0.000	0.000	
Cyanide (Total)	0.000	0.000	•
Ammonia (as N)	0.000	0.000	
Fluoride	0.000	0.000	
TSS	0.000	0.000	
	the range of	7.5 to 10.0 at all	times
pH Within			<del></del>
(i) hip Treatment Was	tewater NSPS		
		Maximum for	
Pollutant or	Maximum for		
Pollutant Property	Any One Day	Monthly Average	
mg/kg (lb/million	lbs) of bery	llium scrap chips to	eated
<b>—</b> 33.1	6.355	2.868	
Beryllium	2.868		
Chromium (Total)	9.920		
Copper	1.550		
Cyanide (Total)	1,033.000		
Ammonia (as N)	271.300		
Fluoride	116.300		-
TSS	tio.suu	7.5 to 10.0 at all	times
pH Withir	i the range or	7.5 00 10.0 40 422	
(j) Beryllium Pebble Control NSPS	Plant Area Ve	nt Wet Air Pollution	<u>n</u>
	Maximum for	Maximum for	
Pollutant or Pollutant Property	Any One Day	Monthly Average	
•	<del>.</del>		
mg/kg (lb/millio	on lbs) of ber	yllium pebbles prod	uced
Beryllium	0.000	0.000	
Chromium (Total)	0.000		
Copper	0.000		
Cyanide (Total)	0.000		
Ammonia (as N)	0.000		
Fluoride	0.000		
	0.000		
TSS Within	n the range of	7.5 to 10.0 at all	times
		ISPS	
(k) <u>Beryl Ore Gangue</u>	Dewacer Ing I		
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Aver	age

	mg/kg (pounds per million pounds) of beryl ore processed
	Beryllium       0.855       0.386         Chromium (Total)       0.386       0.156         Copper       1.335       0.636         Cyanide (Total)       0.209       0.083         Ammonia (as N)       139.032       61.120         Fluoride       36.505       20.756         TSS       15.645       12.516         pH       Within the range of 7.5 to 10.0 at all times
,	(1) Bertrandite Ore Gangue Dewatering NSPS
,	Pollutant or Maximum for Maximum for
	Pollutant Property Any One Day Monthly Average
	mg/kg (pounds per million pounds) of bertrandite ore processed
	Beryllium 2.185 0.986
	Chromium (Total) 0.986 0.400
	Copper 3.411 1.626
	Cyanide (Total) 0.533 0.213
	Ammonia (as N) 355.245 156.169
	Fluoride 93.275 53.034
	TSS 39.975 31.980
	pH Within the range of 7.5 to 10.0 at all times
	(m) <u>Beryl Ore Processing</u> NSPS
	Pollutant or Maximum for Maximum for
	Pollutant Property Any One Day Monthly Average
	mg/kg (pounds per million pounds) of beryl ore processed
	Beryllium 5.988 2.702
	Chromium (Total) 2.702 1.095
	Copper 9.348 4.455
	Cyanide (Total) 1.461 0.584
	Ammonia (as N) 973.490 427.956
	Fluoride 255.605 145.330
-	TSS 109.545 87.636
	pH Within the range of 7.5 to 10.0 at all times

### (n) Aluminum Iron Sludge (AIS) Area Wastewater NSPS

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average	
mg/kg (pounds per mi	llion pounds) of produced as bery	total beryllium carbon yllium	ate
Beryllium Chromium (Total) Copper Cyanide (Total) Ammonia (as N) Fluoride TSS pH Within	383.760 173.160 599.040 93.600 62384.400 16380.000 7020.000 the range of 7.5	173.160 70.200 285.480 37.440 27424.800 9313.200 5616.000 5 to 10.0 at all times	

## (o) Bertrandite Ore Leaching Scrubber NSPS

Pollutant or Pollutant Prope	Maximum for rty Any One Day	Maximum for Monthly Average
n	mg/kg of bertrandite	ore processed
Beryllium Chromium (Total) Copper Cyanide (Total) Ammonia (as N) Fluoride TSS pH	1.934 0.302 201.416 52.885 22.665	0.559 0.227 0.922 0.121 88.545 30.069 18.132 7.5 to 10.0 at all times

# 

Pollutant or	Maximum for	Maximum for
Pollutant Proper	cty Any One Day	Monthly Average
mg/kg of bertrar	ndite ore processed	
Beryllium	0.083	0.037
Chromium (Total)	0.037	0.015
Copper	0.129	0.062
Cyanide (Total)	0.020	0.008
Ammonia (as N)	13.463	5.919
Fluoride	3.535	2.010
TSS	1.515	1.212
pН	Within the range of 7.	5 to 10.0 at all times

#### PRIMARY BERYLLIUM SUBCATEGORY SECT - II

EPA is not promulgating pretreatment standards for existing sources (PSES) for the primary beryllium subcategory.

PSNS are promulgated based on the performance achievable by the application of ammonia steam stripping and cyanide precipitation pretreatment for selected waste streams, followed by chemical precipitation, sedimentation, and multimedia filtration (lime, settle, and filter) technology. The following pretreatment standards are promulgated for new sources:

#### (a) Solvent Extraction Raffinate from Bertrandite Ore PSNS

Pollutant or	Maximum for	Maximum for			
Pollutant Property	Any One Day	Monthly Average			
mg/kg (lb/million lbs) of beryllium carbonate prod from bertrandite ore as beryllium					
Beryllium	1,842.000	831.000			
Chromium (Total)	831.0Q0	336.900			
Copper	2,875.000	1,370.000			
Cyanide (Total)	449.200	179.700			
Ammonia (as N)	299,400.000	131,600.000			
Fluoride	78,610.000	44,700.000			
	• • • • • • • • • • • • • • • • • • • •				
(b) Solvent Extraction Raffinate from Beryl Ore PSNS					
	Maximum for	Maximum for			
Pollutant Property	Any One Day	Monthly Average			
mg/kg (lb/million lbs) of beryllium carbonate produced from beryl ore as beryllium					
	20+3- 010 40 .	oci y mmichin			
Beryllium	180.000	81.000			
Chromium (Total)	81.400	33.000			
Copper	281.600	134.200			
Cyanide (Total)	44.000	17.600			
Ammonia (as N)	29,330.000	12,890.000			
Fluoride	7,700.000	4,378.000			
1	•	•			

# (c) Beryllium Carbonate Filtrate PSNS

(C) Beryllium Carbona	<u> </u>	
Pollutant or	Maximum for	Maximum for
	Any One Day	Monthly Average
Pollutant Property	Ally One Day	inonenty arready
/1- /1h /m:11:0n	lbay of beryllin	m carbonate produced
mg/kg (lb/million	ins) of peryiting	in Carbonace produced
	as beryllium	
•	175 000	79.370
Beryllium	175.900	32.180
Chromium (Total)	79.370	
Copper	274.600	130.800
Cyanide (Total)	42.900	17.160
Ammonia (as N)	28,590.000	12,570.000
Fluoride	7,508.000	4,269.000
(d) Beryllium Hydroxi	de Filtrate PSNS	5
(a) <u>2017-1</u>		
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
	-	-
mg/kg /lh/million	lbs) of berylli	um hydroxide produced
mg/kg (±b/m±±±±0	as beryllium	· · · · · · · · · · · · · · · · · · ·
	as series	
Dowellium	111.520	50.320
Beryllium	50.320	20.400
Chromium (Total)	174.080	82.960
Copper		10.880
Cyanide (Total)	27.200	7,969.600
Ammonia (as N)	18,128.800	
Fluoride	4,760.000	2,706.400
-		
(e) Beryllium Oxide O	Calcining Furnace	Wet Air Pollution
Control PSNS	<del></del>	
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
_	_	
ma/ka (lb/milli	on lbs) of beryl	lium oxide produced
9,9 (, .	•	
Beryllium	216.200	97.570
Chromium (Total)	97.570	39.560
*	337.500	160.900
Copper (Mohal)	52.740	21.100
Cyanide (Total)		15,450.000
Ammonia (as N)	35,150.000	5,248.000
Fluoride	9,230.000	3,240.000

# PRIMARY BERYLLIUM SUBCATEGORY SECT - II

# (f) Beryllium Hydroxide Supernatant PSNS

Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/million	n lbs) of beryll	ium hydroxide produced
	rap and residues	
Beryllium	188.600	85.100
Chromium (Total)	85.100	34.500
Copper	294.400	140.300
Cyanide (Total)	46.000	18.400
Ammonia (as N)	30,660.000	13,480.000
Fluoride	160,300.000	71,200.000
(g) Process Water PS	SNS	
	*	
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/millio	on lbs) of beryl	lium pebbles produced
Beryllium	143.300	64.680
Chromium (Total)	64.680	26.220
Copper	223.700	106.600
Cyanide (Total)	34.960	13.980
Ammonia (as N)	23,300.000	10,240.000
Fluoride	6,118.000	3,479.000
(h) Elwarida Europa	Scrubber PSNS	
(h) Fluoride Furnace	<u>scrubber</u> PSNS	
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/millic	on lbs) of beryl	lium pebbles produced
Beryllium	0.000	0.000
Chromium (Total)	0.000	0.000
(,		
Copper	0.000	0.000
Copper Cvanide (Total)	0.000	0.000 0.000
Copper Cyanide (Total) Ammonia (as N)	0.000 0.000 0.000	0.000 0.000 0.000

## (i) Chip Treatment Wastewater PSNS

(1) Chip Treatment wa	iscewater I bhb	
Pollutant or	Maximum for	Maximum for
Pollutant Property		Monthly Average
		<del>-</del>
mg/kg (lb/million	n lbs) of berylli	ium scrap chips treated
Beryllium	6.355	2.868
Chromium (Total)	2.868	1.163
Copper	9.920	4.728
Cyanide (Total)	1.550	0.620
Ammonia (as N)	1,033.000	454.200
Fluoride	271.300	154.200
FIUOTIUE	2,2,5	
(J) Beryllium Pebble Control PSNS		Wet Air Pollution
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
<del>-</del>		
mg/kg (lb/millio	on lbs) of beryl	lium pebbles produced
Beryllium	0.000	0.000
Chromium (Total)	0.000	0.000
Copper	0.000	0.000
Cyanide (Total)	0.000	0.000
Ammonia (as N)	0.000	0.000
Fluoride	0.000	0.000
11401140		·
(k) Beryl Ore Gangue	Dewatering PSN	S
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
<b>-</b>		<del>-</del>
mg/kg (pounds per	million pounds)	of beryl ore processed
Beryllium	0.855	0.386
Chromium (Total)	0.386	0.156
· · · · · · · · · · · · · · · · · · ·	1.335	0.636
Copper (Motol)	0.209	0.083
Cyanide (Total)	139.032	61.120
Ammonia (as N)	36.505	20.756
Fluoride	30.303	20.750

## PRIMARY BERYLLIUM SUBCATEGORY SECT - II

# (1) Bertrandite Ore Gangue Dewatering PSNS

		-
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (pounds per m	illion pounds) of	bertrandite ore processe
Beryllium	2.185	0.986
Chromium (Total)	0.986	0.400
Copper	3.411	1.626
Cyanide (Total)	0.533	0.213
Ammonia (as N)	355.245	156.169
Fluoride	93.275	53.034
(m) <u>Beryl Ore</u> <u>Proce</u>	ssing PSNS	
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any 1 Day	Monthly Average
mg/kg (pounds pe	r million pounds)	of beryl ore processed
Beryllium	5.988	2.702
Chromium (Total)	2.702	1.095
Copper	9.348	4.455
Cyanide (Total)	1.461	0.584
Ammonia (as N)	973.490	427.956
Fluoride	255.605	145.330
	<u> </u>	
(n) Aluminum Iron S	ludge (AIS) Area W	Wastewater PSNS
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any 1 Day	Monthly Average
mg/kg (pounds	per million pounds	s) of total beryllium
	bonate produced as	
Beryllium	383.760	173.160
Chromium (Total)	173.160	70.200
Copper	599.040	285.480
Cyanide (Total)	93.600	37.440
Ammonia (as N)	62384.400	27424.800
Fluoride	16380.000	9313.200
	\$ ** •	

## (o) Bertrandite Ore Leaching Scrubber PSNS

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg of bertrandite	ore processed	
Beryllium	1.239	0.559
Chromium (Total)	0.559	0.227
Copper	1.934	0.922
Cyanide (Total)	0.302	0.121
Ammonia (as N)	201.416	88.545
Fluoride	52.885	30.069

# (p) <u>Bertrandite Ore</u> <u>Countercurrent</u> <u>and</u> <u>Decantation</u> <u>(CCD)</u> <u>Scrubber</u> <u>PSNS</u>

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg of bertrandite	ore processed	
Beryllium	0.083	0.037
Chromium (Total)	0.037	0.015
Copper	0.129	0.062
Cyanide (Total)	0.020	0.008
Ammonia (as N)	13.463	5.919
Fluoride	3.535	2.010

EPA is not promulgating best conventional pollutant control technology (BCT) limitations for the primary beryllium subcategory at this time.

#### SECTION III

#### SUBCATEGORY PROFILE

This section of the primary beryllium supplement describes the raw materials and processes used in producing primary beryllium and presents a profile of the primary beryllium plants identified in this study.

Beryllium, the seventh lightest known metal, is manufactured and used in three principal product forms: beryllium copper alloy, beryllium oxide and beryllium metal. It is estimated that about percent of beryllium consumption is in the form of beryllium copper or other master alloy, and the remaining 20 percent represents approximately equal quantities of beryllium as oxide and as the pure metal. Beryllium copper alloy, containing 0.5 to 2.75 percent beryllium is used in various electrical mechanical applications including current carrying welding components, tooling dies, safety tools, bearing sleeves, and overseas cable housings. Beryllium oxide, in pure or ceramic form, is used in a number of electronic applications as a in resistor cores, integrated circuit chip traveling wave tubes, and laser tubes. Pure beryllium metal is used primarily in aerospace applications including aircraft brakes, nozzles, optics, components, components.

## DESCRIPTION OF PRIMARY BERYLLIUM PRODUCTION

The production of beryllium products can be divided into three distinct operations - production of beryllium hydroxide from beryllium ores, production of beryllium oxide from beryllium hydroxide, and production of beryllium metal from beryllium hydroxide. The primary beryllium production processes are shown schematically in Figures III-1 through III-3 (pages 3646-3649) and described below. Beryllium-copper master alloy is produced from beryllium hydroxide in a two-step process: calcination of beryllium hydroxide to beryllium oxide, and production of beryllium-copper master alloy using a carbon reduction process. No process wastewater is generated by beryllium-copper master alloy production.

#### RAW MATERIALS

Most domestic beryllium is extracted from bertrandite ore  $(4BeO_2SiO_2H_2O)$ . Imported and domestically produced beryl ore  $(3BeOAl_2O_36SiO_2)$  is another raw material for the primary beryllium industry. The only company processing ore maintains the capability for processing beryl ore, and, in 1985, processed approximately 2,200 tons of beryl ore, compared with the 95,000 tons of bertrandite ore processed that year.

#### PRODUCTION OF BERYLLIUM HYDROXIDE

The production of beryllium hydroxide from beryl and bertrandite ores is presented schematically in Figure III-1 (page 3646). Bertrandite ore is first wet ground and screened to form a slurry which is leached with a 10 percent sulfuric acid solution. The mixture is washed and tailings removed in countercurrent thickeners. The sludge from the thickeners is pumped to the tailings pond as a slurry. The thickener supernatant, containing 0.5 to 0.6 grams per liter of beryllium, next enters a solvent extraction process where beryllium is extracted from solution with di-2-ethylhexyl phosphoric acid in kerosene. The barren raffinate solution is discarded as a wastewater stream.

Wastewater streams are generated from both the bertrandite ore gangue and beryl ore gangue dewatering processes. Further, wastewater streams are generated in the bertrandite ore leaching scrubber and bertrandite counter current decantation scrubber processes.

The beryllium is stripped from the organic phase into an aqueous solution containing 4 to 5 grams per liter of beryllium. Aluminum and iron are precipitated from solution and the aluminum iron sludge is discarded. Beryllium is then precipitated from solution as beryllium carbonate which is separated from the liquid phase by filtration. The barren filtrate is discarded as a wastewater stream or further processed for uranium recovery by solvent extraction prior to discharge. The beryllium carbonate may be sold as a product or further processed to beryllium hydroxide.

The beryllium carbonate filter cake is reslurried in deionized water and hydrolyzed in an autoclave to convert the suspended solids to beryllium hydroxide. Beryllium hydroxide is then separated from the liquid phase by filtration and the filtrate discarded as a waste stream. Beryllium hydroxide may be further processed to make beryllium copper alloy, beryllium oxide, or pure beryllium metal.

When beryl ore is processed, the ore is crushed and melted about 1625°C. The molten material is quenched with cold water to produce a glassy material called frit. The frit dried, ground and leached with strong sulfuric acid, forming mixture of beryllium sulfate, aluminum sulfate, and silica. is added to the mixture and the silica is separated in a series of countercurrent decantation steps. The resultant silica is discarded. The beryllium solution, containing approximately 10 to 11 grams per liter of beryllium is further processed by solvent extraction, purification and precipitation identical manner as beryllium solution from bertrandite ore. Beryl ore processing generates wastewater streams from the quench pit, scrubber and washdown operations.

#### BERYLLIUM OXIDE PRODUCTION

Pure beryllium oxide is produced for use in ceramics production or sold directly to customers. The process is shown schematically in Figure III-2 (page 3647). The oxide is produced by dissolving beryllium hydroxide in water and sulfuric acid. The resulting beryllium sulfate solution is then filtered to remove impurities. The solution flows to an evaporator followed by two crystallizers in parallel where beryllium sulfate crystals are formed. The crystals are separated from the mother liquor in a centrifuge and the mother liquor is recycled to the beryllium hydroxide dissolver. The beryllium sulfate is calcined in gasfired furnaces at about  $1100^{\circ}$ C to beryllium oxide.

Sulfur dioxide in the exhaust gases from the calcining furnaces is removed in caustic scrubbers which discharge scrubber water to treatment.

#### BERYLLIUM METAL PRODUCTION

The beryllium manufacturing process is shown schematically in Figure III-3 (page 3649). Beryllium hydroxide, Be(OH)2, is added to a batch makeup tank along with an ammonium bifluoride solution, calcium carbonate, and recycled beryllium fluoride (BeF2). The resultant ammonium beryllium fluoride solution is filtered to remove insoluble impurities. The filter cake is filtered a second time and rinsed with ammonium bifluoride solution to recover any beryllium present in the filter cake. The rinse water is sent to an evaporator where it is concentrated prior to being recycled to the batch makeup tank. The washed filter cake is a fluoride sludge which is sent to treatment. The condensate from the evaporator flows to the process water pit for reuse.

The filtered ammonium beryllium fluoride solution is treated with ammonium sulfide to precipitate dissolved impurities, particularly iron. The precipitated solids are removed in a filter and the resultant sulfide sludge is sent to treatment.

The ammonium beryllium fluoride solution flows to a crystallizer where ammonium beryllium fluoride crystals are formed. Solids are separated from the liquid phase in a centrifuge, the supernatant from the centrifuge is recycled back to the crystallizer and the solids are sent to a drier. The condensate from the crystallizer is sent to the process water pit for reuse.

The dried ammonium beryllium fluoride,  $(NH_4)_2BeF_4$ , is heated in a graphite induction furnace to drive off ammonium fluoride  $(NH_4F)$  and produce beryllium fluoride  $(BeF_2)$ . The off-gases from the fluoride furnace pass through a recirculating wet scrubber where ammonium fluoride is absorbed from the gas into an aqueous solution. The resultant ammonium fluoride solution generated in the scrubber is used, along with hydrofluoric acid, to make ammonium bifluoride solution. This solution is used in various steps in the beryllium metal production process, particularly in

#### PRIMARY BERYLLIUM SUBCATEGORY SECT - III

the dissolution of beryllium hydroxide to produce ammonium beryllium fluoride solution.

Beryllium fluoride is reduced to beryllium metal in a furnace. Magnesium is added to the furnace and the resulting product is a matrix of beryllium metal and magnesium fluoride (MgF2). matrix is crushed in a hammer mill and ball mill. The beryllium, referred to as beryllium pebbles, is separated from magnesium fluoride by washing our during milling. Gravity separation in a bath of bromochloromethane is used to separate heavy metals from beryllium pebbles after milling. The magnesium fluoride residue is washed with ammonium bifluoride solution to recover beryllium which may be present as beryllium fluoride. The beryllium fluoride solution is recycled to the batch makeup tank where beryllium hydroxide is dissolved to produce ammonium beryllium fluoride solution. The magnesium fluoride residue is then slurried to a disposal pond.

Two other additional beryllium recovery operations are present in primary beryllium subcategory. These are recovery beryllium as a hydroxide from low-grade sources and treatment high-grade beryllium chips. The hydroxide operation recovers beryllium from various internal and external sources, although the amount of total plant beryllium production resulting from (i.e.. beryllium scrap recycled y small. Beryllium is recovere secondary material customers) is very recovered precipitating it as Be(OH)2 with sodium hydroxide, separating the precipitate in a clarifier, and dewatering the hydroxide in a The overflow (or supernatant) from the clarifier is centrifuge. discarded.

#### PROCESS WASTEWATER SOURCES

Although a variety of processes are involved in primary beryllium production, the process wastewater sources can be subdivided into the 18 building blocks listed below.

- (a) Solvent extraction raffinate from bertrandite ore,
- (b) Solvent extraction raffinate from beryl ore,
- (c) Beryllium carbonate filtrate,
- (d) Beryllium hydroxide filtrate,
- (e) Beryllium oxide calcining furnace wet air pollution control,
- (f) Beryllium hydroxide supernatant,
- (g) Process water,
- (h) Fluoride furnace scrubber
- (i) Chip leaching wastewater,
- (j) Beryllium pebble plant area vent wet air pollution control,
- (k) Beryl ore ganque dewatering,
- (1) Bertrandite ore gangue dewatering,
- (m) Beryl ore processing,
- (n) AIS area wastewater,
- (o) Bertrandite ore leaching scrubber, and
- (p) Bertrandite ore counter current decantation scrubber.

## OTHER WASTEWATER SOURCES

There may be other wastewater streams associated with the primary beryllium subcategory. These streams include stormwater runoff, and 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 and are best handled by the appropriate permit authority on a case-by-case basis under authority of Section 403 of the Clean Water Act.

# AGE, PRODUCTION, AND PROCESS PROFILE

Figure Ill-4 (page 3649) shows the location of the three primary beryllium plants operating in the United States. The facility which produces beryllium hydroxide from ore is a zero discharge facility and is located in a net evaporation area. The facility which produces beryllium oxide, beryllium-copper master alloy, and beryllium metal from beryllium hydroxide is a direct discharger. The other facility which produces beryllium-copper master alloy has a dry process. The plant which produces beryllium hydroxide from ores began producing hydroxide in 1969. The facility which produces beryllium oxide and beryllium metal has been operating since 1957.

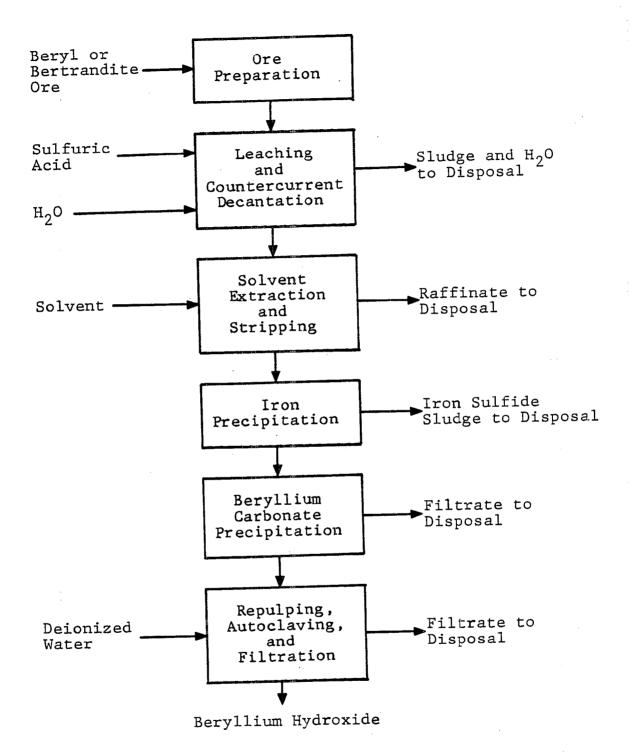


Figure III-1
BERYLLIUM HYDROXIDE PRODUCTION PROCESS

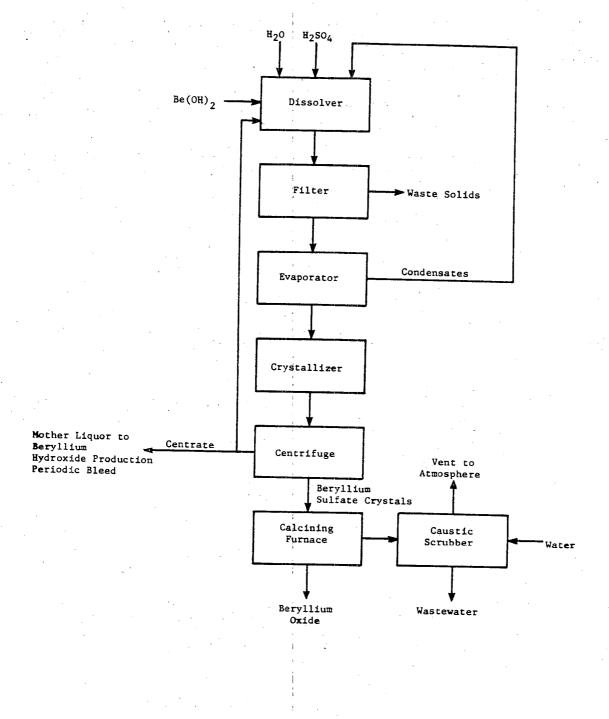


Figure III-2
BERYLLIUM OXIDE PRODUCTION PROCESS

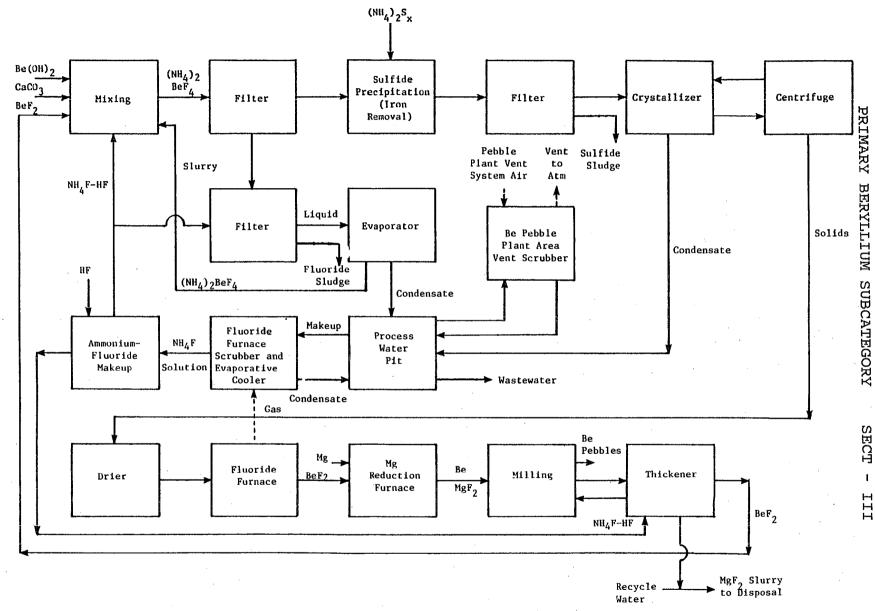
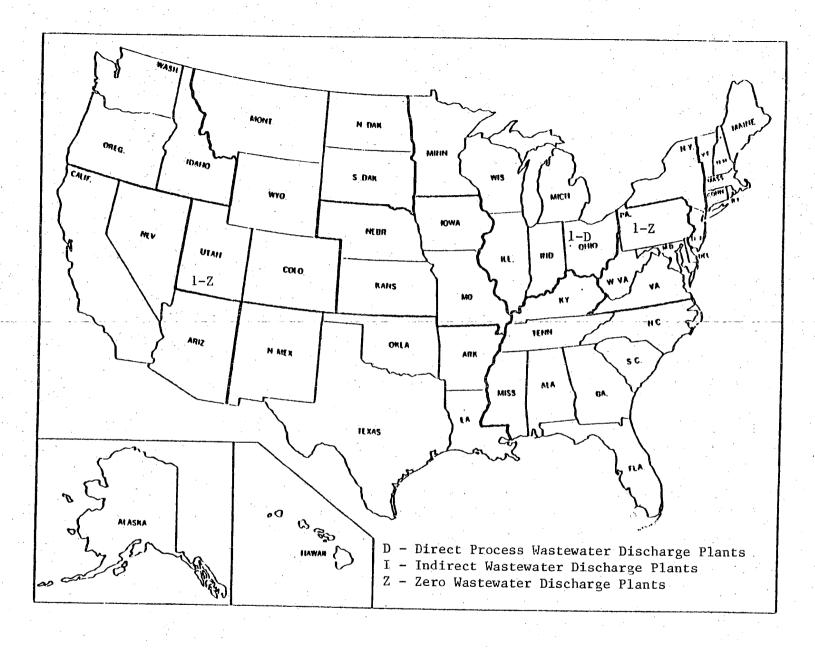


Figure III-3
BERYLLIUM METAL PRODUCTION PROCESS



3649

Figure III-4
GEOGRAPHIC LOCATIONS OF THE PRIMARY BERYLLIUM
SUBCATEGORY PLANTS

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#### SECTION IV

#### SUBCATEGORIZATION

This section summarizes the factors considered during the designation of the primary beryllium subcategory and its related subdivisions. Production normalizing parameters for each subdivision will also be discussed.

# FACTORS CONSIDERED IN SUBDIVIDING THE PRIMARY BERYLLIUM SUBCATEGORY

The factors listed previously were each evaluated when considering subdivision of the primary beryllium 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 beryllium 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 beryllium is still considered a single subcategory, an examination of the production processes has illustrated the need for limitations and standards based on a specific set of wastewater streams. Limitations will be based on specific flow allowances for the following subdivisions:

- (a) Solvent extraction raffinate from bertrandite ore,
- (b) Solvent extraction raffinate from beryl ore,
- (c) Beryllium carbonate filtrate,
- (d) Beryllium hydroxide filtrate,
- (e) Beryllium oxide calcining furnace wet air pollution control,(f) Beryllium hydroxide supernatant,
- (q) Process water,
- (h) Fluoride furnace scrubber,
- (i) Chip treatment wastewater,
- (j) Beryllium pebble plant area vent wet air pollution control,
- (k) Beryl ore gangue dewatering,(l) Bertrandite ore gangue dewatering
- (1) Bertrandite ore gangue dewatering,
  (m) Beryl ore processing,
- (n) AIS area wastewater,
- (O) Bertrandite ore leaching scrubber, and
- (p) Bertrandite ore counter current decantation scrubber.

These building blocks follow directly from differences within the three distinct beryllium production operations: beryllium hydroxide production from ore, beryllium oxide production from beryllium hydroxide, and beryllium metal production from beryllium hydroxide.

The production of beryllium hydroxide from ore gives rise to the

subdivisions (a) through (d) and (k) through (p). Solvent extraction raffinates are a major source of wastewater directly attributable to leaching bertrandite or beryl ore with sulfuric acid and extracting beryllium from the leach solution. Precipitation of beryllium carbonate and beryllium hydroxide each result in filtrate wastewater streams.

Wastewater is generated from the dewatering of beryl ore and bertrandite ore gangue. Beryl ore processing generates wastewater from quenching, scrubber operation and washdown. Aluminum-iron sludge removal generates wastewater. Wastewater is also generated by scrubbing operations associated with bertrandite ore leaching and bertrandite ore counter current decantation operations.

Wastewater from scrubbers which control emissions from calcining furnaces are a major source of wastewater associated with the production of beryllium oxide from beryllium hydroxide.

The operations associated with the production of beryllium metal from beryllium hydroxide give rise to subdivisions (x) through (y). In one by-product recovery operation, beryllium is recovered from internally generated scrap and residues and small amounts of recycled material from customers, by leaching in sulfuric acid and precipitating beryllium hydroxide. A supernatant wastewater results. Process condensates result from beryllium fluoride crystallization and evaporation of ammonium bifluoride filtrate. Wet scrubbers are used to control emissions from fluoride furnaces which convert ammonium beryllium fluoride to beryllium fluoride, and to recover ammonium fluoride for In addition, wet scrubbers are used particulate levels in the air vented from the beryllium pebble plant. Pure beryllium metal scrap is treated with nitric and hydrofluoric acid prior to being vacuum cast along with beryllium pebbles prior to billet manufacturing. The spent acid is discharged as a wastewater stream.

#### OTHER FACTORS

The other factors considered in this evaluation 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. 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 further subdivision of the primary beryllium subcategory.

#### 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 beryllium product or intermediate produced will be used as the PNP. Thus, the PNPs for the 16 subdivisions or building blocks are listed below.

-				
Bui	ldi	ng E	310	ck

## Solvent extraction raffinate from bertrandite ore

## Solvent extraction raffinate from beryl ore

- 3. Beryllium carbonate filtrate
- 4. Beryllium hydroxide filtrate
- Beryllium oxide calcining furnace wet air pollution control
- 6. Beryllium hydroxide supernatant
- 7. Process water
- 8. Fluoride furnace scrubber
- 9. Chip treatment wastewater
- 10. Beryllium pebble plant area vent wet air pollution control
- 11. Beryl ore gangue dewatering
- 12. Bertrandite ore gangue dewatering
- 13. Beryl ore processing

#### PNP

kkg of beryllium carbonate produced from bertrandite ore as beryllium

kkg of beryllium carbonate produced from beryl ore as beryllium

kkg of beryllium carbonate produced as beryllium

kkg of beryllium hydroxide produced as beryllium

kkg of beryllium oxide produced

kkg of beryllium hydroxide produced from scrap and residues as beryllium

kkg of beryllium pebbles produced

kkg of beryllium pebbles produced

kkg of beryllium scrap chips treated

kkg of beryllium pebbles produced

kkg of beryl ore processed

kkg of bertrandite ore processed

kkg of beryl ore processed

#### PRIMARY BERYLLIUM SUBCATEGORY SECT - IV

# Building Block 14. AIS area wastewater kkg of total beryllium carbonate produced as beryllium 15. Bertrandite ore leaching scrubber kkg of bertrandite ore processed kkg of bertrandite ore processed kkg of bertrandite ore processed

Other PNPs were considered. The use of production capacity instead of actual production was eliminated from consideration because the mass of the pollutant produced is more a function of true production than of installed capacity.

#### SECTION V

## WATER USE AND WASTEWATER CHARACTERISTICS

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

Two principal data sources were used in the development of effluent limitations and standards for this subcategory; collection portfolios (dcp) and field sampling results. collection portfolios contain information regarding wastewater flows and production levels.

In order to quantify the pollutant discharge from primary beryllium plants, a field sampling program was conducted. Samples were analyzed for 124 of the 126 priority 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 never analyzed for asbestos. There is reason to expect that TCDD or asbestos would be present nonferrous metals manufacturing.) One plant was selected for sampling in the primary beryllium subcategory. In general, the samples were analyzed for three classes of pollutants: priority organic pollutants, priority metal pollutants, and criteria pollutants (which includes both conventional and nonconventional pollutants).

described in Section IV of this supplement, the primary beryllium subcategory has been divided into 16 subdivisions or wastewater sources, so that the promulgated regulation contains mass discharge limitations and standards for 16 building blocks which may discharge process wastewater. Differences wastewater characteristics associated with these subdivisions are expected. For this reason, wastewater streams corresponding to each subdivision are addressed separately in the discussions that follow. These wastewater sources are:

- Solvent extraction raffinate from bertrandite ore, (a)
- Solvent extraction raffinate from beryl ore, (b)
- (c) Beryllium carbonate filtrate, (d)
- Beryllium hydroxide filtrate,
- Beryllium oxide calcining furnace wet air pollution control, (e)
- (f) · Beryllium hydroxide supernatant,
- (g) Process water,
- (h) Fluoride furnace scrubber, (i) Chip treatment wastewater,
- (j) Beryllium pebble plant area vent wet air pollution control,
- (k) Beryl ore gangue dewatering,

- (1) Bertrandite ore gangue dewatering,
- (m) Beryl ore processing,(n) AIS area wastewater,
- (0) Bertrandite ore leaching scrubber, and
- (p) Bertrandite ore counter current decantation scrubber.

#### WASTEWATER FLOW RATES

Data supplied by dcp responses were evaluated, and two flow-toproduction ratios, water use and wastewater discharge flow, were calculated for each stream. The two ratios are differentiated by the flow value used in calculation. Water use is defined as the volume of water or other fluid required for a given process per mass of beryllium product and is therefore based on the sum recycle and makeup flows to a given process. Wastewater discharged after pretreatment or recycle (if these are present) is used in calculating the production normalized flow -- the volume of wastewater discharged from a given process to further treatment, disposal, or discharge per mass of beryllium 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, beryllium oxide calcining furnace wet air pollution control water flow is related to the production of the beryllium oxide. such, the discharge rate is expressed in liters of scrubber water per metric ton of beryllium oxide produced (gallons of scrubber water per ton of beryllium oxide as produced).

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 (pages 3663 - 36666) 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 IX, X, XI, and XII where representative BPT, 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 CHARACTERIZATION DATA

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

#### DATA COLLECTION PORTFOLIOS

In the data collection portfolios, the beryllium plants that discharge wastewater were asked to specify the presence or absence of toxic pollutants in their wastewater. In all cases, the plants indicated that the priority organic pollutants were believed to be absent. The responses for the priority metals and cyanide are summarized below:

Pollutant	Known Present	Believed Present
Antimony	0	0
Arsenic	0	Ô
Beryllium	1	ī
Cadmium	<u></u>	ก
Chromium	0	Ŏ
Copper	1	ĺ
Cyanide	. 1	<u></u>
Lead	ī	1
Mercury	0	ō
Nickel	1	Ô
Selenium	0	. 0
Silver	0	Ô
Thallium	0	0
Zinc	0	Ô
		<u> </u>

#### FIELD SAMPLING DATA

In order to quantify the concentrations of pollutants present in wastewater from primary beryllium plants. wastewater samples were collected at one of the two primary beryllium plants in the United States. A diagram indicating the sampling sites and contributing production processes is shown in Figures V-1 and V-2 (page 3727 - 3728).

Raw wastewater data are summarized in Tables V-11 through V-15 (pages 3667-3696) Analytical results at various points in the treatment scheme of plant A are summarized in Tables V-16 through V-20 (pages 3700-3723). Note that the stream numbers listed in the tables correspond to those given in individual plant sampling site diagrams, Figures V-1 and V-2. Where no data are listed for a specific day of sampling, the wastewater samples for the stream were not collected.

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.

The detection limits shown on the data tables for priority 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.

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. Priority organic nonconventional, and conventional pollutant data reported with a "less than" sign are considered as detected, but not further quantifiable. A value of zero is also used for averaging. If a pollutant is reported as not detected, it is assigned a value of zero in calculating the average. Finally, priority metal values reported as less than a certain value were considered as not quantifiable, 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:

- 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 beryllium production involves 16 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.

#### SOLVENT EXTRACTION RAFFINATE FROM BERTRANDITE ORE

Beryllium is extracted from bertrandite ore by leaching with sulfuric acid and extracting beryllium from the acid solution with an organic solvent, di-2-ethylhexyl phosphoric acid in kerosene. The barren acid solution, or raffinate stream, is discarded as a waste stream. Water use and discharge rates for

this stream are presented in Table V-1 (page 3663) in liters per metric ton of beryllium carbonate produced (as beryllium). These flows were calculated based on process information from the one facility currently processing bertrandite ore.

Although no sampling data are available for this waste stream, it is expected to have an acidic pH, treatable concentrations of beryllium and other toxic metals which may be leached from the ore along with beryllium, and treatable concentrations of suspended solids. It is also possible that low levels of priority organic pollutants are present in this stream as residuals from the solvent extraction process.

#### SOLVENT EXTRACTION RAFFINATE FROM BERYL ORE

Beryllium is extracted from beryl ore in a manner similar to that used with bertrandite ore. After preliminary processing steps, the ore is leached with sulfuric acid and beryllium is extracted from the acid solution with an organic solvent. The barren raffinate is discharged. Water use and discharge rates for this wastewater stream are presented in Table V-2 (page 3663) in liters per metric ton of beryllium carbonate produced (as beryllium).

No sampling data are available for this waste stream; however, it is expected to have an acidic pH and treatable concentrations of beryllium and other priority metals which may be present in the beryl ore raw material. Treatable concentrations of suspended solids are also expected to be present. It is also possible that toxic organic pollutants may be present in this wastewater stream if they are present in the organic solvent as impurities.

#### BERYLLIUM CARBONATE FILTRATE

Beryllium is stripped from the organic phase into an aqueous solution. Beryllium carbonate is precipitated and separated from the liquid phase by filtration. The filtrate stream is then discharged. Water use and discharge rates for this waste stream are presented in Table V-3 (page 3663) in liters per metric ton of beryllium carbonate produced (as beryllium).

Although there are no sampling data available for this waste stream it is expected to have an alkaline pH and treatable concentrations of beryllium and possibly other toxic metals. Since the separation of BeCO4 from the organic phase is virtually complete, no priority organic pollutants are expected to be present in this stream.

#### BERYLLIUM HYDROXIDE FILTRATE

Beryllium carbonate is reslurried in deionized water, and hydrolyzed in an autoclave to convert the suspended solids to beryllium hydroxide. The beryllium hydroxide is separated from the liquid phase by filtration. The filtrate stream is then

#### PRIMARY BERYLLIUM SUBCATEGORY SECT - V

discharged. Water use and discharge rates are shown in Table V-4 (page 3664) in liters per metric ton of beryllium hydroxide produced (as beryllium).

The flow rate shown in Table V-4 was revised based on new information supplied to Agency after the completion of the original rulemaking.

No sampling data are available for this wastewater stream; however, it is expected to have an alkaline pH and may contain treatable concentrations of beryllium.

#### BERYLLIUM OXIDE CALCINING FURNACE WET AIR POLLUTION CONTROL

When beryllium oxide is produced from beryllium hydroxide, the hydroxide is converted to beryllium sulfate and the sulfate is calcined in a furnace to produce beryllium oxide. Sulfur oxide emissions from the furnaces are controlled with caustic scrubbers. The scrubber liquor is discharged as a wastewater stream. The production normalized water use and discharge rates for beryllium oxide calcining furnace wet air pollution control are shown in Table V-5 (page 3664) in liters per metric ton of beryllium oxide produced and the water use data includes extensive recycle (i.e., greater than 90 percent recycle).

Table V-11 (page 3667) summarizes the field sampling data for beryllium oxide calcining wet air pollution control. This waste stream has a neutral pH and very high concentrations of dissolved solids (primarily sodium sulfate). Treatable concentrations of beryllium, fluoride, and suspended solids are present.

#### BERYLLIUM HYDROXIDE SUPERNATANT

When beryllium is recovered from recycled customer material, internally generated residues, scrap, and recycled mother liquor from the beryllium oxide crystallization operations, the raw material is dissolved in sulfuric acid and beryllium is then precipitated with caustic as beryllium hydroxide After gravity separation, the supernatant is discharged as a wastewater stream. Production normalized water use and discharge data for beryllium hydroxide supernatant are shown in Table V-6 (page 3664) in liters per metric ton of beryllium hydroxide produced (as beryllium).

Table V-12 (page 3672) summarizes the field sampling data for beryllium hydroxide supernatant. It can be seen that this waste stream has an alkaline pH and treatable concentrations of beryllium, copper, fluoride, and suspended solids.

#### PROCESS WATER

Process condensates are generated from the ammonium beryllium fluoride crystallizer and the ammonium fluoride sludge filtrate evaporator. The condensed water is used as makeup for the fluoride furnace scrubbing system, for the beryllium pebble plant

scrubbing system, for sludge washing, and general plant water usage such as floor washings. Periodic discharge from the process water pit is necessary to prevent dissolved solids build-up. Production normalized water use and discharge rates for process water are presented in Table V-7 in liters per metric ton of beryllium metal produced.

Field sampling data for process water are summarized in Table V-13 (page 3676). These data are from samples collected from the process water pit. The data show that process water is characterized by a neutral pH, and treatable concentrations of beryllium and fluoride. Ammonia and cyanide are also reported as present above treatable concentrations.

#### FLUORIDE FURNACE SCRUBBER

Beryllium fluoride (BeF<sub>2</sub>) intermediate is produced by heating ammonium beryllium fluoride in a graphite induction furnace and driving off ammonium fluoride (NH<sub>4</sub>F). Ammonium fluoride is recovered in a wet scrubbing system. Although the scrubber liquor is recycled extensively (>99.9 percent), a blowdown stream is periodically recycled to the ammonium bifluoride makeup tank to be used in beryllium fluoride intermediate production Production normalized water use and discharge rates for fluoride furnace scrubbing liquor are presented in Table V-8 (page 3665) in liters per metric ton of beryllium pebbles produced.

Although at proposal this stream was believed to have been sampled, comments from the plant indicated that the scrubber sampled was the area vent scrubber in the beryllium pebble plant. Fluoride furnace scrubber wastewater is expected to be contaminated with ammonia and fluoride based on the process occurring in the furnace.

#### CHIP TREATMENT WASTEWATER

Pure beryllium metal scrap in the form of chips is treated with nitric acid and rinsed prior to being vacuum cast along with beryllium pebbles into a beryllium metal billet. The spent acid and rinse water are discharged. This operation combines refining beryllium from secondary as well as primary sources. The quantity of beryllium scrap treated and subsequently cast with the beryllium pebbles, however, is small enough to have negligible impact on the production normalized water use and discharge rates for this operation. Water use and discharge rates are presented in Table V-9 (page 3665) in liters per metric ton of beryllium scrap chips treated.

Table V-15 (page 3696) summarizes the field sampling data for chip treatment wastewater. This wastewater is characterized by an acid pH and very high concentrations of beryllium. Other priority metals are present at treatable concentrations including chromium and zinc. Treatable concentrations of fluoride and suspended solids are also present.

#### PRIMARY BERYLLIUM SUBCATEGORY SECT - V

#### BERYLLIUM PEBBLE PLANT AREA VENT WET AIR POLLUTION CONTROL

The beryllium pebble plant contains a ventilation system for air circulation. A wet scrubber is employed to clean the used air prior to venting to the atmosphere. Although the scrubber liquor is recycled extensively, a blowdown stream is periodically discharged to the process water pit. Makeup water for the scrubber is obtained from the process water pit.

Field sampling data for beryllium pebble plant area vent scrubber are summarized in Table V-14 (page 3691). The data show that this stream is characterized by a slightly acidic pH, and treatable concentrations of beryllium and fluoride.

#### ADDITIONAL BUILDING BLOCKS

In the settlement agreement of April 1987, EPA agreed to propose to add new building blocks for the following six processes in the primary beryllium subcategory: beryl ore gangue dewatering, ganque dewatering, beryl ore bertrandite ore processing (comprises quench pit, scrubber and washdown), AIS area wastewater, bertrandite ore leaching scrubber, and bertrandite ore counter current decantation scrubber. These building blocks were not included in the promulgated rule because the Agency lacked adequate information about these processes to promulgate effluent limits at that time. The Agency anticipated that effluent limits for these wastestreams would be established on a best professional judgment ("BPJ") basis by the permit writers during the permit issuance process. The petitioner has requested that EPA establish national regulations for these processes during the settlement negotiations, the Agency obtained the necessary additional information about these processes to do so.

The wastewater discharge rates for these six processes are given below: beryl ore gangue dewatering 1,043 l/kkg of beryl ore processed, bertrandite ore gangue dewatering 2,665 l/kkg of bertrandite ore processed, beryl ore processing 7,303 l/kkg of beryl ore processed, aluminum iron sludge (AIS) area wastewater 468,000 l/kkg of total beryllium carbonate produced as beryllium, bertrandite ore leaching scrubber 1,511 l/kkg of bertrandite ore processed, bertrandite ore countercurrent decantation (CCD) scrubber 101 l/kkg of bertrandite ore processed.

#### TABLE V-1

# WATER USE AND DISCHARGE RATES FOR SOLVENT EXTRACTION RAFFINATE FROM BERTRANDITE ORE

(10<sup>3</sup> l/kkg of beryllium carbonate produced from bertrandite ore as beryllium)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Rate	
1177	0	2246	2246	
	ş			

#### TABLE V-2

# WATER USE AND DISCHARGE RATES FOR SOLVENT EXTRACTION RAFFINATE FROM BERYL ORE

(10<sup>3</sup> 1/kkg of beryllium carbonate produced from beryl ore as beryllium)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Rate	
1177	0	220	220	

#### TABLE V-3

# WATER USE AND DISCHARGE RATES FOR BERYLLIUM CARBONATE FILTRATE

(10<sup>3</sup> 1/kkg of beryllium carbonate produced as beryllium)

Percent Plant Code Recycle		Production Normalized Water Use	Production Normalized Discharge Rate	
1177	0	214.5	214.5	

#### PRIMARY BERYLLIUM SUBCATEGORY SECT - V

#### TABLE V-4

# WATER USE AND DISCHARGE RATES FOR BERYLLIUM HYDROXIDE FILTRATE

(10<sup>3</sup> 1/kkg of beryllium carbonate produced as beryllium)

Plant Code	Percent Norm  Code Recycle Wate		Production Normalized <u>Discharge</u> <u>Rate</u>
1177	0	136.0	136.0

#### TABLE V-5

# WATER USE AND DISCHARGE RATES FOR BERYLLIUM OXIDE CALCINING FURNACE WET AIR POLLUTION CONTROL

(10<sup>3</sup> 1/kkg of beryllium oxide produced)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized <u>Discharge</u> Rate
1111	>90	NR	263.7

#### TABLE V-6

# WATER USE AND DISCHARGE RATES FOR BERYLLIUM HYDROXIDE SUPERNATANT

 $(10^3)$  1/kkg of beryllium hydroxide produced from scrap and residues as beryllium)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized <u>Discharge</u> Rate
1111	0	230.0	230.0

#### PRIMARY BERYLLIUM SUBCATEGORY SECT - 7

#### TABLE V-7

# WATER USE AND DISCHARGE RATES FOR PROCESS WATER

## (10<sup>3</sup> 1/kkg of beryllium pebbles produced)

Plant Code	Percent Recycle	Production Normalized <u>Water</u> Use	Production Normalized <u>Discharge</u> Rate	
1111	NR	NR	174.8	

#### TABLE V-8

# WATER USE AND DISCHARGE RATES FOR SOLVENT EXTRACTION RAFFINATE FROM BERTRANDITE ORE

(10 $^3$  l/kkg of beryllium carbonate produced from bertrandite ore as beryllium)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Rate	
1111	100	NR	0	

#### TABLE V-9

# WATER USE AND DISCHARGE RATES FOR CHIP TREATMENT WASTEWATER

 $(10^3 1/kkg of beryllium scrap chips treated)$ 

Plant Code	Percent Recycle	Production Normalized <u>Water</u> <u>Use</u>	Production Normalized Discharge Rate
1111	0	7.75	7.75

## PRIMARY BERYLLIUM SUBCATEGORY SECT - V

#### TABLE V-10

# WATER USE AND DISCHARGE RATES FOR BERYLLIUM PEBBLE PLANT AREA VENT WET AIR POLLUTION CONTROL

(10<sup>3</sup> 1/kkg of beryllium pebbles produced)

Plant Code	Percent Recycle	Production Normalized <u>Water</u> <u>Use</u>	Production Normalized Discharge Rate
1111	NR	NR	0

Table V-11

PRIMARY BERYLLIUM SAMPLING DATA
BERYLLIUM OXIDE CALCINING FURNACE WET AIR POLLUTION CONTROL
RAW WASTEWATER

	n 11	Stream	Sample	Con	centratio	ns (mg/l)		PRJ
Toxio	<u>Pollutant</u> c Pollutants	Code	Typet	Source	Day 1	Day 2	Day 3	PRIMARY
114.	antimony	481 484	6	<0.003	<0.003 0.015	<0.003 0.013	<0.003 <0.003	BERYLLIUM
. 115	arsenic	481 484	6	<0.003	<0.003 <0.003	<0.003 <0.003	<0.003 <0.003	
117.	beryllium	481 484	6	<0.001	0.49 2.0	0.89 1.20	0.88 0.98	SUBCATEGORY
118.	cadmium	481 484	6	<0.004	0.005 <0.004	<0.004 0.012	<0.004 0.015	[EGORY
119.	chromium (total)	481 484	6 6	0.017	0.055 0.050	0.042 0.086	0.042 0.13	
120.	copper	481 484	6	0.47	0.13 1.5	0.17 0.38	0.12 0.16	SECT -
122.	lead	481 484	6 6	<0.16	<0.168 <0.168	<0.168 <0.168	<0.168 <0.16	⋖
123.	mercury	481 484	6 6	<0.0002	<0.0002 <0.0002	<0.0002 <0.0002	<0.0002 <0.0002	

Table V-11 (Continued)

# PRIMARY BERYLLIUM SAMPLING DATA BERYLLIUM OXIDE CALCINING FURNACE WET AIR POLLUTION CONTROL RAW WASTEWATER

<u>Pollutant</u>	Stream Code	Sample Typet	Conce Source	ntration Day 1	ns (mg/l) Day 2	Day 3	PRIMARY
Toxic Pollutants (Continued)				•			田田
124. nickel	481 484	6 6	<0.006	0.043 0.022	0.019 0.036	0.022 0.036	BERYLLIUM
125. selenium	481 484	6	•	<0.003 <0.003	<0.003 <0.003	<0.003 <0.003	
126. silver	481 484	6 6	<0.0005	0.10 0.066	0.024 0.070	0.033 0.10	SUBCATEGORY
127. thallium	481 484	6 6		<0.002 <0.002	<0.002 <0.002	<0.002 <0.002	GORY
128. zinc	481 484	6 6	0.018	0.052 0.054	0.039 0.051	0.087 0.049	SECT
Nonconventional Pollutants						•	肖
acidity	481 484	6 6	<1	<1 <1	<1 <1	<1 <1	⋖
alkalinity	481 484	6 6	311 1,3 2	350 240	710 280	750 126	*
aluminum	481 484	6 6	<0.100	0.49 0.51	0.47 0.47	0.59 1.0	

Table V-11 (Continued)

# PRIMARY BERYLLIUM SAMPLING DATA BERYLLIUM OXIDE CALCINING FURNACE WET AIR POLLUTION CONTROL RAW WASTEWATER

				. •			
<u>Pollutant</u>		Stream Code	Sample Typet	Cor Source	ncentratio Day 1	ons (mg/l) Day 2	Day 3
Nonconventional Pollutants (Conf	tinued)					,	
ammonia nitrogen		481 484	6 6	6.6	<0.02 35	<0.02 50	120 77
barium		481 484	6	0.20	0.027- 0.15	0.23 0.076	0.19 0.15
boron		481 484	6 6	<0.018	0.50 0.89	0.92 0.57	0.39 0.79
calcium		481 484	6 6	57	4.9 10	9.3 11	11 13
chemical oxygen demand (COD)		481 484	6 6	<b>&lt;1</b>	230 39	<1 490	130 31
chloride		481 484	6 6	95	330 260	120 340	125 190
cobalt		481 484	6 6	<0.012	0.30 0.023	<0.012 0.033	<0.012 0.037
fluoride		481 484	6 6	0.81	5.6 2 4.8 7		13 35
iron		481 484	6	1.4	0.55 0.62	0.32 1.4	0.67 0.95

Table V-11 (Continued)

### PRIMARY BERYLLIUM SAMPLING DATA BERYLLIUM OXIDE CALCINING FURNACE WET AIR POLLUTION CONTROL RAW WASTEWATER

Pollutant	Stream Code	Sample Typet	Concentrations (mg/l) Source Day 1 Day 2 Day 3
Nonconventional Pollutants (Continued)	)		
magnesium	481 484	6 6	36 15 21 15 19 15 18
manganese	481 484	6 6	0.013 0.039 0.058 0.064 0.067 0.072 0.076
molybdenum	481 484	6	0.005 0.046 0.059 0.030 0.043 0.052 0.063
phosphate	481 484	6	<0.732 1.1 8.0 1.6 <0.732 2.9 1.0
sodium	481 484	6 6	17 8,800 1,800 3,300 4,200 9,800 6,000
sulfate	481 484	6 6	1,400 39,000 6,500 7,300 24,000 29,000 18,000
tin	481 484	6 6	<pre>&lt;0.12</pre>
titanium	481 484	6 6	0.73
total dissolved solids (TDS)	481 484	6 6	550 39,000 8,200 33,000 22,000 42,000 23,000

PRIMARY BERYLLIUM SUBCATEGORY

Table V-11 (Continued)

#### PRIMARY BERYLLIUM SAMPLING DATA BERYLLIUM OXIDE CALCINING FURNACE WET AIR POLLUTION CONTROL RAW WASTEWATER

			and the second	to agree the state of the second	*			
Pollucant	Stream			Concentrations (mg/1)				
<u>Pollutant</u>	Code	<u>Type†</u>	Source	Day 1	Day 2	Day 3		
Nonconventional Pollutants (Continued)				•				
total organic carbon (TOC)	481 484	6 6	<1	10	11 8	11 2		
total solids (TS)	481 484	6		9,000 - 8 2,000 42		,000 ,000		
vanadium	481 484	6 6	<0.006	0.032 0.019	<0.006 0.058	<0.006 0.10		
yttrium	481 484	6 6	<0.001	<0.001 <0.001	<0.001 <0.001	<0.001 <0.001		
Conventional Pollutants								
oil and grease	481 484	1	<1	<1 <1	26 <1	<1 <1		
total suspended solids (TSS)	481 484	6	4	100 45	33 60	, 55		
pH (standard units)	481 484	6 6	6.84	8.10 7.58	8.24 6.86	7.52 6.90		

†Sample Type Code: 1 - One-time grab 6 - 24-hour automatic composite

Table V-12

PRIMARY BERYLLIUM SAMPLING DATA
BERYLLIUM HYDROXIDE SUPERNATANT
RAW WASTEWATER

	<u>Pollutant</u>	Stream Code	Sample Type†	Conc Source	entrations Day 1	mg/l) Day 2	Day 3
Toxic	Pollutants						.1
114.	antimony	491	. 1	<0.003	<0.003		
115.	arsenic	491	1	<0.003	<0.003		
117.	beryllium	491	1 -	<0.001	12		
118.	cadmium	4,91	. 1	<0.004	<0.004		
119.	chromium (total)	491	1	0.017	0.11		
120.	copper	491	1	0.47	1.4	•	
122.	lead	491	1	<0.16	<0.168		
123.	mercury	491	1	<0.0002	<0.0002		
124.	nickel	491	1	<0.006	0.12		
125.	selenium	491	1	<0.003	<0.003		
126.	silver	491	1	<0.0005	0.32		
127.	thallium	491	1	<0.002	<0.002		
128.	zine	491	1	0.018	0.19		•

Table V-12 (Continued)

# PRIMARY BERYLLIUM SAMPLING DATA BERYLLIUM HYDROXIDE SUPERNATANT RAW WASTEWATER

					h <del>u</del> l					
	Pollutant		Stream Code	Sample Typet	Concentrations Source Day 1	(mg/1) <u>Day 2</u> <u>Day 2</u>	PRIMARY ام			
Nonconve	ntional Pollutants				<u> 50,500</u>	Day 2 Day				
acidity			491	1 .	<1 <1		BERYLLI			
alkalini	ty	•	491	1	311 2,450		TLIU			
aluminum		FIRE OF THE PERSON OF THE PERS	491	1	<0.100 13		SMD			
ammonia r	nitrogen		491	1.	6.6 13.4		UBC!			
barium			491	1	0.20 0.57		SUBCATEGORY			
boron			491	- 1	<0.018 <0.018		ORY			
calcium			491	1	57 3.5					
chemical	oxygen demand (COD)		491	1	<1 300		SECT			
chloride			491	1	95 520		H			
cobalt			491	1	<0.012 0.019		<			
fluoride		e Solvens	491	1	0.81 1,600					
iron			491	<b>1</b> •	1.4 3.2					
magnesium	1		491	· 1	36 2.7		-			

### PRIMARY BERYLLIUM SAMPLING DATA BERYLLIUM HYDROXIDE SUPERNATANT RAW WASTEWATER

<u>Pollutant</u>	Stream Code	Sample Typet	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Nonconventional Pollutants (Continued)	1		
manganese	491	1	0.013 0.092
molybdenum	491	1	0.005 0.41
phosphate	491	1	<0.732 19
sodium	491	1	17 23,000
sulfate	491	1	1,400 130,000
tin	491	1	<0.12 <0.12
titanium	491	1	0.73 1.3
total dissolved solids (TDS)	491	1	550 99,000
total organic carbon (TOC)	491	1	<1 <1
total solids (TS)	491	1	550 100,000
vanadium	491	1	<0.006 0.10
yttrium	491	1	<0.001 <0.001

PRIMARY BERYLLIUM SUBCATEGORY

#### Table V-12 (Continued)

## PRIMARY BERYLLIUM SAMPLING DATA BERYLLIUM HYDROXIDE SUPERNATANT RAW WASTEWATER

<u>Pollutant</u>	Stream Code	Sample Typet	Con Source	centratio Day 1	ns (mg/l) Day 2	Day 3
Conventional Pollutants	•					
oil and grease	491	1	<1	<1		•
total suspended solids (TSS)	491	1.1.1.	4	100		
pH (standard units)	491	1	6.84	11.5		

tSample Type Code: 1 - One-time grab

Table V-13

PRIMARY BERYLLIUM SAMPLING DATA PROCESS WATER RAW WASTEWATER

	De 11 and and	Stream	Sample	Conc Source	entration	
	<u>Pollutant</u>	Code	Typet	Source	Day 1	Day 2 Day 3
Toxic	Pollutants	-				
1.	acenaphthene	426	1	ND	<b>*</b>	*
2.	acrolein	426	1	ND	ND	ND ND
3.	acrylonitrile	426	1	*	1.682	4.593 4.559
4.	benzene	426	1	*	0.188	0.207 0.617
5.	benzidine	426	1	ND	ND	ND ND
6.	carbon tetrachloride	426	. 1	*	0.069	0.161 0.162
7.	chlorobenzene	426	1	*	*	* *
8.	1,2,4-trichlorobenzene	426	1	ND	ND	ND ND
9.	hexachlorobenzene	426	1	ND	ND	ND ND

Table V-13 (Continued)

<u>Pollutant</u>	Stream Code	Sample Typet	Conce Source	entrations Day 1	s (mg/l) Day 2 Day 3
Toxic Pollutants (Continued)					
10. 1,2-dichloroethane	426	. 1	*	*	0.211 0.142
-111,1-trichloroethane	426		* *		
12. hexachloroethane	426	1	ND	ND	* *
13. 1,1-dichloroethane	426	1	*	0.019	0.043 0.043
14. 1,1,2-trichloroethane	426	1	*	*	* *
15. 1,1,2,2-tetrachloroethane	426	1	*	*	0.078 *
16. chloroethane	426	1	ND	, <b>*</b>	ND ND
17. bis(chloromethyl)ether	426	1	ND	ND	ND ND
18. bis(2-chloroethyl)ether	426	1	ND	ND	ND ND

		*		*				
	Pollutant	Stream Code	Sample Typet	Conc Source	entration Day 1	s (mg/1) Day 2	Day 3	PRIMARY
Toxic	Pollutants (Continued)							
19.	2-chloroethyl vinyl ether	426	1	*	0.101	0.015 0.030		BERYLLIUM
20.	2-chloronaphthalene	426	1	ND	ND	ND ND		
21.	2,4,6-trichlorophenol	426	1	ND	ND	ND ND	-	SUBCATEGORY
22.	p-chloro-m-cresol	426	1	ND	*	ND 0.072		EGORY
23.	chloroform	426	1	*	0.044	0.106 0.109		ន
24.	2-chlorophenol	426	1	ND	ND	ND ND		SECT -
25.	1,2-dichlorobenzene	426	1	ND	ND	ND ND		V
26.	1,3-dichlorobenzene	426	. 1	ND	ND	ND ND		
27.	1,4-dichlorobenzene	426	. 1	ND	ND	ND ND		

Table V-13 (Continued)

			•		•			
		<u>Pollutant</u>	Stream Code	Sample Typet	Conc Source	entration Day 1	us (mg/l) Day 2	Day 3
	Toxic	Pollutants (Continued)	, v					<u> </u>
	2,8.	3,3'-dichlorobenzidine	426	1 .	ND	ND	ND ND	
·		1,1-dichloroethylene	426	1 1 1 1 1 1 1	* -	0.047	0.111 0.115	
)	30.	1,2- <u>trans</u> -dichloroethylene	426	<b>1</b> a 22 - 2	*	0.053	0.134 0.133	
		2,4-dichlorophenol	426	1	ND	ND	ND ND	
		1,2-dichloropropane	426	1	*	0.043	0.113 0.104	
	34.	1,3-dichloropropene	426	1	*	*	0.036 0.023	
	35.	2,4-dimethylphenol 2,4-dimitrotoluene	426	1	ND	ND	ND ND	
	36.	2,6-dinitrotoluene	426	1	ND	ND	ND *	
	30.	2,0-dimitiotoluene	426	1	*	*	*	

Table V-13 (Continued)

		Stream		Concentrations (mg/1)				
	Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	
Toxic	Pollutants (Continued)							
37.	1,2-diphenylhydrazine	426	1	*	*	* *		
38.	ethylbenzene	426	1	*	*	*		
39.	fluoranthene	426	1	*	ND	ND *		
40.	4-chlorophenyl phenyl ether	426	1	ND	ND	ND ND		
41.	4-bromophenyl phenyl ether	426	1	ND	ND	ND ND		
42.	bis(2-chloroisopropyl)ether	426	1	ND	ND	ND ND		
43.	bis(2-chloroethoxy)methane	426	1.	*	ND	ND *		
44.	methylene chloride	426	1	*	0.114	0.211 0.208		
45.	methyl chloride (chloromethane)	426	1	*	*	*		

Table V-13 (Continued)

Po11	Lutant	Stream	Sample	Con	centratio	ns (mg/l)	Day 3
Toxic Pollutant		Code	Typet	Source	Day 1	Day 2	Day 3
							2.5
46. methyl br	omide (bromomethane)	426	1.	ND	*	* *	BERYLLIUM
47. bromoform	(tribromomethane)	426					LIT
						0.130 0.077	
48. dichlorob	en de la companya de La companya de la co	426	1	*	0.021	0.051 0.051	SUBCATEGORY
49. trichloro		426	1	ND	ND	ND ND	EGORY
	ifluoromethane	426	1	ND	ND	ND ND	ญ
51. chlorodib	comomethane	426	1	*	0.080	0.288 0.139	SECT -
52. hexachloro	)butadiene	426	<b>1</b> . * * * * * * * * * * * * * * * * * * *	ND	ND	ND ND	< 4
53. hexachloro	ocyclopentadiene	426	1	ND	ND	ND ND	
54. isophorone		426	1	ND	ND	ND ND	

PRIMARY BERYLLIUM SUBCATEGORY

Table V-13 (Continued)

		Stream	Sample	Conc			
	Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3
Toxic	Pollutants (Continued)						
55.	naphthalene	426	1	*	*	*	
56.	nitrobenzene	426	1	ND	ND	ND *	
57.	2-nitrophenol	426	1	ND	ND	ND ND	
58.	4-nitrophenol	426	1	ND	ND	ND ND	
59.	2,4-dinitrophenol	426	1	ND	ND	ND ND	
60.	4,6-dinitro-o-cresol	426	1	ND	ND	ND ND	·
61.	N-nitrosodimethylamine	426	1	ND	ND	ND *	
62.	N-nitrosodiphenylamine	426	1	ND	*	ND *	
63.	N-nitrosodi-n-propylamine	426	1	ND	ND	ND ND	

Table V-13 (Continued)

•		<u>Pollutant</u>	Stream Code	Sample Typet	Con Source	centratio Day 1	ns (mg/l) Day 2	Dow 3	77.77.77.77.
	Toxi	c Pollutants (Continued)					Day 2	Day 3	+
	64.	pentachlorophenol	426	1	ND	ND	ND		STATE TITE
	65.	phenol	426				ND		T - C
ວ ນ ນ	66.	hia/2	420		ND	ND	ND ND		מסמ ע
ند	00.	bis(2-ethylhexyl) phthalate	426	1	0.024	*	* *		TACATI
	67.	butyl benzyl phthalate	426	1	*	*	*		こらつなど
	68.	di-n-butyl phthalate	426	1 .	0.157	0.034	0.134		<u>v</u>
	69.	di-n-octyl phthalate	426	1	*	ND	ND ND	,	ECT.
	70.	diethyl phthalate			,		ND		<
	,		426	1	0.076	*	0.270 *		
	71.	dimethyl phthalate	426	1	ND	*	ND *		
	72.	benzo(a)anthracene	426	1	*	ND	ND		
				•		* *	ND		

Table V-13 (Continued)

		Stream	Sample	Conc	entrations	(mg/l)	
	Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3
Toxic	Pollutants (Continued)						
73.	benzo(a)pyrene	426	1	*	ND	ND ND	·
74.	benzo(b)fluoranthene	426	1	0.016	ND	ND *	
75.	benzo(k)fluoranthane	426	1	0.011	ND	ND *	
76.	chrysene	426	1	0.017	ND	ND ND	
77.	acenaphthylene	426	1	ND	ND	* *	e e
78.	anthracene (a)	426	1 .	ND	*	* *	
79.	benzo(ghi)perylene	426	1.	ND	ND	ND *	
80.	fluorene	426	. 1 .	ND	*	* *	
81.	phenanthrene (a)	426	1	ND	*	* *	

Table V-13 (Continued)

<u>Pollutant</u>	Stream Code	Sample Typet	Con Source	centration Day 1	ns (mg/1) Day 2	Day 3	PRIMARY
Toxic Pollutants (Continued)							
82. dibenzo(a,h)anthracene	426	1	ND	ND	ND ND	4 .	BERYLL
83. indeno (1,2,3-c,d)pyrene	426		ND	ND -	ND-		LIUM
					ND		*
84. pyrene	426	1	*	ND	ND *		SUBCATEGORY
85. tetrachloroethylene	426	1	*	0.184	0.474 0.481		GORY
86. toluene	426	1	0.085	0.029	0.085 0.065		S
87. trichloroethylene	426	<b>1</b> 1 1 1 1	*	0.017	0.015 0.086		SECT -
88. vinyl chloride (chloroethylene)	426	1	ND	*	*		۷
114. antimony	426	1 QC	<0.003	<0.003	<0.003 <0.003	<0.003	
115. arsenic	426	1 QC	<0.003	0.19	<0.003 <0.003	0.12	

	Stream	Sample	Conc	entration	s (mg/1)	Day 3
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						! !
117. beryllium	426	1 QC	<0.001	230	86 84	36
118. cadmium	426	1 QC	<0.004	0.047	0.007 0.005	0.023
119. chromium (total)	426	1 QC	0.017	0.11	0.058 0.059	0.090
120. copper	426	1 QC	0.47	1.6	1.2 1.1	1.5
121. cyanide (total)	426	1			32.6**	
122. lead	426	1 QC	<0.16	<0.16	<0.168 <0.168	<0.16
123. mercury	426	1 QC	<0.0002	0.0006	0.0009 0.0008	0.0006
124. nickel	426	1 QC	<0.006	0.067	0.027 0.019	0.032
125. selenium	426	1 QC	<0.003	<0.003	<0.003 <0.003	<0.003

<u>Pollutant</u>	Stream Code	Sample Typet	Conc Source	entrations Day 1	mg/l) Day 2	Day 3
Toxic Pollutants (Continued)	,					
126. silver	426	1 QC	<0.0005	<0.0005	0.006 0.007	<0.0005
127. thallium	426		<0.002		<0.002	~ <0.002
		QC			<0.002	
128. zinc	426	1 QC	0.018	0.10	0.047 0.041	0.091
Nonconventional Pollutants			,			
acidity	426	1 QC	<1	<b>&lt;1</b>	<1 <1	<1
alkalinity	426	1 QC	311 1,3	1,4 1,2		560
aluminum	426	1 QC	<0.100		18 19	16
ammonia nitrogen	426	1		4,3	00**	
barium	426	1 QC	0.20	3.3	2.0 3.6	2.3
boron	426	1 QC	<0.018	53	44 39	37

3687

PRIMARY BERYLLIUM SUBCATEGORY

Table V-13 (Continued)

	Stream	Sample		entration			RIMARY
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	[ARY
Nonconventional Pollutants (Continued)						•	
calcium	426	1 QC	57	<0.090	0.44 0.97	4.0	BERYLLIUM
chemical oxygen demand (COD)	426	1 QC	<1		,600 <b>1,</b>	990	
chloride	426	1 QC	95	66	<1 <1	<1	SUBCATEGORY
cobalt	426	1 QC	<0.012	0.062	0.013 0.014	0.044	GORY
fluoride	426	1 QC	0.81 5	,600	43 3, 47	500	SECT
iron	426	1 QC	1.4	3.6	4.2 3.6	3.9	ı
magnesium	426	1 QC	36	1.1	0.19 0.29	2.5	≺
manganese	426	1 QC	0.013	0.065	0.036 0.030	0.083	
molybdenum	426	1 QC	0.005	0.092	0.013 0.024	0.068	

Table V-13 (Continued)

<u>Pollutant</u>	Stream Code	Sample Typet	Co Source	ncentrat Day			PRIMARY
Nonconventional Pollutants (Continued)				- · · · · · · · · · · · · · · · · · · ·		<u> </u>	ARY
phosphate	426	1 QC	<0.732	17.	6.6 6.0	9.2	BERYLLIUM
sodium	426	1 QC	- 17	56	41 40	39-	
sulfate	426	1 1, QC	,400	130	100 100	83	SUBCATEGORY
tin	426	1 QC	<0.12	<0.12	<0.12 <0.12	<0.12	regor)
titanium	426	1 QC	0.73	1.9	1.4 1.4	1.7	•
total dissolved solids (TDS)	426	1 QC	550	3,800	98 100	530	SECT .
total organic carbon (TOC)	426	1 QC	<1	510	1,350 980	440	⋖
total solids (TS)	426	1 QC	550 4	4,200	98 129	570	
vanadium	426	1 QC	<0.006	0.22	<0.006 <0.006	0.10	•

#### Table V-13 (Continued)

### PRIMARY BERYLLIUM SAMPLING DATA PROCESS WATER RAW WASTEWATER

<u>Pollutant</u>	Stream Code	Sample Typet	Conc Source	entration Day 1	ns (mg/1) Day 2	Day 3
Nonconventional Pollutants (Continued) yttrium	426	1 QC	<0.001	<0.001	<0.001 <0.001	<0.001
Conventional Pollutants oil and grease	426	1 QC	<1	<b>&lt;</b> 1	5.2 7.9	15
total suspended solids (TSS)	4.26	1 QC	4	34	<1 <1	4
pH (standard units)	426	1 QC	6.84	7.94	8.09 7.99	7.83

tSample Type Code: 1 - One-time grab

\*Less than or equal to 0.010 mg/l.

\*\*Data from split samples analyzed by the plant and used because EPA analyses were inconclusive.

Table V-14

PRIMARY BERYLLIUM SAMPLING DATA
PEBBLE PLANT AREA VENT SCRUBBER
RAW WASTEWATER

		Pollutant	 Stream Code	Sample Typet	Concentra Source Day		Day 3
	Toxic	Pollutants					<del></del>
	114.	antimony	473	1 QC	<0.003	<0.003 <0.003	
	115.	-arsenic-	473	1- QC	<0.003	0.042 0.060	
3691	117.	beryllium	473	1 QC	<0.001	210 210	
* .* *	118.	cadmium	473	1 QC	<0.004	0.033 0.034	
Í	119.	chromium (total)	473	1 QC	0.017	0.14 0.093	
1	120.	copper	473	1 QC	0.47	0.58 0.50	·
1	122.	lead	473	1 QC	<0.16	<0.168 <0.168	
1	23.	mercury	473	1 QC	<0.0002	0.0004	·

Table V-14 (Continued)

#### PRIMARY BERYLLIUM SAMPLING DATA PEBBLE PLANT AREA VENT SCRUBBER RAW WASTEWATER

<u>Pollutant</u>	Stream Code	Sample Typet	Goncentration Source Day 1	ns (mg/1) <u>Day 2</u> <u>Day 3</u>
Toxic Pollutants (Continued)				
124. nickel	473	1 QC	<0.006	0.064 0.064
125. selenium	473	1 QC	<0.003	<0.003 <0.003
126. silver	473	1 QC	<0.0005	0.008 <0.0005
127. thallium	473	1 QC	<0.002	<0.002 <0.002
128. zinc	473	1 QC	0.018	0.096 0.13
Nonconventional Pollutants				
acidity	473	1 QC	<1	<1 <1
alkalinity	473	1 QC	311	630 640
aluminum	473	1 QC	<0.100	46 41

PRIMARY BERYLLIUM SUBCATEGORY

Table V-14 (Continued)

# PRIMARY BERYLLIUM SAMPLING DATA PEBBLE PLANT AREA VENT SCRUBBER RAW WASTEWATER

<u>Pollutant</u>	Stream Code	Sample Typet	Conce Source	ntrations (mg/l) Day 1 Day 2	Day 3
Nonconventional Pollutants (Continued)					ARY
ammonia nitrogen	473	1 QC	6.6	<0.02 <0.02	BERYLLIUM
-barium	473	QC	0.20	21 24	
boron	473	1 QC	<0.018	57 62	SUBCATEGORY
calcium	473	1 QC	57	4.5 4.9	EGORY
chemical oxygen demand (COD)	473	1 QC	<1	1,930 1,900	Ø
chloride	473	1 QC	95	61 36	SECT -
cobalt	473	1 QC	<0.012	0.074 0.035	∢
fluoride	473	1 QC	0.81	6,650 6,350	

Table V-14 (Continued)

### PRIMARY BERYLLIUM SAMPLING DATA PEBBLE PLANT AREA VENT SCRUBBER RAW WASTEWATER

<u>Pollutant</u>	Stream Code	Sample Typet	Conc.	entrations (mg/l)  Day 1 Day 2 Day	<del>7 3</del>
Nonconventional Pollutants (Continued	)				
iron	473	1 QC	1.4	3.7 4.6	
magnesium	473	1 QC	36	1.6 0.72	
manganese	473	1 QC	0.013	0.041 0.066	
molybdenum	473	1 QC	0.005	0.083 0.082	
phosphate	473	1 QC	<0.732	2.9 4.0	
sodium	473	1 QC	17	74 76	
sulfate	473	1 1 QC	,400	140 150	
tin	473	1 QC	<0.12	<0.12 <0.12	
titanium	473	1 QC	0.73	1.6 1.4	

PRIMARY BERYLLIUM SUBCATEGORY

tSample Type Code: 1 - One-time grab

Table V-14 (Continued)

## PRIMARY BERYLLIUM SAMPLING DATA PEBBLE PLANT AREA VENT SCRUBBER RAW WASTEWATER

<u>Pollutant</u>	Stream Code	Sample Typet	Source	entrations (mg/l) Day 1 Day 2	Day 3 PRIMARY
Nonconventional Pollutants (Continued)		· ·			
total dissolved solids (TDS)	473	1 QC	550	3,910 3,500	BERYLI
total_organic_carbon (TOC)	473	1 QC	· · · <1 - · · ·	470 440	LIUM S
total solids (TS)	473	1 QC	550	3,900 3,700	SUBCATEGORY
vanadium	473	1 QC	<0.006	0.12 0.011	EGORY
yttrium	473	1 QC	<0.001	<0.001 <0.001	Ω
Conventional Pollutants					SECT
oil and grease	473	1 QC	<b>&lt;1</b>	<1 8	ا ح
total suspended solids (TSS)	473	1 QC	4	5 23	
pH (standard units)	473	1 QC	6.84	5.41 5.43	

Table V-15

PRIMARY BERYLLIUM SAMPLING DATA
CHIP TREATMENT
RAW WASTEWATER

<u>Pollutant</u>	Stream Code	Sample Type†	Conce Source	entration Day 1	s (mg/l) Day 2	Day 3	PRIMARY
Toxic Pollutants							
114. antimony	495	1	<0.003			<0.003	ERY)
115. arsenic	495	1	<0.003			<0.003	BERYLLIUM
117. beryllium	495	1	<0.001·		3	,300	
118. cadmium	495	1	<0.004	•		0.063	ОВС
119. chromium (total)	495	1	0.017			7.4	SUBCATEGORY
120. copper	495	1	0.47			1.4	30RY
122. lead	495	1	<0.16			0.20	•
123. mercury	495	1	<0.0002			<0.0002	
124. nickel	495	1	<0.006			0.78	CI
125. selenium	495	1	<0.003			<0.003	<
	495	1	<0.0005			0.040	
	495	1	<0.002			<0.002	,
127. thallium 128. zinc	495	· 1	0.018		• •	7.2	

Table V-15 (Continued)

# PRIMARY BERYLLIUM SAMPLING DATA CHIP TREATMENT RAW WASTEWATER

<u>Pollutant</u>	Stream Code	Sample Typet	Concentrations Source Day 1	(mg/1) Day 2 Day 3
Nonconventional Pollutants				ARY
acidity	495	1	χ <b>1</b>	6,300 BER
alkalinity	495	1	311	6,300 RYLLIUM
aluminum	495	1	<0.100	110
ammonia nitrogen	495	. 1	6.6	\$\text{SUBCATEGORY}\$ 0.068   \text{TEGORY}\$ 2.3
barium	495	1	0.20	0.068 開
boron	495	1	<0.18	2.3 <sup>G</sup>
calcium	495	1	57	8.8
chemical oxygen demand (COD)	495	1	<b>&lt;1</b>	300 SECT
chloride	495	1	95	170 日
cobalt	495	1	<0.012	0.10
fluoride	495	1	0.81	2,500
iron	495	1	1.4	87
magnesium	495	1	36	37

#### Table V-15 (Continued)

### PRIMARY BERYLLIUM SAMPLING DATA CHIP TREATMENT RAW WASTEWATER

	Stream	Sample	Conc	entrations	(mg/l)		PRIMARY
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	IARY
Nonconventional Pollutants (Continued)	)						
manganese	495	1	0.013			9.9	RYLI
molybdenum·····	495 -	. 1	0.005			0.44	BERYLLIUM
phosphate	495	1	<0.732			18	
sodium	495	1	17/ //		•	51	SUBCATEGORY
sulfate	495	1	1,400			73	ŒGO
tin	495	. 1	<0.12			<0.12	RY
titanium	495	1	0.73			3.9	το .
total dissolved solids (TDS)	495	1	550		34,	000	SECT
total organic carbon (TOC)	495	1	<1			170	. I
total solids (TS)	495	1 ·	550		35,	000	7
vanadium	495	1	<0.006			0.35	
yttrium	495	1	<0.001			<0.001	

Table V-15 (Continued)

## PRIMARY BERYLLIUM SAMPLING DATA CHIP TREATMENT RAW WASTEWATER

<u>Pollutant</u>	Stream Code	Sample Typet	Concentrations (mg/1) Source Day 1 Day 2 Day				
Conventional Pollutants							
oil and grease	495	1	<b>&lt;1</b>			35	
total suspended solids (TSS)	495	1	4			370	
pH (standard units)	495	1	6.84			0.97	

†Sample Type Code: 1 - One-time grab

Table V-16
PRIMARY BERYLLIUM SAMPLING DATA
TRIANGULAR LAGOON EFFLUENT

	Pollutant	Stream Code	Sample Typet	Conc Source	entration Day 1	s (mg/1) Day 2	Day 3	PRIMARY
Tox	ic Pollutants							
114	. antimony	477	2 QC	<0.003	<0.003	<0.003 <0.003	<0.003	BERYLLIUM
115	. arsenic	477	2 QC	<0.003	<0.003	<0.003 <0.003	<0.003	
117	. beryllium	477	2 QC	<0.001	1.3	0.46 0.46	1.4	SUBCAI
118	. cadmium	477	2 QC	<0.004	0.027	<0.004 <0.004	0.009	SUBCATEGORY
119	. chromium (total)	477	2 QC	0.017	0.084	0.043 0.039	0.11	
120	. copper	477	2 QC	0.47	39	2.1 2.7	60	SECT -
121	. cyanide (total)	477	1 QC	0.12		0.09 0.10		<
122	. lead	477	2 QC	<0.16	<0.16	<0.168 <0.168	<0.168	
123	. mercury	477	2 QC	<0.0002	<0.0002	<0.0002 <0.0002	<0.0002	2

Table V-16 (Continued)

### PRIMARY BERYLLIUM SAMPLING DATA TRIANGULAR LAGOON EFFLUENT

Pollutant	Stream Sample		Con	Concentrations (mg/l)				
FOITULANL	Code	Typet	Source	Day 1	Day 2	Day 3		
Toxic Pollutants (Continued)								
124. nickel	477	2 QC	<0.006	0.26	0.015 0.020	0.65		
125. selenium	477	2 QC	<0.003	<0.003	<0.003 <0.003	<0.003		
126. silver	477	2 QC	<0.0005	0.042	0.010 0.013	0.016		
127. thallium	477	2 QC	<0.002	<0.002	<0.002 <0.002	<0.002		
128. zinc	477	2 QC	0.018	0.42	0.11 0.052	0.51		
Nonconventional Pollutants			-					
acidity	477	2 QC	<1	<b>&lt;1</b>	<1 <1	<b>&lt;1</b>		
alkalinity	477	2 QC	311	263	600 600	240		
aluminum	477	2 QC	<0.100	5.0	0.44 0.71	4.1		

#### Table V-16 (Continued)

### PRIMARY BERYLLIUM SAMPLING DATA TRIANGULAR LAGOON EFFLUENT

Pollutant	Stream Code	Sample Typet	Source	Day 1	ns (mg/1) Day 2	Day 3
Nonconventional Pollutants (Continued)	)					RY
ammonia nitrogen	477	2 QC	6.6	13.4	6.9 9.1	<0.02 B
barium	477	2 QC	0.20	0.28	0.21 0.25	0.02
boron	477	2 QC	<0.018	1.5	0.99 1.2	0.90
calcium	477	2 QC	57	40	22 22	0.90 BCALEGO
chemical oxygen demand (COD)	477	2 QC	<1	39	34 33	79
chloride	477	2 QC	95	100	180 270	230
cobalt	477	2 QC	<0.012	0.077	0.014 0.022	0.10
fluoride	477	2 QC	0.81	20	26 28	,500

Table V-16 (Continued)

### PRIMARY BERYLLIUM SAMPLING DATA TRIANGULAR LAGOON EFFLUENT

e e e e e e e e e e e e e e e e e e e			α.						
	<u>Pollutant</u>		Stream Code	Sample Typet	Co Source	ncentrati	ons (mg/l)	D 2	֡֝֟֝֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֡֡֝֡֓֓֡֡֝֓֓֡֡֝֡֡֡֝֡֡֡֡֝֡֡֡֝֡֡֡֡֝֡֡֡֡֡֡
Nonconvent	ional Pollutants	(Continued)			Bource	Day 1	Day 2	Day 3	·
iron			477	2 QC	1.4	1.7	0.83 0.87	2.5	BEKY
magnesium			477	2 QC	36	32	4.0 5.2	38	MO TOTA
manganese			477	2 QC	0.013	0.094	7	0.11	
molybdenum			477	2 QC	0.005	0.095	0.024 0.029	0.031	SUBCATEGORY
phosphate			477	2 QC	<0.732	480	3.8 4.4	170	χχ
sodium			477	2 QC	17 2		2,100 2, 2,000	300	SECT
sulfate			477	2 1 QC	,400		3,900 4, 3,900	300	<b>-</b> ✓
tin		ŧ	477	2 QC	<0.12	<0.12	<0.12 <0.12	<0.12	
titanium			477	2 QC	0.73	0.85	<0.010 <0.010	1.0	

#### Table V-16 (Continued)

### PRIMARY BERYLLIUM SAMPLING DATA TRIANGULAR LAGOON EFFLUENT

<u>Pollutant</u>	Stream Code	Sample Type†	Conc Source	centration Day 1	s (mg/1) Day 2	Day 3
Nonconventional Pollutants (Continued)						
total dissolved solids (TDS)	477	2 QC	550 12		000 14 000	,000
total organic carbon (TOC)	477	2 QC	<b>&lt;1</b>	45	19 19	19
total solids (TS)	477	2 QC	550 12		000 15	,000
vanadium	477	2 QC	<0.006	0.15	<0.006 <0.006	<0.006
yttrium	477	2 QC	<0.001	<0.006	<0.001 <0.001	<0.001
Conventional Pollutants						
oil and grease	477	1 QC	<1	<1	<1 6	
total suspended solids (TSS)	477	2 QC	4	170	24 21	260
pH (standard units)	477	2 QC	6.84	7.61	11.20 11.30	6.8

tSample Type Code: 1 - One-time grah

1 - One-time grab2 - Manual composite during intermittent process operation

Table V-17 PRIMARY BERYLLIUM SAMPLING DATA NUMBER 6 LAGOON EFFLUENT

<u> Po</u>	<u>llutant</u>	Stream Code	Sample Typet	Cor Source	ncentratio Day 1	ns (mg/l) Day 2	Day 3	PRI
Toxic Polluta	<u>nts</u>				-	<u> </u>	<u>bay 5</u>	PRIMARY
1. acenaph	thene	427	6	ND	ND	ND	ND	
2. acroleii	n .	427	1	ND	ND	ND	ND	BERYLLIUM
3. acrylon	itrile	427	1. 1. 1 juiju 2	<b>*</b>	<b>*</b>	<b></b>	-*	MOIT
4. benzene		427	<b>1</b>	*	*	0.011	0.014	SUI
5. benzidir	ne	427	6	ND	ND	ND	ND	SUBCATEGORY
6. carbon t	cetrachloride	427	1	*	*	*	*	EGO
7. chlorobe	enzene	427	1	*	*	*	*	RY
8. 1,2,4-tr	richlorobenzene	427	6	ND	ND	ND	ND	S
9. hexachlo	robenzene	427	6	ND	ND	ND	ND	SECT
10. 1,2-dich	loroethane	427	1	*	*	*	*	.<
11. 1,1,1-tr	ichloroethane	427	1	*	*	*	*	
12. hexachlo	roethane	427	6	ND	ND	*	*	
13. 1,1-dich	loroethane	427	1	*	*	*	*	
14. 1,1,2-tr	ichloroethane	427	1	*	*	*	*	

	Pollutant	Stream Code	Sample Type†	Source	entrations Day 1	mg/1) Day 2	Day 3
Toxic	Pollutants (Continued)						
15.	1,1,2,2-tetrachloroethane	427	1	*	*	*	*
16.	chloroethane	427	1	ND	ND	ND	ND
17.	bis(chloromethyl)ether	427	1.	ND	ND	ND	ND
•	bis(2-chloroethyl)ether	427	6	ND	ND	ND	ND
	2-chloroethyl vinyl ether	427	1	*	*	*	*
	2-chlorónaphthalene	427	6	ND	ND	ND	ND
	2,4,6-trichlorophenol	427	6	ND	ND	ND	ND
22.	p-chloro-m-cresol	427	6	ND	*	ND	ND
ė.	chloroform	427	1	*	*	*	*
24.	2-chlorophenol	427	6	ND	ND	ND	ND
25.	1,2-dichlorobenzene	427	6	ND	ND	ND	ND
	1,3-dichlorobenzene	427	6	ND	ND	ND	ND
26.	1,4-dichlorobenzene	427	6	ND	ND	ND	ND
27. 28.	3,3'-dichlorobenzidine	427	6	ND	ND	ND	ND

PRIMARY BERYLLIUM SUBCATEGORY

Table V-17 (Continued)

Stream Code	Sample Typet	Conc Source	entratio Day 1	ons (mg/l) Day 2	Day 3
427	1	*	*	*	*
427	1	*	*	*	*
427	6	ND	N.D - :	ND	
427	1	*	*	*	*
427	1	*	*	*	*
427	6	ND	ND	ND	ND
427	6	ND	ND	ND	ND
427	6	*	*	*	*
427	6	*	ND	*	ND
427	1	*	*	*	*
427	6	*	ND	ND	ND
427	. 6	ND	ND	ND	ND
427	6	ND	ND	ND	ND
427	6	ND	ND	*	ND
	427 427 427 427 427 427 427 427 427 427	Code       Type†         427       1         427       1         427       6         427       1         427       6         427       6         427       6         427       6         427       6         427       6         427       6         427       6         427       6         427       6         427       6         427       6         427       6         427       6	Code         Type†         Source           427         1         *           427         1         *           427         6         ND           427         1         *           427         6         ND           427         6         ND           427         6         *           427         6         *           427         6         *           427         6         ND           427         6         ND           427         6         ND           427         6         ND           427         6         ND	Code         Type†         Source         Day 1           427         1         *         *           427         1         *         *           427         6         ND         ND           427         1         *         *           427         6         ND         ND           427         6         ND         ND           427         6         *         ND           427         6         *         ND           427         6         *         ND           427         6         ND         ND	Code         Typet         Source         Day 1         Day 2           427         1         *         *         *           427         1         *         *         *           427         6         ND         ND         ND           427         1         *         *         *           427         6         ND         ND         ND           427         6         ND         ND         ND           427         6         *         *         *           427         6         *         ND         ND           427         6         *         ND         ND           427         6         ND         ND         ND

3708

Table V-17 (Continued)

Pollutant	Stream Code	Sample Type†	Con Source	centratio Day 1	ns (mg/1) Day 2	Day 3
Toxic Pollutants (Continued)						
43. bis(2-chloroethoxy)methane	427	6	*	*	*	*
44. methylene chloride	427	1 .	*	*	*	*
45. methyl chloride (chloromethane)	427	1	*	*	*	*
46. methyl bromide (bromomethane)	427	·· - 1	- · · ND - ·	- · · ND · · ·	ND	ND
47. bromoform (tribromomethane)	427	1	*	*	*	*
48. dichlorobromomethane	427	1	*	*	*	*
49. trichlorofluoromethane	427	1	ND	ND	ND	ND
50. dichlorodifluoromethane	427	1	ND	ND	ND	ND
51: chlorodibromomethane	427	1	*	ND	ND	*.
52. hexachlorobutadiene	427	. 6	ND	ND	ND	ND
53. hexachlorocyclopentadiene	427	6	ND	ND	ND	ND
	427	6	ND	ND	ND	ND
54. isophorone	427	6	*	ND	*	*
55. naphthalene	•	6	ND	ND	*	*
56. nitrobenzene	427	O	IξD	1110		

Table V-17 (Continued)

	Pollutant	Stream	Sample	Conc	centratio	ns (mg/l)	
Tovi		<u>Code</u>	Typet	Source	Day 1	Day 2	Day 3
TOXIC	Pollutants (Continued)						
57.	2-nitrophenol	427	6	ND	*	ND	*
58.	4-nitrophenol	427	6	ND	ND	ND	ND
59.	2,4-dinitrophenol	427	6	ND	N-D	N D	<b>N</b> D
60.	4,6-dinitro-o-cresol	427	6	ND	0.012	ND	ND
61.	N-nitrosodimethylamine	427	6	ND	ND	*	*
62.	N-nitrosodiphenylamine	427	6	ND	ND	ND	ND
63.	N-nitrosodi-n-propylamine	427	6	ND	ND	ND	ND
64.	pentachlorophenol	427	6	ND	ND	ND	ND
65.	phenol	427	6	ND	ND	ND	0.066
66.	bis(2-ethylhexyl) phthalate	427	6	0.024	0.012	0.014	*
67.	butyl benzyl phthalate	427	6	*	*	*	*
68.	di-n-butyl phthalate	427	6	0.157	0.087	0.049	0.026
69.	di-n-octyl phthalate	427	6	*	ND	*	*
70.	diethyl phthalate	427	6	0.076	0.071	0.018	0.018

371C

Table V-17 (Continued)

Pollutant	Stream Code	Sample Typet	Source	centratio Day 1	ns (mg/1) Day 2	Day 3
Toxic Pollutants (Continued)						
71. dimethyl phthalate	427	6	ND	ND	ND	ND
72. benzo(a)anthracene	427	6	*	ND	ND	ND
73. benzo(a)pyrene	427	6	*	ND	ЙD	ND
74. benzo(b)fluoranthene	427	6	0.016	· · ··ND -	. ND	*
75. benzo(k)fluoranthane	427	6	0.011	ND	ND	*
76. chrysene	427	6	0.017	ND	ND	ND
77. acenaphthylene	427	6.	ND	ND	ND	ND
78. anthracene (a)	427	6	ND	ND	*	*
79. benzo(ghi)perylene	427	6	ND	ND	ND	ND
30. fluorene	427	6	ND	ND	ND	ND
81. phenanthrene (a)	427	6	ND	ND	*	*
82. dibenzo(a,h)anthracene	427	6	ND	ND	ND	ND
83. indeno (1,2,3-c,d)pyrene	427	6	ND	ND	ND	ND
84. pyrene	427	6	*	ND	ND	ND

Table V-17 (Continued)

		Stream	Sample	C			r	ы
	<u>Pollutant</u>	Code	Type†	Source	centratio Day 1	$\frac{\text{ns (mg/1)}}{\text{Day 2}}$		ŘIJ
Toxio	Pollutants (Continued)				247 1	Day 2	Day 3	PRIMARY
85.	tetrachloroethylene	427	1.	*	*	*	*	
86.	toluene	427	1	0.085	*	*	*	BERYLLIUM
87.	trichloroethylene	427		·		· · · · · · · · · · · · · · · · · · ·	*	MOT
88.	vinyl chloride (chloroethylene)	427	1	ND	ND	ND ·	*	
114.	antimony	427	6	<0.003	<0.003	<0.003	<0.003	CAT
115.	arsenic	427	6	<0.003	<0.003	<0.003	<0.003	SUBCATEGORY
117.	beryllium	427	6	<0.001	0.029	0.27	0.024	χΥ
118.	cadmium	427	6	<0.004	0.005	<0.004	<0.004	ស
119.	chromium (total)	427	6	0.017	0.013	0.047	0.034	SECT
120.	copper	427	6	0.47	0.75	0.59	0.38	ı <
121.	cyanide (total)	427	1	0.12	0.08	0.06	<0.02	
122.	lead	427	6	<0.16	<0.168	<0.168	<0.168	
123.	mercury	427	6	<0.0002	0.0011	0.0008	0.0007	
124.	nickel	427	6	<0.006	0.055	0.029	0.023	•
		· .					0.023	

Table V-17 (Continued)

<u>Pollutant</u>	Stream Code	Sample Typet	Conc Source	entration Day 1	ns (mg/1) Day 2	Day 3	PRIMARY
Toxic Pollutants (Continued)							•
125. selenium	427	6	<0.003	<0.003	<0.003	<0.003	BERYLL
126. silver	427	6	<0.0005	0.017	0.011	0.019	TI
127. thallium	427	6	<0.002	<0.002	<0.002	<0.002	IUM
128. zinc	427	· 6	- 0.01-8	0.006	0.048	_0.019	SUBCATEGORY
Nonconventional Pollutants							H.T.W.
acidity	427	6	<b>&lt;1</b>	<1	<1°	<b>&lt;1</b>	GOR
alkalinity	427	6	311	92	80	82	K
aluminum	427	6	<0.100	0.28	<0.100	<0.100	SECT
ammonia nitrogen	427	6	6.6	8.9	<0.02	210	CT
barium	427	6	0.20	0.15	0.27	0.23	ا ⊲
boron	427	6	<0.018	1.2	1.7	1.7	
calcium	427	6	57	140	97	120	
chemical oxygen demand (COD)	427	6	<1	31	47	25	
chloride	427	6	95	510	830	810	

Table V-17 (Continued)

# PRIMARY BERYLLIUM SAMPLING DATA NUMBER 6 LAGOON EFFLUENT

<u>Pollutant</u>	Stream Code	Sample Typet	Concentrations (mg/1) Source Day 1 Day 2 Day 3
Nonconventional Pollutants (Continued	) · · · · · · · · · · · · · · · · · · ·		
cobalt	427	6	<0.012 <0.012 <0.012 <0.012
fluoride	427	6	0.81 26 16.5 17
iron	427.	-6	1.4 1.8 0.95
magnesium	427	6	36 15 11 12
manganese	427	6	0.013 0.010 0.045 0.005
molybdenum	427	6	0.005 0.022 0.028 0.032
phosphate	427	6	(0.700
sodium	427	6	17 2,400 1,700 1,900
sulfate	427	6 1	,400 3,600 3,700 3,800
tin .	427	6	<0.12 <0.12 <0.12 <0.12
titanium	427	6	0.73 0.78 0.70 <0.010
total dissolved solids (TDS)	427	6	550 10,000 9,300 310
total organic carbon (TOC)	427	6	<1 12 18 13
total solids (TS)	427	6	550 11,000 9,800 300

PRIMARY BERYLLIUM SUBCATEGORY

SECT

PRIMARY BERYLLIUM SUBCATEGORY

Table V-17 (Continued)

### PRIMARY BERYLLIUM SAMPLING DATA NUMBER 6 LAGOON EFFLUENT

	Stream	Sample	Concentrations (mg/l)				
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	
Nonconventional Pollutants (Continued)	)						
vanadium	427	6	<0.006	<0.006	<0.006	<0.006	
yttrium	427	6	<0.001	<0.001	<0.001	<0.001	
Conventional Pollutants		<u></u>					
oil and grease	427	1	<1	<1	<1	5	
total suspended solids (TSS)	427	6	4	23	22	34	
pH (standard units)	427	6	6.84	8.63	8.25	8.29	

†Sample Type Code: 1 - One-time grab 6 - 24-hour automatic composite

\*Less than or equal to 0.010 mg/l.

Table V-18

PRIMARY BERYLLIUM SAMPLING DATA
LIME TANK EFFLUENT

<u>Polluta</u>	nt	Stream Code	Sample Typet	Con Source	centration Day 1		Day 3	PRI
Toxic Pollutants				300200	<u>Day 1</u>	Day 2	Day 3	PRIMARY
114. antimony		487	1	<0.003	<0.003	<0.003	<0.003	BER
115. arsenic		487	1	<0.003	0.47	0.33	<0.003	BERYLLIUM
117. beryllium		487	1	<0.001	240	100	550	M
118. cadmium		487	1	<0.004	0.13	0.032	0.23	SUBO
119. chromium (to	tal)	487	1	0.017	8.4	2.0	13	CATI
120. copper		487	1 .	0.47	2.5	13	7.7	SUBCATEGORY
121. cyanide (tota	al)	487	1	0.12	11	21	<0.02	ĸ
122. lead		487	1	<0.16	1.1	0.54	2.3	E S
123. mercury		487	. 1	<0.0002	<0.0002	<0.0002	<0.0002	$\mathbf{G}$
124. nickel		487	1	<0.006	<0.300	0.50	3.9	<b>-</b>
125. selenium		487	1	<0.003	<0.003	<0.003	<0.003	
126. silver		487	1	<0.0005	0.089	0.098	0.27	
127. thallium		487	, 1 <b>1</b>	<0.002	<0.002	<0.002	<0.002	
128. zinc		487	1	0.018	2.6	0.93	4.1	•

PRIMARY BERYLLIUM SUBCATEGORY

Table V-18 (Continued)

### PRIMARY BERYLLIUM SAMPLING DATA LIME TANK EFFLUENT

	Stream	Sample	Concentrations (mg/1)
Pollutant	Code	Typet	Source Day 1 Day 2 Day 3
Nonconventional Pollutants			
acidity	487	1	<1 <1 <1 <1
alkalinity	487	, 1	311 29,000 20,000 2,800
aluminum	- 487	1.	<0.100 <0.100 69 <0.100
ammonia nitrogen	487	1	6.6 <0.02 <0.02 <0.02
barium	487	1	0.20 2.9 3.3 2.9
boron	487	1	<0.018 9.1 29 12
calcium	487	1	57 11,000 12,000 18,000
chemical oxygen demand (COD)	487	1	<1 1,500 <1 1,630
chloride	487	1	95 1,300 <1 <1
cobalt	487	· 1	<0.012 0.16 0.076 0.23
fluoride	487	1	0.81 34,000 55,000 14
iron	487	1	1.4 310 110 630
magnesium	487	1	36 1,300 370 490

Table V-18 (Continued)

# PRIMARY BERYLLIUM SAMPLING DATA LIME TANK EFFLUENT

<u>Pollutant</u>	Stream Code	Sample Typet	Concentrations (mg/1) Source Day 1 Day 2	Day 3
Nonconventional Pollutants (Continued)				
manganese	487	1	0.013 5.0 1.6	8.1
molybdenum	487	1	0.005 0.26 0.11	0.53
phosphate	487	1	<0.732 56 13	20
sodium	487	1	17 810 420	270
sulfate	487	1 1,	400 21,000 1,500	320
tin	487	1	<0.12 <0.12 <0.12	<0.12
titanium	487	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.73 9.1 4.2	13
total dissolved solids (TDS)	487	1	550 4,900 20,000 16,	000
total organic carbon (TOC)	487	1	<1 19 300	550
total solids (TS)	487	. 1 .	550 150,000 20,000 17,	000
vanadium	487	1 .	<0.006 1.1 0.39	1.8
yttrium	487	1	<0.001 <0.001 <0.001	<0.001

PRIMARY BERYLLIUM SUBCATEGORY

SECT

Table V-18 (Continued)

### PRIMARY BERYLLIUM SAMPLING DATA LIME TANK EFFLUENT

	Stream	Sample	Concentrations $(mg/1)$					
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3		
Conventional Pollutants								
oil and grease	487	1	<1	18	<1	6		
total suspended solids (TSS)	487	1	4 130	,000	420	29		
pH (standard units)	487	1	6.84	10.40	11.20	9.28		

tSample Type Code: 1 - One-time grab

Table V-19
PRIMARY BERYLLIUM SAMPLING DATA
STRIPPER EFFLUENT

	Pollutant	Stream	Sample	Con	centratio	ns (mg/l)	
· · · · · · · · · · · · · · · · · · ·		<u>Code</u>	Typet	Source	Day 1	Day 2	Day 3
Toxic	Pollutants				× .		
114.	antimony	488	1	<0.003	<0.003	<0.003	<0.003
115. á	arsenic	488	1	<0.003	0.53	<0.003	0.15
117. b	peryllium	488	i.	<0.001	-340	: :39	480
	admium	488	1	<0.004	0.18	0.014	0.019
119. c	chromium (total)	488	1	0.017	11	0.91	0.33
120. c	copper	488	1	0.47	3.2	5.7	4.5
121. c	yanide (total)	488	1	0.12	4.2	2.4	<0.02
	ead	488	1	<0.16	1.8	0.19	0.20
123. m	ercury	488	1	<0.0002	<0.0002	<0.0002	<0.0002
124. n	ickel	488	1	<0.006	<0.006	0.34	0.15
125. s	elenium	488	1 .	<0.003	<0.003	<0.003	<0.003
126. s	ilver	488	1,	<0.0005	0.15	0.025	0.013
127. th	hallium	488	. 1	<0.002	<0.002	<0.002	<0.002
128. zi	inc	488	1	0.018	4.0	0.63	0.41

Table V-19 (Continued)

### PRIMARY BERYLLIUM SAMPLING DATA STRIPPER EFFLUENT

Pollutant	Stream Code	Sample Typet	Source	oncentrati Day 1	ons (mg/l Day 2		PRIMARY
Nonconventional Pollutants							-
acidity	488	1	<1	<b>&lt;1</b>	<1	<1	ERY
alkalinity	488	1	311	9,900	6,000	25	BERYLLIUM
aluminum	488	· · · · · · · · · · · · · · · · · · ·	<0.100	<0.10	32	43	
ammonia nitrogen	488	1	6.6	<0.02	<0.02	<0.02	SUBC
barium	488	1	0.20	3.9	1.7	1.6	ATE
boron	488	1	<0.018	18	17	8.4	SUBCATEGORY
calcium	488	1	57	16,000	7,300	7,500	•
chemical oxygen demand (COD)	488	1	<1	<1	1,300	1,320	SECT
chloride	488	1	95	130	<1	1,700	占
cobalt	488	.1	<0.012	0.21	0.06	7 0.051	⋖
fluoride	488	1	0.81	40,000	9,700	23	
iron	488	1.	1.4	550	50	26	
magnesium	488	. 1	36	2,600	290	160	

Table V-19 (Continued)

## PRIMARY BERYLLIUM SAMPLING DATA STRIPPER EFFLUENT

<u>Pollutant</u>	Stream Code	Sample Typet	Concentrations (mg/1) Source Day 1 Day 2 Day 3
Nonconventional Pollutants (Continued)	- -		
manganese	488	1	0.013 8.1 1.2 0.62
molybdenum	488	1	0.005 0.39 0.073 0.11
phosphate	488	1	<0.732 56 2.1 <0.732
sodium	488	1	17 700 220 510
sulfate	488	1	1,400 15,000 1,000 420
<b>tin</b>	488	1	<0.12 <0.12 <0.12 <0.12
titanium	488	1	0.73 12 2.5 3.2
total dissolved solids (TDS)	488	1	550 13,000 16,000 6,200
total organic carbon (TOC)	488	1	<1 920 190 490
total solids (TS)	488	1	550 160,000 25,000 6,300
vanadium	488	1	<0.006 1.5 0.23 0.21
yttrium	488	1	<0.001 <0.001 <0.001 <0.001

PRIMARY BERYLLIUM SUBCATEGORY

Table V-19 (Continued)

### PRIMARY BERYLLIUM SAMPLING DATA STRIPPER EFFLUENT

·	Stream	Sample Typet	Source	ncentra Day		) Day 3
Pollutant	Code	Турет	Doulee	20)		
Conventional Pollutants						
oil and grease	488	1	<1	11	<1	18
total suspended solids (TSS)	488	1	4 15	0,000	12,000	68
pH (standard units)	488	1	6.84	8.6	7.85	9.09

†Sample Type Code: 1 - One-time grab

Table V-20
PRIMARY BERYLLIUM SAMPLING DATA
NUMBER 5 LAGOON

•	Pollutant	Stream Code	Sample	Con	centration	<u> </u>		PRI
Toxio	Pollutants		Typet	Source	Day 1	Day 2	Day 3	PRIMARY
114.	antimony	480	1	<0.003	<0.003			•
115.	arsenic	480	1	<0.003	<0.003			BERYLLTUM
11.7.	beryllium	480	1	<0.001	0.74			MIII
118.	cadmium	480	1	<0.004	<0.004		ָט ט	ZIIB RIIB
119.	chromium (total)	480	1	0.017	0.043		) 红 H	SUBCATEGORY
120.	copper	480	1	0.47	0.17		ָהָ קר	นี้ วิท
121.	cyanide (total)	480	1	0.12			₹	∢
122.	lead .	480	1	<0.16	<0.168		<u>ن</u> تا	/ ኳ
123.	mercury	480	1	<0.0002	<0.0002		\bar{\text{P}}	- J
124.	nickel	480	1 .	<0.006	0.11	•		I. <b>∢</b>
125.	selenium	480	1	<0.003	<0.003	•		
126.	silver	480	1	<0.0005	0.093			
127.	thallium	480	1	<0.002	<0.003			
128.	zinc	480	1	0.018	0.034			

Table V-20 (Continued)

# PRIMARY BERYLLIUM SAMPLING DATA NUMBER 5 LAGOON

Pollutant	Stream Code	Sample Typet	Con- Source	centrations Day 1	mg/1) Day 2	Day 3	PRIMARY
Nonconventional Pollutants		,					
acidity	480	. 1	<b>&lt;1</b>	<1			RYI
alkalinity	480	1	311	180			BERYLLIUM
aluminum	480	1	<0.100	0.19	· 		
ammonia nitrogen	480	1	6.6	53			UBC!
barium	480	1 .	0.20	0.22			SUBCATEGORY
boron	480,_	1	<0.018	1.5			ORY
calcium	480	1	57	100			
chemical oxygen demand (COD)	480	1	<1	31			SECT
chloride	480	1	95	570	V.		ij
cobalt	480	1	<0.012	0.024	•	**	<
•	480	1	0.81	43			
fluoride iron	480	1	1.4	0.41			
magnesium	480	1, 1,	36	57	***		

Table V-20 (Continued)

# PRIMARY BERYLLIUM SAMPLING DATA NUMBER 5 LAGOON

Pollutant	Stream Code	Sample Typet	Concentrations (mg/1) Source Day 1 Day 2 Day 3	PRI
Nonconventional Pollutants (Continued)				PRIMARY
manganese	480	1	0.013 0.059	ba
molybdenum	480	1	0.005 0.21	ERYLL
phosphate	480		<0.732 2.8	IUM
sodium	480	1	17 4,400	
sulfate	480	1 1,	400 16,000	SUBCATEGORY
tin	480	1	<0.12 <0.12	EGO]
titanium	480	1	0.73 <0.010	χχ
total dissolved solids (TDS)	480	1 5	550 19,000	S
total organic carbon (TOC)	480	1	<b>&lt;1 7.</b> 0	SECT
total solids (TS)	480	1	50 20,000	   
vanadium	480	1	<0.006 0.017	
yttrium	480	1	<0.001 <0.001	

Table V-20 (Continued)

# PRIMARY BERYLLIUM SAMPLING DATA NUMBER 5 LAGOON

	Stream	Sample	Con	Day 3		
Pollutant	_Code_	Typet	Source	Day 1	Day 2	Day 5
Conventional Pollutants						
oil and grease	480	1	<1	<1		
total suspended solids (TSS)	480	1	4	54		
pH (standard units)	480	1	6.84	8.89		

tSample Type Code: 1 - One-time grab

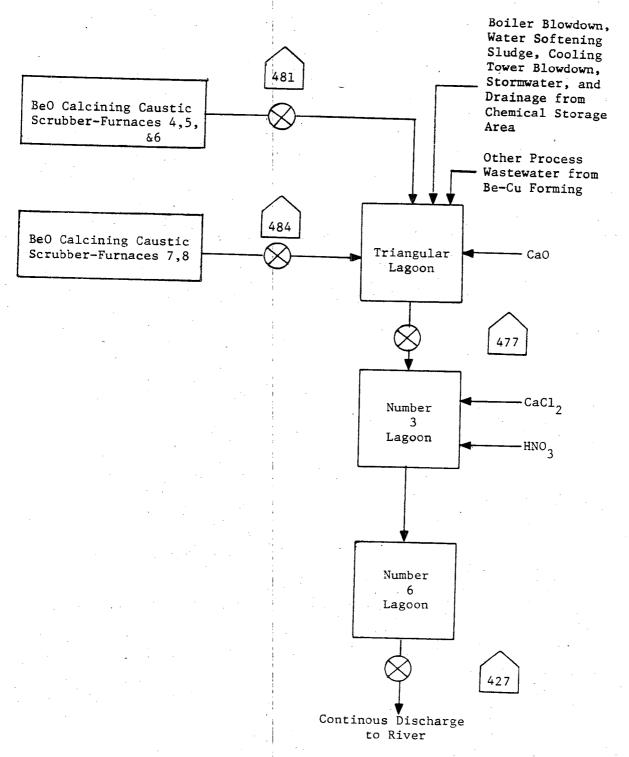


Figure V-1
SAMPLING LOCATIONS AT BERYLLIUM PLANT A BERYLLIUM OXIDE PRODUCTION AREA

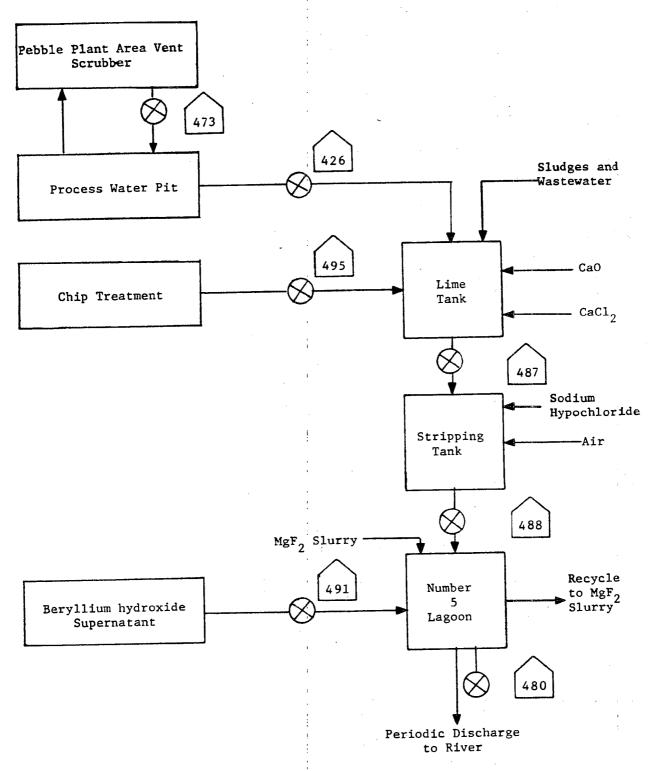


Figure V-2
SAMPLING LOCATIONS AT BERYLLIUM PLANT A BERYLLIUM METAL PRODUCTION AREA

#### SECTION VI

#### SELECTION OF POLLUTANT PARAMETERS

Section V of this supplement presented data from primary beryllium 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 Vol. I. 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 presents and briefly discusses the selection of conventional and nonconventional pollutants for effluent limitations. Also described is the analysis that was performed to select or exclude toxic priority 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 priority metals were the long-term performance values achievable by chemical precipitation. Sedimentation, and filtration. The treatable concentrations used for the priority organics were the long-term performance values achievable by carbon adsorption.

#### CONVENTIONAL AND NONCONVENTIONAL POLLUTANT PARAMETERS

This study examined samples from the primary beryllium subcategory for three conventional pollutant parameters (oil and grease, total suspended solids, and pH) and two nonconventional pollutant parameters (ammonia and fluoride).

Other nonconventional pollutants were analyzed for, including aluminum, barium, boron, cobalt, iron, magnesium, manganese, molybdenum, tin, titanium, and vanadium. These nonconventional pollutants were not selected for limitations in this subcategory because they were generally not found in treatable concentrations in raw wastewater samples, and there is no reason to believe these pollutants should be present based on an examination of the raw materials and production processes involved. In addition, the Agency believes these nonconventional pollutants will be effectively controlled by the limitations established for the selected priority metal pollutants.

#### CONVENTIONAL AND NONCONVENTIONAL POLLUTANT PARAMETERS SELECTED

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

ammonia fluoride total suspended solids (TSS) pH

Although ammonia was not proposed for limitations, the Agency stated that it was considering limiting ammonia in the Notice of Data Availability, based on data received in a comment. Ammonia is selected for regulation in this subcategory. In samples split and analyzed by the primary beryllium plant sampled, up to 4,300 mg/l of NH3 were found in samples of process water. Ammonia compounds are used throughout the beryllium production process and are expected to be present in wastewaters generated by the process. Therefore, the Agency is selecting this pollutant for regulation.

Fluoride was detected in all 14 raw wastewater samples analyzed. Eleven of the observed concentrations were above the treatable concentration of 14.5 mg/l. The treatable concentrations observed ranged from 35 to 6,650 mg/l. For this reason, fluoride is selected for limitation in this subcategory.

TSS concentrations ranging from less than 1 to 370 mg/l were observed in the 13 raw waste samples analyzed for this study. Ten of the concentrations are above the 2.6 mg/l treatable concentration. 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 14 pH values observed during this study ranged from 0.97 to 11.5. 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 PRIORITY POLLUTANTS

The frequency of occurrence of the priority metal pollutants and cyanide in the raw wastewater samples taken is presented in Table VI-1 (page 3739). Table VI-1 is based on the raw wastewater data from streams 481. 484. 491, 426. 473, and 495 (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.

Some samples were analyzed for toxic organic pollutants, and although these analytical data were not available in sufficient time prior to the regulatory proposal to allow for thorough analysis. these data are presented in Section V and have been used in the selection of pollutant parameters for limitation for

the promulgated regulation.

TOXIC POLLUTANTS NEVER DETECTED

The toxic pollutants listed in Table VI-2 (page 3742) were not detected in any raw wastewater samples from this subcategory; therefore, they are not selected for consideration in establishing limitations.

TOXIC POLLUTANTS NEVER FOUND ABOVE THEIR ANALYTICAL QUANTIFICATION CONCENTRATION

The toxic pollutants listed in Table VI-3 (page 3744) 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.

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.

- 114. arsenic
- 123. mercury

Arsenic was detected above its quantifiable concentration of 0.01 mg/l in four out of 14 raw wastewater samples analyzed. The quantifiable concentrations observed ranged from 0.042 to 0.19 mg/l, all of which are below the concentration considered achievable by available treatment technology (0.34 mg/l).

Arsenic is therefore not selected for further consideration for regulation.

Mercury was detected above the analytical quantification concentration in six out of 14 raw wastewater samples analyzed. The largest concentration observed is 0.0009 mg/l, which is well below the treatable concentration of 0.036 mg/l. Mercury is therefore not selected for further consideration for regulation.

TOXIC POLLUTANTS DETECTED IN A SMALL NUMBER OF SOURCES

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

- 3. acrylonitrile
- 4. benzene
- 6. carbon tetrachloride

- 10. 1,2-dichloroethane
- 13. 1,1-dichloroethane
- 15. 1,1,2,2-tetrachloroethane
- 19. 2-chloroethyl vinyl ether
- 22. p-chloro-m-cresol
- 23. chloroform
- 29. 1,1-dichloroethylene
- 30. 1,2-trans-dichloroethylene
- 32. 1,2-propropane
- 33. 1,3-dichloropropene
- 44. methylene chloride
- 47. bromoform
- 48. dichlorobromomethane
- 51. chlorodibromomethane
- 68. di-n-butyl phthalate
- 70. diethyl phthalate
- 85. tetrachloroethylene
- 86. toluene
- 87. trichloroethylene
- 118. cadmium
- 122. lead
- 124. nickel
- 126. silver
- 128. zinc

Acrylonitrile was detected above the level considered achievable by identified treatment technology (0.010 mg/l) in three out of three raw wastewater samples. The treatable concentrations observed are 1.68. 4.59 and 4.56 mg/l. The Agency has no reason to believe that treatable concentrations of acrylonitrile should be present in primary beryllium wastewaters. The Agency believes that these observed values are not representative and may be due to analytical error or site specific factors. Acrylonitriile is therefore not selected for further consideration for limitation.

Benzene was detected above the level considered achievable by identified treatment technology in three out of three raw wastewater samples. The treatable concentrations observed are 0.188, 0.207, and 0.617 mg/l. The Agency has no reason to believe that treatable concentrations of benzene should be present in primary beryllium wastewaters. The Agency believes that these observed values are not representative and may be due to analytical error or site specific factors. Benzene is therefore not selected for further consideration for limitation.

Carbon tetrachloride was detected above the level considered achievable by identified treatment technology (0.010 mg/l) in three out of three raw wastewater samples. The treatable concentrations observed are 0.069, 0.161 and 0.164 mg/l. The Agency has no reason to believe that treatable concentrations of carbon tetrachloride should be present in primary beryllium wastewaters. The Agency believes that these observed values are not representative and may be due to analytical error or site specific factors. Carbon tetrachloride is therefore not selected for further consideration for limitation.

1,2-Dichloroethane was detected above the level considered achievable by identified treatment technology (0.010 mg/l) in two out of three wastewater samples. The treatable raw concentrations observed are 0.211 and 0.142 mg/1. The Agency has no reason to believe that treatable concentrations of 1 2dichloroethane should be present in primary beryllium wastewaters. The Agency believes that these observed values are not representative and may be due to analytical error or site specific factors. 1,2-Dichloroethane is therefore not selected for further consideration for limitation.

l,l-Dichloroethane was detected above the level considered achievable by identified treatment technology (0.010 mg/l) in three out of three raw wastewater samples. The treatable concentrations observed are 0.019, 0.043, and 0.043 mg/l. The Agency has no reason to believe that treatable concentrations of l,l-dichloroethane should be present in primary beryllium wastewaters. The Agency believes that these observed values are not representative and may be due to analytical error or site specific factors. l,l-Dichloroethane is therefore not selected for further consideration for limitation.

1,1,2,2-Tetrachloroethane was detected above the level considered achievable by identified treatment technology (0.010 mg/l) in one out of three raw wastewater samples. The treatable concentration observed is 0.078 mg/l. The Agency has no reason to believe that treatable concentrations of 1,1,2,2-tetrachloroethane should be present in primary beryllium wastewaters. The Agency believes that the observed value is not representative and may be due to analytical error or site specific factors. 1,1,2,2-Tetrachloroethane is therefore not selected for further consideration for limitation.

2-Chloroethyl vinyl ether was detected above the level considered achievable by identified treatment technology (0.010 mg/l) in three out of three raw wastewater samples. The treatable concentrations observed are 0.101, 0.014, and 0.030 mg/l. The Agency has no reason to believe that treatable concentrations of 2-chloroethyl vinyl ether should be present in primary beryllium wastewaters. The Agency believes that these observed values are not representative and may be due to analytical error or site specific factors. 2-Chloroethyl vinyl ether is therefore not selected for further consideration for limitation.

Parachlorometacresol was detected above the level considered achievable by identified treatment technology (0.010 mg/l) in one out of three raw wastewater samples. The treatable concentration observed is 0.072 mg/l. The Agency has no reason to believe that treatable concentrations of parachlorometacresol should be present in primary beryllium wastewaters. The Agency believes that the observed value is not representative and may be due to analytical error or site specific factors. Parachlorometacresol is therefore not selected for further consideration for limitation.

Chloroform was detected above the level considered achievable by identified treatment technology (0.010 mg/l) in three out of three raw wastewater samples. The treatable concentrations observed are 0.044, 0.106, and 0.109 mg/l. The Agency has no reason to believe that treatable concentrations of chloroform should be present in primary beryllium wastewaters. The Agency believes that these observed values are not representative and may be due to analytical error or site specific factors. Chloroform is therefore not selected for further consideration for limitation.

l,l-Dichloroethylene was detected above the level considered achievable by identified treatment technology (0.010 mg/l) in three out of three raw wastewater samples. The treatable concentrations observed are 0.047, 0.111, and 0.115 mg/l. The Agency has no reason to believe that treatable concentrations of l,l-dichloroethylene should be present in primary beryllium wastewaters. The Agency believes that these observed values are not representative and may be due to analytical error or site specific factors. l,l-Dichloroethylene is therefore not selected for further consideration for limitation.

1,2-Trans-dichloroethylene was detected above the level considered achievable by identified treatment technology (0.010 mg/l) in three out of three raw wastewater samples. The treatable concentrations observed are 0.053, 0.134, and The Agency has no reason to Believe that treatable concentrations of 1,2-trans-dichloroethylene should be present in primary beryllium wastewaters. The Agency believes that these observed values are not representative and may be due to or site specific factors. 1,2-Transdichloroethylene is therefore not selected for consideration for limitation.

1,2-Dichloropropane was detected above the level considered achievable by identified treatment technology (0.010 mg/l) in three out of three raw wastewater samples. The treatable concentrations observed are 0.043, 0.113, and 0.104 mg/l. The Agency has no reason to believe that treatable concentrations of 1,2-dichloropropane should be present in primary beryllium wastewaters. The Agency believes that these observed values are not representative and may be due to analytical error or sire specific factors. 1,2-Dichloropropane is therefore not selected for further consideration for limitation.

1,3-Dichloropropene was detected above the level considered achievable by identified treatment technology (0.010 mg/l) in two out of three raw wastewater samples. The treatable concentrations observed are 0.036 and 0.023 mg/l. The Agency has no reason to believe that treatable concentrations of 1,3-dichloropropene should be present in primary beryllium wastewaters. The Agency believes that these observed values are not representative and may be due to analytical error or site specific factors. 1,3-Dichloropropene is therefore not selected

for further consideration for limitation.

Methylene chloride was detected above the level considered achievable by identified treatment technology (0.010 mg/l) in three out of three raw wastewater samples. The treatable concentrations observed are 0.114, 0.211, and 0.208 mg/l. The Agency has no reason to believe that treatable concentrations of methylene chloride should be present in primary beryllium wastewaters. The Agency believes that these observed values are not representative and may be due to analytical error or site specific factors. Methylene chloride is therefore not selected for further consideration for limitation.

Bromoform was detected above the level considered achievable by identified treatment technology (0.010 mg/l) in two out of three raw wastewater samples. The treatable concentrations observed are 0.130 and 0.077 mg/l. The Agency has no reason to believe that treatable concentrations of bromoform should be present in primary beryllium wastewaters. The Agency believes that these observed values are not representative and may be due to analytical error or site specific factors. Bromoform is therefore not selected for further consideration for limitation.

Dichlorobromomethane was detected above the level considered achievable by identified treatment technology (0.010 mg/l) in three of three raw wastewater samples. The treatable concentrations observed are 0.021, 0.041. and 0.041 mg/l. The Agency has no reason to believe that treatable concentrations of dichlorobromomethane should be present in primary beryllium wastewaters. The Agency believes that these observed values are not representative and may be due to analytical error or site specific factors. Dichlorobromomethane is therefore not selected for further consideration for limitation.

Chlorodibromomethane was detected above the level considered achievable by identified treatment technology (0.010 mg/l) in three of three raw wastewater samples. The treatable concentrations observed are 0.080, 0.288, and 0.139 mg/l. The Agency has no reason to believe that treatable concentrations of chlorodibromomethane should be present in primary beryllium wastewaters. The Agency believes that these observed values are not representative and may be due to analytical error or site specific factors. Chlorodibromomethane is therefore not selected for further consideration for limitation.

Di-n-butyl phthalate was detected above the level considered achievable by identified treatment technology (0.010 mg/l) in two out of three raw wastewater samples. The treatable concentrations observed are 0.034 and 0.134 mg/l. The Agency has no reason to believe that treatable concentrations of di-n-butyl phthalate should be present in primary beryllium wastewaters. The Agency believes that these observed values are not representative and may be due to analytical error or site specific factors. Di-n-butyl phthalate is therefore not selected for further consideration for limitation.

Diethyl phthalate was detected above the level considered achievable by identified treatment technology (0.010 mg/l) in one out of three raw wastewater samples. The treatable concentration observed is 0.270 mg/l. The Agency has no reason to believe that treatable concentrations of diethyl phthalate should be present in primary beryllium wastewaters. The Agency believes that the observed value is not representative and may be due to analytical error or site specific factors. Diethyl phthalate is therefore not selected for further consideration for limitation.

Tetrachloroethylene was detected above the level considered achievable by identified treatment technology (0.010 mg/l) in three of three raw wastewater samples. The treatable concentrations observed are 0.184, 0.474, and 0.481 mg/l. The Agency has no reason to believe that treatable concentrations of tetrachloroethylene should be present in primary beryllium wastewaters. The Agency believes that these observed values are not representative and may be due to analytical error or site specific factors. Tetrachloroethylene is therefore not selected for further consideration for limitation.

Toluene was detected above the level considered achievable by identified treatment technology (0.010 mg/l) in three of three raw wastewater samples. The treatable concentrations observed are 0.029, 0.084, and 0.064 mg/l. The Agency has no reason to believe that treatable concentrations of toluene should be present in primary beryllium wastewaters. The Agency believes that these observed values are not representative and may be due to analytical error or site specific factors. Toluene is therefore not selected for further consideration for limitation.

Trichloroethylene was detected above the level considered achievable by identified treatment technology (0.010 mg/l) in three of three raw wastewater samples. The treatable concentrations observed are 0.017, 0.014, and 0.086 mg/l. The Agency has no reason to believe that treatable concentrations of trichloroethylene should be present in primary beryllium wastewaters. The Agency believes that these observed values are not representative and may be due to analytical error or site specific factors. Trichloroethylene is therefore not selected for further consideration for limitation.

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 permit issuing authority to specify effluent limitations.

Cadmium detected above the concentration considered achievable by identified treatment technology (0.049 mg/l) in one out of 14 raw wastewater samples. The treatable concentration observed is 0.063 mg/l. The Agency has no reason to believe that treatable cadmium concentrations should be present in primary beryllium wastewaters and believes that this one value is not representative of the subcategory. Cadmium is therefore not

selected for further consideration for limitation.

Lead was detected above the concentration considered achievable by identified treatment technology (0.08 mg/l) in one out of 14 raw wastewater samples. The treatable concentration observed is 0.20 mg/l. The Agency has no reason to believe that treatable lead concentrations should be present in primary beryllium wastewaters and believes that this one value is not representative of the subcategory. Lead is therefore not selected for limitation.

Nickel was detected above the concentration considered achievable by identified treatment technology (0.204 mg/l) in one out of 14 raw wastewater samples. The treatable concentration observed is 0.78 mg/l. The Agency has no reason to believe that treatable nickel concentrations should be present in primary beryllium wastewaters, and does not believe that this one value is representative of the subcategory. Nickel is therefore not selected for further consideration for limitation.

Silver was detected above the concentration considered achievable by identified treatment technology (0.07 mg/l) in three out of 14 raw wastewater samples. The treatable concentrations observed range from 0.10 mg/l to 0.32 mg/l. The Agency has no reason to believe that treatable silver concentrations should be present in primary beryllium wastewaters. Silver is therefore not selected for further consideration for limitation.

Zinc was detected above the concentration considered achievable by identified treatment technology (0.23 mg/l) in one out of 14 raw wastewater samples. The treatable concentration observed is 7.2 mg/l. The Agency has no reason to believe that treatable zinc concentrations should be present in primary beryllium wastewaters, and does not believe that this one value is representative. Zinc is therefore not selected for further consideration for limitation.

### TOXIC POLLUTANTS SELECTED FOR FURTHER CONSIDERATION IN ESTABLISHING LIMITATIONS AND STANDARDS

The priority 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.

- 117. beryllium
- 119. chromium
- 120. copper
- 121. cyanide

Beryllium was detected above the concentration considered achievable by identified treatment technology (0.20 mg/l) in all 14 raw wastewater samples. The treatable concentrations observed range from 0.49 mg/l to 3,300 mg/l. Beryllium 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 eight out of 14 raw wastewater samples. The treatable concentrations observed range from 0.086 mg/l to 7.5 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 nine out of 14 raw wastewater samples. The treatable concentrations observed range from 0.50 mg/l to 1.6 mg/l. Copper is therefore selected for further consideration for limitation.

Although cyanide was not proposed for limitations, the Agency stated that it was considering limiting cyanide in the Notice of Data Availability, based on data received in a comment. Cyanide was detected above the concentration considered achievable by identified treatment technology (0.047 mg/l) in the only sample for which the Agency has reliable cyanide data. This sample was a split sample from the Agency's sampling visit which was analyzed by the facility. The observed concentration of 32.6 mg/l was verified by the plant as being a representative value for process water. Cyanide is formed in the carbon lined induction furnaces which are used to produce BeF4 from (NH4)2BeF4. The cyanide is picked up in the fluorine furnace scrubber which discharges an ammonium fluoride solution to various plant processes.

Table VI-1

# FREQUENCY OF OCCURRENCE OF PRIORITY POLLUTANTS PRIMARY BERYLLIUM SUBCATEGORY RAW WASTEWATER

		Pollutant	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentra- tion (mg/l)(b)	Number of Streams Analyzed	Number of Samples Analyzed	<u>ND</u>	Detected Below Quantification Concentration	Detected Below Treat- able Concen- tration	Netected Above Treat- able Concen- tration	
	1.		0.010	0.010	1	3		3	and the second		
	2.	acrolein	0.010	0.010	1	3	3	. •			
	3.	acrylonitrile	0.010	0.010	1	3	- 5			. 3	
	4.	benzene	0.010	0.010	1	3		· · · · · · · · · · · · · · · · · · ·		. 3 3 .	
	5.	benzidine	0.010	0.010	1	. 3	· 3				
	6.	carbon tetrachloride	0.010	0.010	1	3	•		1	2	
	7.	chlorobenzene	0.010	0.0.10	·				er games and reserve as agrant to	3	-
	.8.	1,2,4-trichlorobenzene	0.010	0.010	1	3	3				
	9.	hexachlorobenzene	0.010	0.010	1	3	3	*			
	10.	1,2-dichlorobenzene	0.010	0.010	1	3	•	1 .			
	11.	1,1,1-trichlorobenzene	0.010	0.010	1	3		3		2	
	12.	hexachloroethane	0.010	0.010	1	3	1.	2	. "		
	13.	1,1-dichloroethane	0.010	0.010	1	3	• .			3	
	14.	1,1,2-trichloroethane	0.010	0.010	1	3		3		3	
	15.	1,1,2,2-tetrachloroethane	0:010	0.010	1.,	3		2		•	
	16.	chloroethane	0.010	0.010	1	3	2	1		. '	
	17.	bis(chloromethyl)ether	0.010	0.010	1	.3	3	· •		F 2	
•	18.	bis(2-chloroethyl)ether	0.010	0.010	1	3	3	-	*	•	
	19.	2-chloroethyl vinyl ether	0.010	0.010	1	3	•			3	
	20.	2-chloronaphthalene	0.010	0.010	1	3	3	1 5	*	3	
	21.	2,4,6-trichlorophenol	0.010	0.010	1	3	3				
	22.	parachlorometa cresol	0.010	0.010	1	3	1	. 1			
	23.	chloroform	0.010	0.010	1 .	3	• •			1	
	24.	2-chlorophenol	0.010	0.010	1	3	3			3	
	25.	1,2-dichlorobenzene	0.010	0.010	1	3	3	. *			
	26.	1,3-dichlorobenzene	0.010	0.010	. 1	· 3	3				
	27.	1,4-dichlorobenzene	0.010	0.010	1	3	3			1	
	28.	3,3'-dichlorobenzidine	0.010	0.010	1	3	3	1	-		
	29.	1,1-dichloroethylene	0.010	0.010	1	á		*		•	
	30.	1,2-trans-dichloroethylene	0.010	0.010	. 1	3				3	
	31.	2,4-dichlorophenol	0.010	0.010	.1	3	3				
	32.	1,2-dichloropropane	0.010	0.010	1	3	-			, , , , , , , , , , , , , , , , , , ,	
	33.	1,3-dichloropropylene	0.010	0.010	1 1	3	3	1		2	
	34.	2,4-dimethylphenol	0.010	0.010	1	3	3	•	•	2	
	35.	2,4-dintrotoluene	0.010	0.010	1	. 3	3	•			
	36.	2,6-dintrotoluene	0.010	0.010	1 1	3	-	3			
	37.	1,2-diphenylhydrazine	0.010	0.010	1	3		3	200	*	
	38.	ethylbenzene	0.010	0.010	1	3		. 1	*		
	39.	fluoranthene	0.010	0.010	1	3 .	2	5 i	•		

# FREQUENCY OF OCCURRENCE OF PRIORITY POLLUTANTS PRIMARY BERYLLIUM SUBCATEGORY RAW WASTEWATER

			1/111	, iiiio i miiii.					
	Pollutan <u>t</u>	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentra- tion (mg/l)(b)	Number of Streams Analyzed	Number of Samples Analyzed	<u>ND</u>	Detected Below Quantification Concentration	Detected Below Treat- able Concen- tration	Detected Above Treat- able Concen- tration
	•	0.040	0.010	1	3	3			
40.	4-chlorophenyl phenyl ether	0.010	0.010	· i	3	3			
41.	4-bromophenyl phenyl ether	0.010	0.010	i	3	3			
42.	bis(2-chloroisopropyl)ether	0.010	0.010	i	3	2	1		
43.	bis(2-chloroethoxy)methane	0.010	0.010	1	3				3
44.	methylene chloride	0.010	0.010	i	3		3		
45.	methyl chloride	0.010	0.010	· i	3	-	3		
46.	methyl bromide	0.010	0.010	•	3		1		2
47.	bromoform	0.010	0.010	1	3				3
48.	dichlorobromomethane	0.010	0.010	i	3	3	•		
49.	trichlorofluoromethane	0.010		•	3	3			
50.	dichlorodifluoromethane	0.010	0.010	1	. 3			•	3
51.	chlorodibromomethane	0.010	0.010		3	3			
52.	hexachlorobutadiene	0.010	0.010		3	3			
53.	hexachlorocyclopentadiene	0.010	0.010		3	3			
54.	isophorone	0.010	0.010		3	•	. 3		•
55.	naphthalene	0.010	0.010	1	3	2	1		
56.	nitrobenzene	0.010	0.010		3	3			
57.	2-nitrophenol	0.010	0.010	, !	. 3	3			
58.	4-nitrophenol	0.010	0.010		3	3			F
59.	2,4-dinitrophenol	0.010	0.010	1	3	3			-
60.	4,6-dinitro-o-cresol	0.010	0.010	1	3	2	1	1	
61.		0.010	0.010	1	3	1	2		
62.		0.010	0.010	1	3	. 3	-		
63.		0.010	0.010	1	3	3		,	
64.		0.010	0.010	1	3	3		•	
65.	<del>-</del>	0.010	0.010	1	3	J	3		
66.		0.010	0.010	1	3		. 3		•
67.		0.010	0.010	. 1	3	1			2 .
68.		0.010	0.010	1	. 3	3	,		
69.		0.010	0.010	1	3	3	2		1
70.		0.010	0.010	1	_	1	2		
71.		0.010	0.010	1	- 3 - 3	3	<b>-</b>		Control of the Control
72.		0.010	0.010	1	3	3			
73.		0.010	0.010	1	3	3 2.	1		,
74.		0.010	0.010	1	3	2.	i		
75.		0.010	0.010	1	3	. 3	•	•	
76.		0.010	0.010	. 1		3 1	2		. *
77.	-	0.010	0.010	1	3	•	3		
78.		0.010	0.010	1	, 3 3	2	1		
79.		0.010	0.010	1	<b>.</b>	4	•		

PRIMARY BERYLLIUM SUBCATEGORY

Table VI-1 (Continued)

# FREQUENCY OF OCCURRENCE OF PRIORITY POLLUTANTS PRIMARY BERYLLIUM SUBCATEGORY RAW WASTEWATER

	<u>Pollutant</u>	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentra- tion (mg/l)(b)	Number of Streams Analyzed	Number of Samples Analyzed	Detected Below Quantification ND Concentration	Detected Below Treat- able Concen- tration	Detected Above Treat- able Concen- tration
80. 81. 82. 83.	fluorene phenanthrene dibenzo(a,h)anthracene indeno(1,2,3-cd)pyrene	0.010 0.010 0.010 0.010	0.010 0.010 0.010 0.010	1 1 1	3 3 3	3 3		
84. 85. 86.	pyrene tetrachloroethylene toluene trichloroethylene	0.010 0.010 0.010 0.010	0.010 0.010 0.010 0.010	1 1 1	3 3 3 3	2 1		3 3
88. 114. 115. 117.	antimony arsenic beryllium	0.010 0.100 0.010 0.010	0.010 0.47 0.34 0.20	6 6 6	3 14 14 14	3 14 10	4	14
118. 119. 120. 121. 122.	cadmium chromium copper cyanide (c)	0.002 0.005 0.009 0.02	0.049 0.07 0.39 0.047	6 6 6 1	14 14 14 1		9 6 5	1 8 9
123. 124. 125. 126.	lead mercury nickel selenium silver	0.020 0.0001 0.005 0.01	0.08 0.036 0.22 0.20	6 6 6	14 14 14 14	13 8 14	6 .13	1
127.	thallium zinc	0.02 0.100 0.050	0.07 0.34 0.23	6 6 6	14 14 14	6 14 4	5 9	3

(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) 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.

#### TABLE VI-2

### TOXIC POLLUTANTS NEVER DETECTED

acrolein 2. benzidine 5. 1.2,4-trichlorobenzene 8. hexachlorobenzene 9. 17. bis (chloromerhyl) ether (deleted) bis (2-chloroethyl) ether 18. 2-chloronaphthalene 20. 2,4,6-trichlorophenol 21. 2-chlorophenol 22. 1,2-dichlorobenzene 23. 1,3-dichlorobenzene 26. 1,4-dichlorobenzene 27. 3,3'-dichlorobenzidine 28. 2,4-dichlorophenol 31. 1,2-dichloropropylene (1,3-dichloropropene) 33. 2,4-dimethylphenol 34. 2.4-dinitrotoluene 35. 4-chlorophenyl phenyl ether 40. 4-bromophenyl phenyl ether 41. bis(2-chloroisopropyl) ether 42. drichlorofluoromethane (deleted) 49. dichlorodifluoromethane (delered) 50. 4.6-dinicro-o-cresol 60. N-nitrosodi-n-propylamine 63. pentachlorophenol 64. 65. phenol di-n-octyl phthalate 69. benzo (a)anthracene (1,2-benzanthracene) 72. benzo (a)pyrene (3,4-benzopyrene) 73. 76. chrysene dibenzo (a,h)anthracene (1.2.5.6-dibenzanthracene) 82. indeno (1.2.3-cd)pyrene (w,e,-o-phenylenepyrene) 83. aldrin\* 89. 90. dieldrin\* chlordane (technical mixture and metabolites)\* 91. 92. 4,4'-DDT\* 4,4'-DDE(p,p'DDX)\* 93. 4,4'-DDD(p,p'TDE)\* 94. 95. Alpha-endosulfan\* 96. Beta-endosulfan\* 97. endosulfan sulfate\* 98. endrin\* 99. endrin aldehyde\* 100. heptachlor\*

### TABLE VI-2 (Continued)

### TOXIC POLLUTANTS NEVER DETECTED

- 101. heptachlor epoxide\* 102. Alpha-BHC\* 103. Beta-BHC\* Gamma-BHC (lindane)\* 104. 105. Delta-BHC\* PCB-1244 (Arochlor 1242)\* 106. 107. PCB-1254 (Arochlor 1244)\* PCB-1221 (Arochlor 1221)\* 108. 109. PCB-1232 (Arochlor 1232)\* 110. PCB-1248 (Arochlor 1248)\* 111. PCB.1260 (Arochlor 1260)\* 112. PCB-1016 (Arochlor 1016)\* 113. toxaphene\* 116. asbestos (fibrous)
- 129. 2,3,7,8-tetra chlorodibenzo-p-dioxin (TCDD)

\*The Agency did not analyze for these pollutants in samples of raw wastewater from this subcategory. These pollutants are not believed to be present based on the Agency's best engineering judgment of the manufacturing process operations.

### TABLE VI-3

### PRIORITY POLLUTANTS NEVER FOUND ABOVE THEIR ANALYTICAL QUANTIFICATION CONCENTRATION

- acenaphthene 1.
- chlorobenzene 7.
- 11. 1,1,1-trichloroethane
- 12. hexachloroethane
- 1,1,2-trichloroethane 14.
- chloroethane 16.
- 36. 2,6-dinitrotoluene
- 37. 1,2-diphenylhydrazine
- 38. ethylbenzene
- fluoranthene 39.
- 43. bis(2-chloroethoxy)methane
- 44. methyl chloride
- 46. methyl bromide
- 55. naphthalene
- 56. nitrobenzene
- 61. N-nitrosodidimethylamine
- 62. N-nirrosodiphenylamine
- 66. bis(2-ethylhexyl)phthalate
- 67. butyl benzyl phthalare
- 71. dimethyl phthalate 72. 3,4-benzofluoranthene
- 73. benzo(k)fluoranthene
- 77. acenaphthylene
- 78. anthracene
- 79. benzo(g,h,i)perylene
- 80. fluorene
- 81. phenanthrene
- 84. pyrene
- 88. vinyl chloride
- 114. antimony
- 125. selenium
- 127. thallium

#### SECTION VII

#### CONTROL AND TREATMENT TECHNOLOGIES

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

### CURRENT CONTROL AND TREATMENT PRACTICES

This section presents a summary of the control and treatment technologies that are currently being applied to each of the sources generating wastewater in this subcategory. As discussed Section V, wastewater associated with the primary beryllium subcategory is characterized by the presence of the toxic metal pollutants 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 streams are commonly combined wastewater 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 different alkalinity to reduce treatment chemical requirements. One plant in this subcategory currently has a combined wastewater treatment system consisting of chemical precipitation and sedimentation. have chemical precipitation, sedimentation and filtration. such, three options have been selected for consideration for BPT, BAT, NSPS, and pretreatment based on combined treatment of compatible waste streams.

#### BERYLLIUM HYDROXIDE PRODUCTION

There is currently only one facility in the United Stated which produces beryllium hydroxide from bertrandite or beryl ore. This facility is in a net evaporation area and achieves zero discharge, through the use of evaporation ponds, of all wastewater streams associated with beryllium hydroxide production from ore. These ten wastewater streams are listed below:

- (a) Solvent extraction raffinate from bertrandite ore,
- (b) Solvent extraction raffinate from beryl ore,
- (c) Beryllium carbonate filtrate,
- (d) Beryllium hydroxide filtrate,
- (k) Beryl ore gangue dewatering,
- (1) Bertrandite ore gangue dewatering,

#### PRIMARY BERYLLIUM SUBCATEGORY SECT - VII

- (m) Beryl ore processing,
- (n) AIS area wastewater,
- (o) Bertrandite ore leaching scrubber, and
- (p) Bertrandite ore counter current decantation scrubber.

BERYLLIUM OXIDE AND BERYLLIUM METAL PRODUCTION FROM BERYLLIUM HYDROXIDE

There is currently only one facility in the United States which produces beryllium oxide and beryllium metal from beryllium hydroxide. This plant is a direct discharger and treats all of the wastewater streams associated with beryllium oxide and beryllium metal production with chemical precipitation and sedimentation technology. These six wastewater streams are listed below:

- (e) Beryllium oxide calcining furnace wet air pollution control,
- (f) Beryllium hydroxide supernatant,
- (g) Process water,
- (h) Fluoride furnace scrubber,
- (i) Chip treatment wastewater, and
- (j) Beryllium pebble plant area vent wet air pollution control.

The process water stream is used in the beryllium pebble plant scrubbing system prior to treatment and discharge. Two plants produce beryllium copper master alloy from beryllium hydroxide using a dry process.

### CONTROL AND TREATMENT OPTIONS

The Agency examined two control and treatment technology options that are applicable to the primary beryllium subcategory. The options selected for evaluation represent a combination of pretreatment and end-of-pipe treatment technologies.

### OPTION A

Option A for the primary beryllium subcategory requires control and treatment technologies to reduce the discharge of wastewater pollutant mass.

The Option A treatment scheme consists of recycle of scrubber liquors, ammonia steam stripping, and cyanide precipitation pretreatment for selected waste streams, followed by chemical precipitation and sedimentation technology. Specifically, lime or some other alkaline compound is used to precipitate metal ions as metal hydroxides. The metal hydroxides and suspended solids settle out and the sludge is collected. Vacuum filtration is used to dewater sludge.

#### OPTION C

Option C for the primary beryllium subcategory consists of all

# PRIMARY BERYLLIUM SUBCATEGORY SECT - VII

control and treatment requirements of Option A (recycle of scrubber liquors, ammonia steam stripping, and cyanide precipitation pretreatment steps, 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, beyond the concentration attainable by gravity sedimentation. The filter suggested is of the gravity, mixedmedia type, although other forms of filters, such as rapid sand filters or pressure filters would perform satisfactorily. The addition of filters also provides consistent removal during periods of time in which there are rapid increases in flows or loadings of pollutants to the treatment system.

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#### SECTION VIII

### COSTS, ENERGY, AND NONWATER QUALITY ASPECTS

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

### TREATMENT OPTIONS FOR EXISTING SOURCES

As discussed in Section VII, two treatment options have been developed for existing primary beryllium sources. The treatment schemes for each option are summarized below and schematically presented in Figures X-1 and X-2 (pages 3791 and 3792).

#### OPTION A

Option A consists of recycle of scrubber liquors, ammonia steam stripping, and cyanide precipitation pretreatment followed by chemical precipitation and sedimentation end-of-pipe technology.

### OPTION C

Option C requires recycle of scrubber liquors, ammonia steam stripping, and cyanide precipitation pretreatment, followed by end-of-pipe treatment technology consisting of chemical precipitation, sedimentation, and multimedia filtration.

### COST METHODOLOGY

A detailed discussion of the methodology used to develop the compliance costs is presented in Section VIII of Vol. I. These compliance costs calculate incremental costs, above treatment already in place, necessary to comply with the promulgated effluent limitations and standards. The costs developed for the final regulation are presented in Table VIII-1 (page 3752). No subcategory-specific assumptions were used in developing compliance costs for the primary beryllium subcategory.

#### NONWATER QUALITY ASPECTS

Nonwater quality impacts specific to the primary beryllium subcategory, including energy requirements, solid waste and air pollution, are discussed below.

### **ENERGY REQUIREMENTS**

Energy requirements for Option A are estimated at 1,136,000 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 two 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 beryllium subcategory is due to the precipitation of metal hydroxides and carbonates using lime. Sludges associated with the primary beryllium subcategory will necessarily contain quantities of toxic metal pollutants. Except for sludges produced by cyanide precipitation, these sludges are 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 Recovery Act (RCRA), Section 3001(b)), as interpreted by EPA. small excess (5-10 %) of lime is added during treatment, Agency does not believe these sludges would be identified as hazardous under RCRA in any case. (Compliance costs include this lime.) This judgment is based on the amount of results of Extraction Procedure (EP) toxicity tests performed on similar (toxic metal-bearing sludges) generated by 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 Thus, the Agency believes that the wastewater will similarly not be EP toxic if the recommended technology is applied.

Throughout this study, sludges generated as a result of cyanide precipitation have been considered as hazardous, and appropriate costs for disposal have been included in the compliance cost estimates.

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

If these wastes should be identified or are listed as hazardous, they will come within the scope of RCRA's "cradle to grave" hazardous waste management program, requiring regulation, from the point of generation to point of final disposition. EPA s generator standards would require generators of hazardous nonferrous metals manufacturing wastes to meet containerization, labeling, recordkeeping, and reporting requirements; if plants dispose of hazardous wastes off-site, they would have to prepare

a manifest which would track the movement of the wastes from the generator's premises to a permitted off-site treatment, storage, or disposal facility. See 40 CFR 262.20, 45 FR 33142 (May 19, 1980), as amended at 45 FR 86973 (December 31, 1980). The transporter regulations require transporters of hazardous wastes to comply with the manifest system to assure that the wastes are delivered to a permitted facility. See 40 CFR 263.20, 45 FR 33151 (May 19, 1980), as amended at 45 FR 86973 (December 31, 1980). Finally, RCRA regulations establish standards for hazardous waste treatment, storage, and disposal facilities allowed to receive such wastes. See 40 CFR Part 464, 46 FR 2802 (January 12, 1981), 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.

It is estimated that 696 metric tons per year of sludge will be generated as a result of these promulgated regulations for the primary beryllium subcategory. Sixty-five metric tons of this sludge is considered to be hazardous.

#### AIR POLLUTION

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

### TABLE VIII-1

# COST OF COMPLIANCE FOR THE PRIMARY BERYLLIUM SUBCATEGORY DIRECT DISCHARGERS

### (March 1982 Dollars)

Option	Capital Cost	Annual Cost
A	226500	251200
В	256200	265600

### 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). BPT reflects the existing performance by plants of various sizes, ages, and manufacturing processes within the primary beryllium subcategory, as well as the established performance of the recommended BPT systems. Particular consideration is given to the treatment already in place at plants within the data base.

The factors considered in identifying BPT include the total cost of applying the technology in relation to the effluent reduction benefits from such application, the age of equipment facilities involved, the manufacturing processes used, nonwater quality environmental impacts (including energy requirements), and other factors the Administrator considers appropriate. general, the BPT level represents the average of the existing performances of plants of various ages, sizes. processes, other common characteristics. Where existing performance is uniformly inadequate, BPT may be transferred from a different subcategory or category. Limitations based on transfer 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. BPT focuses on end-of-pipe treatment rather than process changes or internal controls except where such practices 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 beryllium subcategory has been subdivided into 16 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 16 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. Each plant within the Subcategory was then analyzed to determine (1) which subdivisions were present, (2) the specific flow rates generated for each subdivision, and (3) the specific production normalized flows for each subdivision. This analysis is discussed in detail in Section V. Nonprocess wastewaters such as rainfall runoff and noncontact cooling water are not considered in the analysis.

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

The second requirements 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) and a combination of reuse and recycle to reduce flow.

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 primarily because plants stream-by-stream basis, in subcategory may perform one or more of the operations in various combinations. The mass loadings (milligrams of pollutant per kilogram of production unit - mg/kg) are based on multiplying the regulatory flow (1/kkg) by the concentration achievable by the BPT level of treatment technology (mg/l) for each pollutant These mass loadings are parameter to be limited under BPT. published in the Federal Register and in 40 CFR Part 421 as 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 beryllium 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 (1/kkg) is a link between the production operations and the effluent limitations. The pollutant discharge attributable to each operation can be calculated from the normalized flow and effluent concentration achievable by the treatment technology and summed to derive an appropriate limitation for each plant.

### INDUSTRY COST AND POLLUTANT REMOVAL ESTIMATES

In balancing costs in relation to pollutant removal estimates, EPA considers the volume and nature of existing discharges, the volume and nature of discharges expected after application of BPT, the general environmental effects of the pollutants, and the cost and economic impacts of the required pollution control level. The Act does not require or permit consideration of water quality problems attributable to particular point sources or industries, or water quality improvements in particular water quality bodies. Accordingly, water quality considerations were not the basis for selecting the proposed or promulgated BPT.

The methodology for calculating pollutant removal estimates and plant compliance costs is discussed in Section X. Pollutant removal estimates have been revised since proposal to correspond to the new costs generated for promulgation. Table X-1 (page 3781) shows the estimated pollutant removal estimates for each treatment option for direct dischargers. Compliance costs for each option are presented in Table X-2 (page 3782).

### BPT OPTION SELECTION - PROPOSAL

The technology basis for the proposed BPT limitations was Option A, chemical precipitation and sedimentation technology to remove metals and solids from combined wastewaters and to control pH and fluoride. This technology is already in-place at the one discharger in the subcategory. The pollutants specifically proposed for regulation at BPT were beryllium, chromium, copper, fluoride, TSS, and pH. The Agency was also considering ammonia limitations based on ammonia steam stripping and cyanide limitations based on cyanide precipitation.

Because the one discharging facility in the primary beryllium subcategory already has the BPT technology in-place, and our data indicated that the technology is achieving the proposed BPT limitations, no pollutant removal above the current discharge level and no incremental capital or annual costs were expected at proposal.

### BPT OPTION SELECTION - PROMULGATION

The technology basis for the promulgated BPT limitations is Option A, recycle of scrubber liquors, ammonia steam stripping, and cyanide precipitation pretreatment for selected waste streams, and chemical precipitation and sedimentation technology to remove metals and solids from combined wastewaters and to control pH and fluoride. The Agency decided to promulgate ammonia and cyanide limitations based on ammonia steam stripping and cyanide precipitation because data submitted in comments confirmed the presence of ammonia and cyanide in process waters generated in the beryllium industry. The remaining pollutants specifically promulgated for regulation at BPT are beryllium, chromium, copper, fluoride, TSS, and pH.

Ammonia steam stripping is demonstrated at six facilities in the nonferrous metals manufacturing category. These facilities ammonia bearing wastewaters associated with production of primary tungsten, primary columbium and tantalum, primary molybdenum, secondary tungsten and cobalt, and primary zirconium and hafnium. EPA believes that performance data from the iron and steel manufacturing category provide a valid measure technology's performance on nonferrous wastewater because manufacturing category raw 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 promulgated steam stripping performance values using steam stripping data collected at a zirconium-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.

In addition, data submitted by a primary columbium-tantalum plant, which also has significant raw ammonia levels, verifies the promulgated steam stripping performance values.

Cyanide precipitation technology is required for the primary beryllium subcategory because existing treatment within the subcategory does not effectively remove cyanide. Cyanide

precipitation is directed at control of free and complexed This subcategory collectively discharges approximately cyanides. 536 kg/yr of cyanide. The achievable performance is transferred from three well-operated coil coating plants in the coil coating category, and are contained within the public record supporting this document. The Agency believes this technology, and the achievable concentration limits, are transferable to the primary subcategory because raw wastewater beryllium concentrations (prior to dilution with waste streams cyanide) are of the same order of magnitude in both categories. Further, no pollutants were identified in primary beryllium wastewater that would interfere with the operation or performance of this technology.

Implementation of the promulgated BPT limitations is estimated to remove 2,698 kilograms of priority pollutants, 70,000 kilograms of ammonia and 313 kilograms of TSS from raw wastewater annually. The estimated capital cost for achieving promulgated BPT is \$226,500 and the annual cost is estimated at \$251,200 (1982 dollars). A schematic representation of the selected BPT treatment option is presented in Figure IX-1 (page 3763).

Revisions to the promulgated BPT limitations are identical to the revisions to the promulgated BAT limitations which are discussed in Section X.

### WASTEWATER DISCHARGE RATES

A BPT discharge rate is calculated for each subdivision based on the average of the flows of all representative 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 16 wastewater sources 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 product which is produced by the process associated with the waste stream in These production normalizing parameters, or PNPs, are question. 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 (pages 3663 - 3666).

As discussed in Section V of this document, six new building blocks have been added to this subcategory, and the production normalized flow for one additional building block, beryllium hydroxide filtrate, was revised based on more detailed data acquired since promulgation of the original rulemaking.

#### SOLVENT EXTRACTION RAFFINATE FROM BERTRANDITE ORE

The proposed and promulgated BPT wastewater discharge rate for solvent extraction raffinate from bertrandite ore is 2,246,000 l/kkg (538,200 gal/ton) of beryllium carbonate precipitated (as beryllium). This rate is allocated only for those plants which extract beryllium from an acid solution generated by leaching bertrandite ore. There is currently only one plant which practices this operation.

Water use and discharge rates are presented in Table V-1 (page 3663). The BPT wastewater discharge rate for solvent extraction raffinate from bertrandite ore is based on the value reported by the one facility which currently generates this waste stream.

#### SOLVENT EXTRACTION RAFFINATE FROM BERYL ORE

The BPT wastewater discharge rate proposed for solvent extraction raffinate from beryl ore was 200,000 l/kkg (47,900 gal/ton) of beryllium carbonate precipitated (as beryllium). This rate was allocated only for those plants which extract beryllium from an acid solution generated by leaching beryl ore. After proposal, EPA received comments from the industry requesting an increase in the discharge allowance for this waste stream. The Agency evaluated the new flow and production data submitted and based on that it is promulgating a new discharge rate.

The BPT wastewater discharge rate promulgated for solvent extraction raffinate from beryl ore is 220,000 l/kkg (52,720 gal/ton) of beryllium carbonate precipitated (as beryllium). This rate is allocated only for those plants which extract beryllium from an acid solution generated by leaching beryl ore.

Water use and discharge rates are presented in Table V-2 (page 3663). The BPT wastewater discharge rate for solvent extraction raffinate from beryl ore processing is based on the value reported by the one facility reporting this waste stream.

#### BERYLLIUM CARBONATE FILTRATE

The proposed and promulgated BPT wastewater discharge rate for beryllium carbonate filtrate is 214,500 l/kkg (51,400 gal/ton) of beryllium carbonate precipitated (as beryllium). This rate is allocated only for those plants which precipitate beryllium from solution as beryllium carbonate. There is currently only one plant which practices this operation.

Water use and discharge rates are presented in Table V-3 (page 3663). The BPT wastewater discharge rate for beryllium carbonate filtrate is based on the value reported by the one facility which currently generates this waste stream.

### BERYLLIUM HYDROXIDE FILTRATE

The proposed and promulgated BPT wastewater discharge rate for

beryllium hydroxide filtrate was 52,660 l/kkg (12,620 gal/ton) of beryllium hydroxide produced (as beryllium). However, based on more detailed information not available at the time of the original rulemaking, EPA has revised the BPT wastewater discharge rate to be 136,000 l/kkg (32,600 gal/ton) of beryllium hydroxide produced (as beryllium). This rate is allocated only for those plants which produce beryllium hydroxide from bertrandite or beryl ore. Water use and discharge rates are presented in Table V-4 (page 3664).

### BERYLLIUM OXIDE CALCINING FURNACE WET AIR POLLUTION CONTROL

The proposed and promulgated BPT wastewater discharge rate for beryllium oxide calcining furnace wet air pollution control is 263,700 l/kkg (63,190 gal/ton) of beryllium oxide produced. Since proposal, industry comments to EPA have indicated that recycle is presently practiced for this waste stream at a rate of greater than 90 percent. This rate is allocated only for those plants which use wet air pollution control devices to control emissions from beryllium oxide calcining furnaces. Water use and discharge rates are presented in Table V-5 (page 3664).

#### BERYLLIUM HYDROXIDE SUPERNATANT

BPT wastewater discharge rate proposed for hydroxide supernatant was 104,324 l/kkg (25,000 gal/ton) of beryllium hydroxide produced from scrap and residues This rate was allocated only for those plants which beryllium). recover beryllium from residues and scrap by dissolution in sulfuric acid and precipitation of beryllium as beryllium hydroxide. After proposal, EPA received comments from the industry requesting an increase in the discharge allowance waste stream. The Agency evaluated the new flow and production data submitted and based on that it is promulgating a new discharge rate. The BPT wastewater discharge rate promulgated for beryllium hydroxide supernatant is 430,000 1/kkg (54,120 gal/ton) of beryl-lium hydroxide produced from scrap and residues (as beryllium). This rate is allocated only for those plants which recover beryl-lium from residues and scrap by dissolution sulfuric acid and precipitation of beryllium as beryllium hydroxide.

This discharge allowance includes all water generated from the beryllium hydroxide recovery operation. Because this operation includes scrap recycled from external sources, it is technically a secondary as well as primary beryllium operation. The Agency is, however, considering this as a primary beryllium operation for the purposes of this regulation. In establishing the BPT flow rate, it has given full consideration to the amount of wastewater generated due to the secondary nature of this operation. Water use and discharge rates are presented in Table V-6 (page 3664).

#### PROCESS WATER

At proposal, this waste stream was called process condensates. At

proposal no BPT wastewater discharge allowance for process condensates was provided. Based on the available data, EPA believed that this facility reuses all of this water in scrubbing systems and other plant uses.

Industry comments after proposal clarified the process condensates collection and reuse system, and indicated that periodic discharges have to be made from the process water pit to prevent dissolved solids build-up. Information was supplied to the Agency so that a discharge rate for process water could be calculated.

The BPT wastewater discharge rate promulgated for process water is 174,800 l/kkg (41,890 gal/ton) of beryllium pebbles produced. This rate is allocated only for those plants which collect process condensates generated from the manufacture of beryllium metal and discharge this process water after extensive recycle in various plant applications. Water use and discharge rates are presented in Table V-7 (page 3668).

#### FLUORIDE FURNACE SCRUBBER

The BPT wastewater discharge rate proposed for fluoride furnace scrubber water was 2,205 l/kkg (530 gal/ton) of beryllium metal pebbles produced. This rate was allocated only for those plants which produce beryllium fluoride (BeF<sub>2</sub>) intermediate by heating ammonium beryllium fluoride in a furnace.

Industry comments submitted to the EPA after proposal regarding the fluoride furnace scrubber indicated that this scrubber does not generate a discharge. Scrubber liquor is extensively recycled, makeup water is taken from the process water pit, and a bleed stream is reused in ammonium bifluoride preparation. For this reason, EPA is not providing a discharge allowance for the fluoride furnace scrubber water.

The BPT wastewater discharge rate promulgated for fluoride furnace scrubber water is zero. The Agency believes that, based on demonstrated practice, any facility which operates a fluoride furnace scrubber can achieve zero discharge through recycle and reuse.

#### CHIP TREATMENT WASTEWATER

At proposal, this waste stream was called chip leaching. The BPT wastewater discharge rate for proposed chip leaching wastewater was 4,742 l/kkg (1,138 gal/ton) of beryllium scrap chips treated. This rate was allocated only for those plants which treat beryllium scrap chips with nitric acid prior to vacuum casting. After proposal, EPA received comments from the industry requesting an increase in the discharge allowance for this waste stream. The Agency evaluated the new flow and production data submitted and based on those, it is promulgating a new discharge rate.

### PRIMARY BERYLLIUM SUBCATEGORY SECT - IX

The BPT wastewater discharge rate promulgated for chip treatment wastewater is 7.750 l/kkg (1,860 gal/ton) of beryllium scrap chips treated. This rate is allocated only for those plants which treat beryllium scrap chips with nitric acid prior to vacuum casting. Water use and discharge rates are presented in Table V-9 (page 3665).

### BERYLLIUM PEBBLE PLANT AREA VENT WET AIR POLLUTION CONTROL

A BPT pollutant discharge allowance for beryllium pebble plant area vent scrubber wastewater was not proposed because of incomplete information about the scrubbers that use water from or recirculate into the process water pit. Industry comments have clarified the recycle, reuse, and discharge practices of these scrubbers. After evaluating the new information, EPA has added a tenth subdivision.

The BPT wastewater discharge rate used at promulgation for beryllium pebble plant area vent scrubber wastewater is zero. Presently, one plant operates a pebble plant scrubber which obtains makeup water from the process water pit, and discharges a scrubber liquor bleed stream back to the process water pit. Because a separate discharge allowance is being promulgated for process water discharge, the Agency did not believe it necessary to give an additional discharge allowance for the beryllium pebble plant scrubber wastewater.

#### ADDITIONAL BUILDING BLOCKS:

The BPT discharge rates for the six new building blocks are identical to the production normalized wastewater flows presented for these streams in Section V. These BPT flows would be applicable to plants processing bertrandite ore and beryl ore into beryllium hydroxide or beryllium carbonate products.

### REGULATED POLLUTANT PARAMETERS

The raw wastewater concentrations from individual operations and the subcategory as a whole were examined to select certain pollutant parameters for limitation. This examination and evaluation was presented in Section VI. A total of eight pollutants or pollutant parameters are selected for limitation under BPT and are listed below:

- 117. beryllium
- 119. chromium
- 120. copper
- 121. cyanide ammonia fluoride TSS

### EFFLUENT LIMITATIONS

The treatable concentrations achievable by application of the promulgated BPT are discussed in Section VII of Vol. I and summarized there in Table VII-21 (page 248), with one exception. The one exception is the fluoride treatment effectiveness for the beryllium hydroxide supernatant concentration subdivision, which has been revised from 14.6 mg/l to 170 mg/l, based on the unusually high concentration of total dissolved solids (TDS) in that wastewater stream. These treatable concentrations (both one day maximum and monthly average values) treatable are multiplied by the BPT normalized discharge flows summarized in Table IX-1 (page 3781) 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 (page 3782) for each individual waste stream.

TABLE IX-1

BPT WASTEWATER DISCHARGE RATES FOR THE PRIMARY BERYLLIUM SUBCATEGORY

<u>Wastewater</u> <u>Stream</u>	Dischard	malized <u>e Rate</u> 103 gal/ton	Productin <u>Normalized</u> <u>Parameter</u>
Solvent extraction raffinate from bertrandite ore	2,246	538.2	Beryllium carbonate pro- duced from bertrandite ore as beryllium
Solvent extraction raffinate from beryl ore	220.0	52.72	Beryllium carbonate pro- duced from beryl ore as beryllium
Beryllium carbonate filtrate	214.5	51.40	Beryllium carbonate pro- duced as beryllium
Beryllium hydroxide filtrate	136.0	32.6	Beryllium hydroxide pro- duced as beryllium
Beryllium oxide calcining furnace wet air pollution control	263.7	63.19	Beryllium oxide produced
Beryllium hydroxide supernatant	230.0	55.12	Beryllium hydroxide pro- duced from scrap and residues as beryllium
Process water	174.8	41.89	Beryllium pebbles produced
Fluoride furnace scrubber	0	0	Beryllium pebbles produced
Chip treatment wastewater	7.75	1.86	Beryllium scrap chips treated
Beryllium pebble plant area vent wet air pollution control	0	0	Beryllium pebbles produced

TABLE IX-1 (Continued)

BPT WASTEWATER DISCHARGE RATES FOR THE PRIMARY BERYLLIUM SUBCATEGORY

		ormalized ge <u>Rate</u>	Productin
Wastewater Stream	103 1/kkg	103 gal/ton	Normalized Parameter
Beryllium ore gangue dewatering	1.043	0.25	Beryllium ore processed
Bertrandite ore gangue dewatering	2.665	0.639	Bertrandite ore processed
Beryllium ore processing	7.303	1.75	Beryllium ore processed
AIS area wastewater	468.0	112.1	Total beryllium carbonate produced as beryllium
Bertrandite ore leaching	1.511	0.362	Bertrandite ore processed
Bertrandite ore counter	0.101	0.024	Bertrandite ore processed

### PRIMARY BERYLLIUM SUBCATEGORY SECT - IX

TABLE IX-2
BPT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

### (a) Solvent Extraction Raffinate from Bertrandite Ore BPT

Pollutant pollutant		Maximum for monthly average
	mg/kg (lb/million lbs) of b produced from bertrandi	
Beryllium Chromium Copper Cyanide Ammonia Fluoride TSS pH	2,763.000 988.200 4,267.000 651.300 299,400.000 78,610.000 92,090.000 Within the range of 7	1,235.000 404.300 2,246.000 269.500 131,600.000 44,700.000 43,800.000 .5 to 10.0 at all times

### (b) Solvent Extraction Raffinate from Beryl Ore BPT

Pollutant		Maximum for	Maximum for
pollutant	property	any one day	monthly average
			ryllium carbonate
	produ	ced from beryl o	re (as Be)
			• •
Beryllium		270.600	121.000
Chromium		96.800	39.600
Copper		418.000	220.000
Cyanide		63.800	26.400
Ammonia		29,330.000	12,890.000
Fluoride		7,700.000	4,378.000
TSS		9,020.000	4,290.000
pН	Within	•	5 to 10.0 at all times

### TABLE IX-2 (Continued)

# BPT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

# (c) Beryllium Carbonate Filtrate BPT

Pollutant or pollutant property	Maximum for any one day	Maximum for monthly average	
mg/kg (lb/million lbs)	of beryllium	carbonate produced	(as Be)
Beryllium Chromium Copper Cyanide Ammonia Fluoride TSS pH Within	.800 94.380 407.600 62.210 28,590.000 7,508.000 8,795.000 the range of	118.000 38.610 214.500 25.740 12,570.000 4,269.000 4,183.000 7.5 to 10.0 at all	times

# (d) Beryllium Hydroxide Filtrate BPT

Pollutant pollutant	Maximum for any one day	Maximum for monthly average	
	 llion lbs) of b produced (as	eryllium hydroxide Be)	
Beryllium Chromium Copper Cyanide Ammonia Fluoride TSS pH	167.300 59.840 258.400 39.440 18,130.000 4,760.000 5,576.000 the range of 7	74.800 24.480 136.000 16.320 7,970.000 2,706.000 2,652.000	:S

### PRIMARY BERYLLIUM SUBCATEGORY SECT - IX

### TABLE IX-2 (Continued)

### BPT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

### (e) Beryllium Oxide Calcining Furnace Wet APC BPT

Pollutant or pollutant property	Maximum for any one day	Maximum for monthly average
mg/kg (lb/mill	ion lbs) of bery	llium oxide produced
Beryllium Chromium Copper Cyanide Ammonia Fluoride TSS pH Withi	324.400 116.000 501.000 76.470 35,150.000 9,230.000 10,810.000 n the range of 7	145.000 47.470 263.700 31.640 15,450.000 5,248.000 5,142.000 .5 to 10.0 at all times

### (f) Beryllium Hydroxide Supernatant BPT

	<u> </u>		
Pollutant	or	Maximum for	Maximum for
pollutant	property	any one day	monthly average
· · · · · · · · · · · · · · · · · · ·			beryllium hydroxide residues (as Be)
Beryllium	÷	282.900	126.500
Chromium		101.200	41.400
Copper		437.000	230.000
Cyanide		66.700	27.600
Ammonia		30,660.000	13,480.000
Fluoride		160,300.000	71,200.000
TSS		9,430.000	4,485.000
pН	Within		7.5 to 10.0 at all times

### PRIMARY BERYLLIUM SUBCATEGORY SECT - IX

### TABLE IX-2 (Continued)

# BPT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

# (g) Process Water BPT

Pollutant or pollutant property	Maximum for any one day	Maximum for monthly average	
mg/kg (lb/mill	ion lbs) of beryl	lium pebbles produced	
Beryllium Chromium Copper Cyanide Ammonia Fluoride TSS pH Withi	215.000 76.910 332.100 50.690 23,300.000 6,118.000 7,167.000 n the range of 7.	96.140 31.460 174.800 20.980 10,240.000 3,479.000 3,409.000 5 to 10.0 at all times	

# (h) Fluoride Furnace Scrubber BPT

Pollutant or pollutant property	Maximum for any one day	Maximum for monthly average
mg/kg (lb/millio	n lbs) of beryll	lium pebbles produced
Beryllium Chromium Copper Cyanide Ammonia Fluoride TSS pH Within	0.000 0.000 0.000 0.000 0.000 0.000 the range of 7	0.000 0.000 0.000 0.000 0.000 0.000 0.000

### TABLE IX-2 (Continued)

### BPT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

### (i) Chip Treatment Wastewater BAT

Pollutant or pollutant propert	Maximum for Maximum for any one day monthly average
mg/kg (lb/mi	lion lbs) of beryllium scrap chips treated
Beryllium	9.533 4.263
Chromium	3.410 1.395
Copper	14.730 7.750
Cyanide	2.248 .930
Ammonia	1,033.000 454.200
Fluoride	271.300 154.200
TSS	317.800 151.100
pH W	thin the range of 7.5 to 10.0 at all times

### (j) Beryllium Pebble Plant Area Vent Wet APC BPT

Pollutant or pollutant pro	perty	Maximum for any one day	Maximum for monthly average
mg/kg (	lb/milli	on lbs) of bery	llium pebbles produced
Chromium	t.	0.000	0.000
Copper		0.000	0.000
Cyanide		0.000	0.000
Ammonia		0.000	0.000
Fluoride		0.000	0.000
TSS	**	0.000	0.000
рН	Withi	n the range of	7.5 to 10.0 at all times

### PRIMARY BERYLLIUM SUBCATEGORY SECT - IX

### TABLE IX-2 (Continued)

### BPT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

### (k) Beryl Ore Gangue Dewatering BPT

Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (pounds per	million pounds)	of beryl ore processed
_	1	
Beryllium	1.283	0.574
Chromium (Total)	0.459	0.188
Copper	1.982	1.043
Cyanide (Total)	0.302	0.125
Ammonia (as N)	139.032	61.120
Fluoride	36.505	20.756
Total Suspended Solids	42.763	20.339
		to 10.0 at all times.

### (1) Bertrandite Ore Gangue Dewatering BPT

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average	<del>-</del> : , , .
mg/kg (pounds per	million pounds) of	bertrandite ore proces	ssed
Beryllium	3.279	1.466	
Chromium (Total)	1.173	0.480	1
Copper	5.064	2.665	
Cyanide (Total)	0.773	0.320	
Ammonia (as N)	355.245	156.169	
Fluoride	93.275	53.034	
Total Suspended Sol	lids 109.265	51.968	
pH With	nin the range of 7.	5 to 10.0 at all times	• '

### TABLE IX-2 (Continued)

# BPT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

### (m) Beryl Ore Processing BPT

	aximum for ny One Day	Maximum for Monthly Average
mg/kg (pounds per mil	lion pounds)	of beryl ore processed
Beryllium Chromium (Total) Copper Cyanide (Total) Ammonia (as N) Fluoride Total Suspended Solids pH Within the	8.983 3.213 13.876 2.118 973.490 255.605 299.423 range of 7.5	4.017 1.315 7.303 0.876 427.956 145.330 142.409 to 10.0 at all times.

### BPT

# (n) Aluminum Iron Sludge (AIS) Area Wastewater BPT

Pollutant					
		Maximum	for	Maximum	for
Pollutant	Property	Any One	Dav	,	
		2 ,	- 47	Monthly	Average

mg/kg (pounds per million pounds) of total beryllium carbonate produced (as Be)

<sup>\*</sup>Regulated Pollutant

# TABLE IX-2 (Continued)

# BPT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

# (o) Bertrandite Ore Leaching Scrubber BPT

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg of	bertrandite o	re processed
Beryllium Chromium (Total) Copper Cyanide (Total) Ammonia (as N) Fluoride Total Suspended Solids pH Within	1.859 0.665 2.871 0.438 201.416 52.885 61.951 the range of 7.	0.831 0.272 1.511 0.181 88.545 30.069 29.465 5 to 10.0 at all times.

# (p) Bertrandite Ore Countercurrent and Decantation (CCD) Scrubber BPT

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg	of bertrandite or	e processed
Beryllium Chromium (Total) Copper Cyanide (Total) Ammonia (as N) Fluoride Total Suspended Solic pH Within	0.124 0.044 0.192 0.029 13.463 3.535 ds 4.141 h the range of 7.5	0.056 0.018 0.101 0.012 5.919 2.010 1.970 to 10.0 at all times.

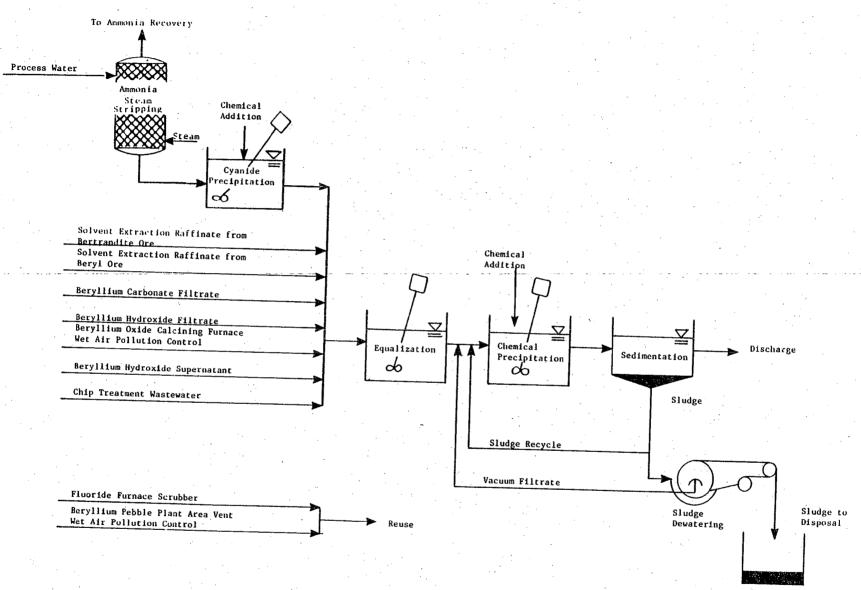


Figure IX-1
BPT TREATMENT SCHEME

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#### SECTION X

#### BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE

These effluent limitations 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. BAT represents the best available technology economically achievable at plants of various ages, sizes, processes, or other characteristics. BAT may be transferred from a different subcategory or category and may include feasible process changes or internal controls, even when not in common industry practice.

The required assessment of BAT considers costs, but does not require a balancing of costs against pollutant removals. However, in assessing BAT, the Agency has given substantial weight to the economic achievability of the technology.

### TECHNICAL APPROACH TO BAT

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

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

The treatment technologies considered for BAT are summarized below:

Option A (Figure X-1, page 3791) is based on:

o Recycle of scrubber liquors

- o Ammonia steam stripping and cyanide precipitation pretreatment for selected waste streams
  - Chemical precipitation and sedimentation

Option C (Figure X-2, page 3792) is based on:

- o Recycle of scrubber liquors
- o Ammonia steam stripping and cyanide precipitation pretreatment for selected waste streams
- o Chemical precipitation and sedimentation
- o Multimedia filtration

The two options examined for BAT are discussed in greater detail on the following pages. The first option considered (Option A) is the same as the BPT treatment and control technology which was presented in the previous section. The section option represents substantial progress toward the reduction of pollutant discharges above and beyond the progress achievable by BPT.

#### OPTION A

Option A for the primary beryllium subcategory is equivalent to the control and treatment technologies which were analyzed for BPT in Section IX (see Figure X-1). The BPT end-of-pipe treatment scheme includes recycle of scrubber liquors, ammonia steam stripping, and cyanide precipitation pretreatment for selected waste streams, followed by chemical precipitation and sedimentation. 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 beryllium subcategory consists of all control and treatment requirements of Option A (recycle of liquors, ammonia steam stripping, and precipitation pretreatment, followed by chemical precipitation and sedimentation) plus multimedia filtration technology added at end of the Option A treatment scheme (see Figure X-2). the filtration is used to remove suspended Multimedia including precipitates of toxic metals, beyond the concentrations The filter suggested is of attainable by gravity sedimentation. the gravity, mixed media type, although other forms of filters, such as rapid sand filters or pressure filters, would perform satisfactorily.

### INDUSTRY COST AND POLLUTANT REMOVAL ESTIMATES

As one means of evaluating each technology option, EPA developed estimates of the pollutant removals 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 Vol. I. The pollutant removal estimates have been revised from proposal because of new production normalized flows for several subdivisions. The methodology for calculating pollutant removals has not changed, and the data used to estimate removals are the same as those used to revise compliance costs.

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 beryllium subcategory. The pollutant removal estimates were calculated for each plant by first estimating the total mass of each pollutant in the untreated wastewater. This was calculated by first multiplying the raw waste values by the corresponding production value for that stream and then summing these values for each pollutant for every stream generated by the plant.

Next, the volume of wastewater discharged after the application of each treatment option was estimated for each operation at each plant by comparing the actual discharge to the regulatory flow. The smaller of the two values was selected and summed with the other plant flows. The mass of pollutant discharged was then estimated by multiplying the achievable concentration values attainable with the option (mg/l) by the estimated volume of process wastewater discharged by the subcategory. The mass of pollutant removed is the difference between the estimated mass of pollutant generated by each plant in the subcategory and the mass of pollutant discharged after application of the treatment option. The pollutant removal estimates for direct dischargers in the primary beryllium subcategory are presented in Table X-1 (page 3981).

#### COMPLIANCE COSTS

In estimating subcategory-wide compliance costs, the first step was to develop a cost estimation model, relating the total costs associated with installation and operation of wastewater treatment technologies to plant process wastewater discharge. EPA applied the model to each plant. The plant's investment operating costs are determined by what treatment it has in place and by its individual process wastewater discharge flow. discussed above, this flow is either the actual or whichever is lesser. The final step was to regulatory flow, annualize the capital costs, and to sum the annualized capital costs, and the operating and maintenance costs for each plant, yielding the cost of compliance for the subcategory. comparison of the costs developed for proposal and the revised costs for promulgation are presented in Table X-2 (page 3782) for direct dischargers in the primary beryllium subcategory. These costs were used in assessing economic achievability.

#### BAT OPTION SELECTION - PROPOSAL

Our proposed BAT limitations for this subcategory were based on chemical precipitation and sedimentation (BPT technology), with the addition of in-process wastewater reduction, and filtration. Flow reduction was based on 90 percent recycle of beryllium oxide calcining furnace wet air pollution control. The pollutants specifically limited under BAT were beryllium, chromium, copper, and fluoride.

Implementation of the proposed BAT limitations would remove annually an estimated 257 kg of priority pollutants, which is 8 kg of priority metals over the estimated BPT discharge.

#### BAT OPTION SELECTION - PROMULGATION

EPA promulgated BAT limitations for the primary beryllium subcategory based on recycle of scrubber liquors, ammonia steam stripping, and cyanide precipitation pretreatment for selected waste streams, followed by chemical precipitation, sedimentation, and multimedia filtration technology. Flow reduction beyond what is currently practiced was not promulgated because industry comments to the Agency indicated that this scrubber is presently operated with recycle. The Agency decided that further recycle for this scrubber is not feasible.

The pollutants specifically limited under promulgated BAT are beryllium, chromium, copper, cyanide, ammonia, and fluoride. The Agency decided to promulgate ammonia and cyanide limitations based on ammonia steam stripping and cyanide precipitation because data submitted in comments confirmed the presence of ammonia and cyanide in process waters generated in the beryllium industry.

Implementation of the promulgated BAT limitations would remove annually an estimated 2,705 kilograms of priority pollutants and 524 kilograms of TSS, which is 7 kilograms of priority metals and 211 kilograms of TSS over the estimated BPT removals. The estimated capital cost of promulgated BAT is \$256,200 and the estimated annual cost is \$265,600 (1982 dollars). The end-of-pipe treatment configuration for Option C is presented in Figure X-2.

#### FINAL AMENDMENTS TO THE REGULATION

For the Primary Beryllium Subcategory, EPA prepared a settlement agreement in April 1987 which would amend the regulation promulgated on September 20, 1985, (50  $\overline{\text{FR}}$  38276), concerning four topics, which are briefly described here.

EPA agreed to revise the treatment effectiveness concentration for fluoride in the beryllium hydroxide supernatant subdivision, based on the unusually high concentration of total dissolved solids in this waste stream.

EPA agreed to revise the regulatory flow for the beryllium hydroxide filtrate building block based upon more detailed information not available to EPA at the time of the original rulemaking.

EPA agreed to add new building blocks for the following six processes in this subcategory: beryl ore gangue dewatering, bertrandite ore gangue dewatering, beryl ore processing (comprises quench pit, scrubber and washdown), AIS area wastewater, bertrandite ore leaching scrubber, and bertrandite ore countercurrent decantation scrubber.

EPA agreed to allow modification of the monitoring requirements for cyanide at any beryllium manufacturing facility which certifies that it does not use or generate cyanide at the facility. This modification would allow yearly cyanide monitoring.

#### WASTEWATER DISCHARGE RATES

A BAT discharge rate was calculated for each subdivision based upon the flows of the existing plants, as determined from analysis of the data collection portfolios. The discharge rate is used with the achievable treatment concentrations to determine BAT effluent limitations. Since the discharge rate may be different for each wastewater source, separate production normalized discharge rates for each of the 10 wastewater sources were determined and are summarized in Table 10-3. 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, or PNPs, are also listed in Table X+4 (page 3785).

At proposal, the BAT discharge rates reflected the flow reduction requirements of the selected BAT option. For this reason, the one scrubber water which was targeted for flow reduction through recycle for BAT had a lower flow rate than the corresponding BPT flow. Since several plants in other subcategories have demonstrated sufficient ability to achieve substantial recycle of similar wastewaters, lower flow allowances for this steam were believed to represent the best available technology economically achievable.

The proposed BAT discharge rate for beryllium oxide calcining furnace wet air pollution control water was based on 90 percent recycle of the scrubber effluent (refer to Section VII of the General Development Document). Consequently, the proposed BAT production normalized discharge flow for beryllium oxide calcining furnace wet air pollution control was 26,373 l/kkg (6,320 gal/ton) of beryllium oxide produced.

Since proposal, industry comments to EPA have indicated that recycle is presently practiced for the beryllium oxide calcining

furnace scrubber, and to require additional recycle at BAT would be unachievable. Upon evaluation of the data, the Agency decided not to require any recycle beyond what is presently practiced. Thus, the promulgated BAT discharge allowance for beryllium oxide calcining furnace wet air pollution control is 263,700 l/kkg (63,190 gal/ton) of beryllium oxide produced. This discharge rate is equivalent to that promulgated at BPT.

## REGULATED POLLUTANT PARAMETERS

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 pollutants selected for specific limitation are listed below:

- 117. beryllium
- 119. chromium
- 120. copper
- 121. cyanide ammonia fluoride

#### EFFLUENT LIMITATIONS

The concentrations achievable by application of BAT are discussed in Section VII. The treatable concentrations both one day maximum and monthly average values are multiplied by the BAT normalized discharge flows summarized in Table X-3 (page 3783) 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 (page 3785) for each waste stream.

Table X-1

POLLUTANT REMOVAL ESTIMATES
PRIMARY BERYLLIUM SUBCATEGORY

<u>Pollutant</u>	Raw Waste (kg/yr)	Option A Discharge (kg/yr)	Option A Removed (kg/yr)	Option C Discharge (kg/yr)	Option C Removed (kg/yr)
Antimony Arsenic Beryllium Cadmium Chromium (Total) Copper Cyanide (Total)	0.0225 1.7080 2,157.5560 0.4495 2.2698 26.0466 535.7427	0.0225 1.7080 6.7420 0.4495 1.8878 13.0346	0.0000 0.0000 2,150.8140 0.0000 0.3820 13.0121 534.1696	0.0225 1.7080 4.4947 0.4495 1.5731 8.7646 1.0562	0.0000 0.0000 2,153.0613 0.0000 0.6967 17.2820 534.6864
Lead Mercury Nickel Selenium Silver Thallium Zinc	0.0225 0.0225 0.9439 0.0000 0.4944 0.0000 2.1574	0.0225 0.0225 0.9439 0.0000 0.4944 0.0000 2.1574	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0225 0.0225 0.9439 0.0000 0.4944 0.0000 2.1574	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
TOTAL PRIORITY POLLUTANTS	2,727.4358	29.0581	2,698.3777	21.7093	2,705.7265
Ammonia Fluoride	70,666.2800 58,657.8587	723.6426 325.8639	69,942.6374 58,331.9949	723.6426 325.8639	69,942.6374 58,331.9949
TOTAL NONCONVENTIONALS	129,324.1387	1,049.5064	128,274.6323	1,049.5064	128,274.6323
TSS Oil and Grease	582.2401 179.6746	269.6805 179.6746	312.5596 0.0000	58.4308 179.6746	523.8093 0.0000
TOTAL CONVENTIONALS	761.9147	449.3551	312.5596	238.1054	523.8093
TOTAL POLLUTANTS	132,813.4892	1,527.9196	131,285.5696	1,309.3211	131,504.1681

#### TABLE X-2

# COST OF COMPLIANCE FOR THE PRIMARY BERYLLIUM SUBCATEGORY DIRECT DISCHARGERS

# (March 1982 Dollars)

Option	Capital Cost	Annual Cost
A	226500	251200
В	256200	265600

Table X-3
BAT WASTEWATER DISCHARGE RATES FOR THE PRIMARY BERYLLIUM SUBCATEGORY

			to the control of the
	BAT No	rmalized	
Wastewater Stream	Dischar 103 1/kkg	ge Rate 103 gal/ton	Productin <u>Normalized</u> <u>Parameter</u>
Solvent extraction raffinate from bertrandite ore	2,246	538.2	Beryllium carbonate pro- duced from bertrandite ore as beryllium
Solvent extraction raffinate from beryl ore	220.0	52.72	Beryllium carbonate pro- duced from beryl ore as beryllium
Beryllium carbonate filtrate	214.5	51.40	Beryllium carbonate pro- duced as beryllium
Beryllium hydroxide filtrate	136.0	32.6	Beryllium hydroxide pro- duced as beryllium
Beryllium oxide calcining furnace wet air pollution control	263.7	63.19	Beryllium oxide produced
Beryllium hydroxide supernatant	230.0	55.12	Beryllium hydroxide pro- duced from scrap and residues as beryllium
Process water	174.8	41.89	Beryllium pebbles produced
Fluoride furnace scrubber	.0	0	Beryllium pebbles produced
Chip treatment wastewater	7.75	1.86	Beryllium scrap chips treated
Beryllium pebble plant area vent wet air pollution control	0	0	Beryllium pebbles produced

Table X-3 (Continued)

BAT WASTEWATER DISCHARGE RATES FOR THE PRIMARY BERYLLIUM SUBCATEGORY

		ormalized ge <u>Rate</u>	Productin
Wastewater Stream	103 1/kkg	103 gal/ton	Normalized Parameter
Beryllium ore gangue dewatering	1.043	0.25	Beryllium ore processed
Bertrandite ore gangue dewatering	2.665	0.639	Bertrandite ore processed
	7.303	1.75	Beryllium ore processed
Beryllium ore processing AIS area wastewater	468.0	112.1	Total beryllium carbonate produced as beryllium
Bertrandite ore leaching scrubber	1.511	0.362	Bertrandite ore processed
Bertrandite ore counter	0.101	0.024	Bertrandite ore processed

TABLE X-4
BAT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

# (a) Solvent Extraction Raffinate from Bertrandite Ore BAT

Pollutant or pollutant property	Maximum for any one day	Maximum for monthly average
	million lbs) of bery ed from bertrandite	
Beryllium	1,842.000	831.000
Chromium	831.000	336.900
Copper	2,875.000	1,370.000
Cyanide	449.200	179.700
Ammonia	299,400.000	131,600.000
Fluoride	78,610.000	44,700.000
(b) Solvent Extract	ion Raffinate from Bo	eryl Ore BAT
Pollutant or	Maximum for	Maximum for
pollutant property	any one day	monthly average
	million lbs) of bery duced from beryl ore	
Beryllium	180.400	81.400
Chromium	81.400	33.000
Chromium Copper	81.400 281.600	33.000 134.200
Chromium Copper Cyanide	81.400 281.600 44.000	33.000 134.200 17.600
Chromium Copper Cyanide Ammonia	81.400 281.600 44.000 29,330.000	33.000 134.200 17.600 12,890.000
Chromium Copper Cyanide	81.400 281.600 44.000	33.000 134.200 17.600
Chromium Copper Cyanide Ammonia	81.400 281.600 44.000 29,330.000 7,700.000	33.000 134.200 17.600 12,890.000
Chromium Copper Cyanide Ammonia Fluoride  (c) <u>Beryllium</u> <u>Carbona</u>	81.400 281.600 44.000 29,330.000 7,700.000	33.000 134.200 17.600 12,890.000
Chromium Copper Cyanide Ammonia Fluoride  (c) Beryllium Carbona Pollutant or	81.400 281.600 44.000 29,330.000 7,700.000	33.000 134.200 17.600 12,890.000 4,378.000
Chromium Copper Cyanide Ammonia Fluoride  (c) Beryllium Carbona Pollutant or pollutant property	81.400 281.600 44.000 29,330.000 7,700.000 ate Filtrate BAT  Maximum for any one day	33.000 134.200 17.600 12,890.000 4,378.000
Chromium Copper Cyanide Ammonia Fluoride  (c) Beryllium Carbona Pollutant or pollutant property  mg/kg (lb/million lk	81.400 281.600 44.000 29,330.000 7,700.000 ate Filtrate BAT  Maximum for any one day	33.000 134.200 17.600 12,890.000 4,378.000 Maximum for monthly average
Chromium Copper Cyanide Ammonia Fluoride  (c) Beryllium Carbona Pollutant or pollutant property  mg/kg (lb/million lb Beryllium	81.400 281.600 44.000 29,330.000 7,700.000 ate Filtrate BAT Maximum for any one day	33.000 134.200 17.600 12,890.000 4,378.000  Maximum for monthly average conate produced (as Be
Chromium Copper Cyanide Ammonia Fluoride  (c) Beryllium Carbona Pollutant or pollutant property  mg/kg (lb/million lb Beryllium Chromium	81.400 281.600 44.000 29,330.000 7,700.000 ate Filtrate BAT  Maximum for any one day  os) of beryllium cark	33.000 134.200 17.600 12,890.000 4,378.000  Maximum for monthly average conate produced (as Be 79.370
Chromium Copper Cyanide Ammonia Fluoride  (c) Beryllium Carbona Pollutant or pollutant property	81.400 281.600 44.000 29,330.000 7,700.000  Ate Filtrate BAT  Maximum for any one day  0s) of beryllium cark  175.900 79.370	33.000 134.200 17.600 12,890.000 4,378.000  Maximum for monthly average conate produced (as Be 79.370 32.180
Chromium Copper Cyanide Ammonia Fluoride  (c) Beryllium Carbona Pollutant or pollutant property  mg/kg (lb/million lb Beryllium Chromium Copper	81.400 281.600 44.000 29,330.000 7,700.000 Ate Filtrate BAT  Maximum for any one day  os) of beryllium cark  175.900  79.370  274.600	33.000 134.200 17.600 12,890.000 4,378.000 Maximum for monthly average conate produced (as B 79.370 32.180 130.800

## TABLE X-4 (Continued)

#### BAT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

#### (d) Beryllium Hydroxide Filtrate BAT

`		i	
Pollutant	or	Maximum for	Maximum for
pollutant	property	any one day	monthly average
			3 3
mg/kg (I	o/million lbs	s) of peryllium nyo	droxide produced (as I
Beryllium		111.520	50.320
Chromium		50.320	20.400
Copper		174.080	82.960
Cyanide		27.200	10.880
Ammonia		18,128.800	7,969.600
Fluoride		4,760.000	2,706.400
		;	•
	_		
(e) Beryl	<u>lium Oxide Ca</u>	alcining Furnace We	et APC BAT
Pollutant	Or	Maximum for	Maximum for
	property	any one day	monthly average
porrucanc	brober cl	any One day	Monthly average
mg,	/kg (lb/milli	on lbs) of beryll:	ium oxide produced
Portellium		216.200	97.570
Beryllium Chromium		97.570	39.560
		337.500	160.900
Copper		52.740	21.100
Cyanide Ammonia			15,450.000
		35,150.000	
Fluoride		9,230.000	5,248.000
(f) Beryl	Lium Hydroxid	le Supernatant BAT	
Pollutant	or	Maximum for	Maximum for
pollutant	property	any one day	monthly average
	/l /lb/-:	llion lbay of base	-11: b
		llion lbs) of bery from scrap and res	
Barrellium	produced, i	188.600	85.100
Beryllium Chromium			34.500
		85.100	
Copper		294.400	140.300
Cyanide		46.000	18.400
Ammonia		30,660.000	13,480.000
Fluoride		160,300.000	71,200.000

## TABLE X-4 (Continued)

## BAT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

(a)	Process	Water	BAT

,		
Pollutant or	Maximum for	Maximum for
pollutant property	any one day	monthly average
		-
mg/kg (lb/million l	lbs) of beryllium	pebbles produced
	- 10 - 10 - 10 - 10 - 10 - 10 - 10 - 10	
Beryllium	143.300	64.680
Chromium	64.680	26.220
Copper	223.700	106.600
Cyanide	34.960	13.980
	3,300.000	10,240.000
	5,118.000	3,479.000
	-	<del></del>
(h) Fluoride Furnace Scru	ıbber BAT	
() 11401140 1411400 2011		
Pollutant or	Maximum for	Maximum for
pollutant property	any one day	monthly average
porradanc propercy	any one aay	o
mg/kg (lb/million ]	bs) of beryllium	pebbles produced
9,9 (2.0,==2=0=-		posterio producta
Beryllium	0.000	0.000
Chromium	0.000	0.000
Copper	0.000	0.000
Cyanide	0.000	0.000
Ammonia	0.000	0.000
Fluoride	0.000	0.000
11401140	0.000	0.000
(i) Chip Treatment Wastew	vater BAT	
(1) 51115 1104051101 110505		
Pollutant or	Maximum for	Maximum for
pollutant property	any one day	monthly average
polluouno proporoj	u	
mg/kg (lb/million lk	s) of beryllium s	scrap chips treated
	, 20-7-2-4	orap onips oreason
Beryllium	6.355	2.868
Chromium	2.868	1.163
Copper	9.920	4.728
Cyanide	1.550	.620
Ammonia	1,033.000	454.200
Fluoride	271.300	154.200
		2011200

## TABLE X-4 (Continued)

## BAT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

## (j) Beryllium Pebble Plant Area Vent Wet APC BAT

Pollutant or	Maximum	for	Maximum	for
pollutant property	any one		monthly	
Polludano Ploberol	ung one	uu j		
mg/kg (lb/milli	on lbs) of be	ryllium	pebbles pro	duced
Beryllium	0.000		0.00	0
Chromium	0.000	*	0.00	0
Copper	0.000		0.00	
Cyanide	0.000		0.00	
Ammonia	0.000		0.00	
Fluoride	0.000		0.00	0
(k) Beryl Ore Gangue	Dewatering B	УT		
Pollutant or	Maximum	for	Maximum	for
pollutant property	any one	day	monthly	average
mg/kg (pounds per	million pound	ds) of	beryl ore pr	ocessed
Beryllium	0, 855		0.386	<u>.</u>
Chromium (Total)	0.386	•	0.156	
Copper	1.335		0.636	•
Cyanide (Total)	0.209		0.083	•
Ammonia (as N)	139.032		61.120	* *
Fluoride	36.505		20.756	
(1) Bertrandite Ore G	angue Dewater	ing BA	·Τ	
Pollutant or	Maximum	for	Maximum	for
pollutant property	any one	day	monthly	average
mg/kg (pounds per mi	llion pounds)	of ber	trandite ore	processed
Beryllium	2,185		0.986	N
Chromium (Total)	0.986		0.400	
Copper	3,411		1.626	
Cyanide (Total)	0.533		0.213	
Ammonia (as N)	355.245		156.169	
Fluoride	93,275		53.034	•

#### TABLE X-4 (Continued)

## BAT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

#### (m) Beryl Ore Processing BAT

Pollutant or pollutant property	Maximum for any one day	Maximum for monthly average
mg/kg (pounds per	million pounds) c	of beryl ore processed
Beryllium	5.988	2.702
Chromium (Total)	2.702	1.095
Copper	9.348	4.455
Cyanide (Total)	1.461	0.584
Ammonia (as N)	973.490	427.956
Fluoride	255.605	145.330

## (n) Aluminum Iron Sludge (AIS) Area Wastewater BAT

Pollutant or	Maximum for	Maximum for
pollutant property	any one day	monthly average

# mg/kg (pounds per million pounds) of total beryllium carbonate produced (as Be)

Beryllium	383.760	173.160
Chromium (Total)	173.160	70.200
Copper	599.040	285.480
Cyanide (Total)	93.600	37.440
Ammonia (as N)	62,384.400	27,424.800
Fluoride	16,380.000	9,313.200

# (o) Bertrandite Ore Leaching Scrubber BAT

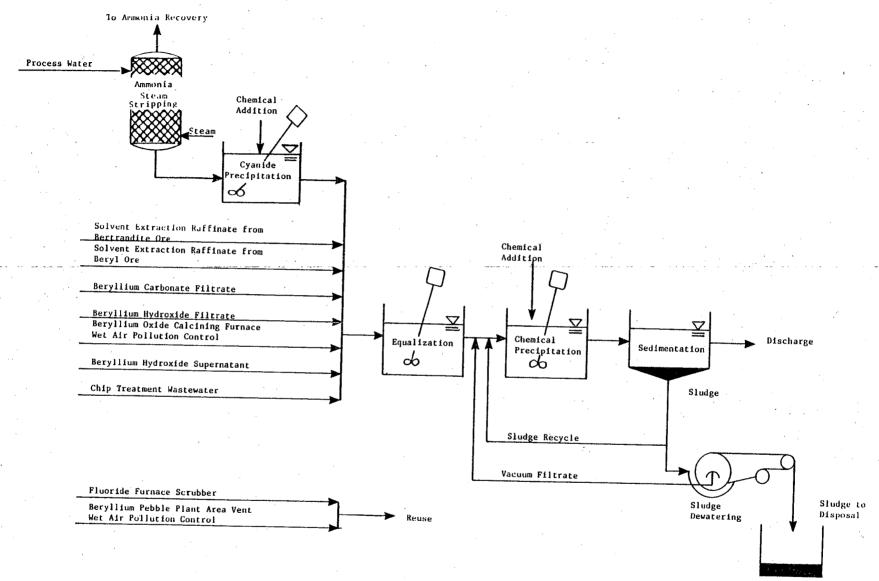
Pollutant or pollutant property	Maximum for any one day	Maximum for monthly average
mg/kg o	f bertrandite ore	processed
Beryllium	1.239	0.559
Chromium (Total)	0.559	0.227
Copper	1.934	0.922
Cyanide (Total)	0.302	0.121
Ammonia (as N)	201.416	<b>88.</b> 545
Fluoride	52.885	30.069

TABLE X-4 (Continued)

# BAT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

# (p) $\frac{\text{Bertrandite}}{(\text{CCD})} \frac{\text{Ore}}{\text{Scrubber}} \frac{\text{Countercurrent}}{\text{BAT}} \frac{\text{and}}{\text{Decantation}}$

Pollutant or pollutant property	Maximum for any one day	Maximum for monthly average
mg/kg o	f bertrandite ore p	rocessed
Beryllium Chromium (Total) Copper Cyanide (Total) Ammonia (as N) Fluoride	0.083 0.037 0.129 0.020 13.463 3.535	0.037 0.015 0.062 0.008 5.919 2.010



3791

Figure X-1
BAT TREATMENT SCHEME FOR OPTION A

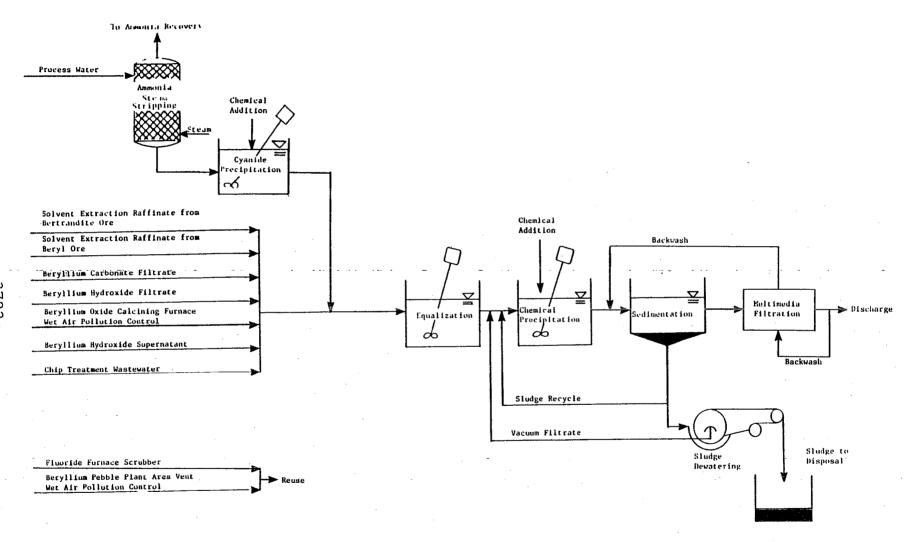


Figure X-2
BAT TREATMENT SCHEME FOR OPTION C

#### SECTION XI

#### NEW SOURCE PERFORMANCE STANDARDS

This section describes the technologies for treatment of wastewater from new sources and presents mass discharge standards for regulated pollutants for NSPS in the primary beryllium subcategory, based on the selected treatment technology. 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, the best demonstrated process changes, in-plant controls, and end-of-pipe treatment technologies which reduce pollution to the maximum extent feasible are considered as a basis for BDT.

#### TECHNICAL APPROACH TO NSPS

New source performance standards are equivalent to the best available technology (BAT) selected for currently existing primary beryllium plants. This result is a consequence of careful review by the Agency of a wide range of technical options for new source treatment systems which is discussed in Section XI of Vol. I. 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 (page 3796).

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

#### OPTION A

- o Recycle of scrubber liquors
- o Ammonia steam stripping and cyanide precipitation for selected waste streams
- o Chemical precipitation and sedimentation

#### OPTION C

- o Recycle of scrubber liquors
- o Ammonia steam stripping and cyanide precipitation pretreatment for selected waste streams
- o Chemical precipitation and sedimentation
- o Multimedia filtration

#### NSPS OPTION SELECTION - PROPOSAL

EPA proposed that the best available demonstrated technology for

the primary beryllium subcategory be equivalent to Option C. At proposal, Option C included in-process flow reduction, chemical precipitation, sedimentation, and multimedia filtration technology. The Agency was also considering regulation of ammonia based on ammonia steam stripping technology, and regulation of cyanide based on cyanide precipitation.

The wastewater flow rates for NSPS were the same as the proposed BAT flow rates. Flow reduction measures beyond those proposed at BAT were not considered feasible because no new demonstrated technologies existed within the subcategory that improved on discharge practices. The pollutants proposed for regulation at NSPS were the same as those proposed for regulation at BAT, with the addition of TSS and pH.

#### NSPS OPTION SELECTION - PROMULGATION

EPA is promulgating best available demonstrated technology for the primary beryllium subcategory equivalent to Option C. In contrast to Option C at proposal, Option C at promulgation includes ammonia steam stripping and cyanide precipitation pretreatment for selected waste streams, followed by chemical precipitation, sedimentation, and multimedia filtration.

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 further flow reduction beyond that already promulgated for BAT. Because NSPS is equal to BAT we believe that the promulgated NSPS will not have a detrimental impact on the entry of new plants into this subcategory.

#### REGULATED POLLUTANT PARAMETERS

The Agency has no reason to believe that the pollutants that will be found in treatable concentrations in processes within new sources will be any different than with existing sources. Accordingly, pollutants and pollutant parameters selected for limitation under promulgated NSPS, in accordance with the rationale of Sections VI and X, are identical to those selected for promulgated 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 (page 3786). The mass of pollutant allowed to be discharged per mass of product (mg/kg) is based on the product of the appropriate treatable concentration (mg/l) and the production normalized wastewater discharge flows (l/kkg). The treatment effectiveness concentrations are listed in Table VII-21 (page 248) of Vol. I with the exception of fluoride for beryllium hydroxide supernatant, as discussed in Section IX. The results of these

calculations are the production based new source performance standards. These standards are presented in Table XI-2.

TABLE XI-1 NSPS WASTEWATER DISCHARGE RATES FOR THE PRIMARY BERYLLIUM SUBCATEGORY

Wastewater Stream	NSPS No Dischard 103 1/kkg	ormalized <u>ge Rate</u> <u>103 gal/ton</u>	Productin Normalized Parameter	PRIMARY
Solvent extraction raffinate from bertrandite ore	2,246	538.2	Beryllium carbonate pro- duced from bertrandite ore as beryllium	•
Solvent extraction raffinate from beryl ore	220.0	52.72	Beryllium carbonate pro- duced from beryl ore as beryllium	BERYLLIUM
Beryllium carbonate filtrate	214.5	51.40	Beryllium carbonate pro- duced as beryllium	
Beryllium hydroxide filtrate	136.0	32.6	Beryllium hydroxide pro- duced as beryllium	SUBCATEGORY
Beryllium oxide calcining furnace wet air pollution control	e 263.7	63.19	Beryllium oxide produced	RY
Beryllium hydroxide supernatant	230.0	55.12	Beryllium hydroxide pro- duced from scrap and residues as beryllium	SECT
Process water	174.8	41.89	Beryllium pebbles produced	×I
Fluoride furnace scrubber	0	0	Beryllium pebbles produced	
Chip treatment wastewater	7.75	1.86	Beryllium scrap chips treated	
Beryllium pebble plant area vent wet air pollution control	0		Beryllium pebbles produced	

TABLE XI-1 (Continued)

# NSPS WASTEWATER DISCHARGE RATES FOR THE PRIMARY BERYLLIUM SUBCATEGORY

Wastewater Stream		Normalized rge Rate 103 gal/ton	Productin Normalized Parameter
Beryllium ore gangue dewatering	1.043	0.25	Beryllium ore processed
Bertrandite ore gangue dewatering	2.665	0.639	Bertrandite ore processed
Beryllium ore processing	7.303	1.75	Beryllium ore processed
AIS area wastewater	468.0	112.1	Total beryllium carbonate
Bertrandite ore leaching scrubber	1.511	0.362	produced as beryllium  Bertrandite ore processed
Bertrandite ore counter current decantation scrubber	0.101	0.024	Bertrandite ore processed

TABLE XI-2

NSPS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

## (a) Solvent Extraction Raffinate from Bertrandite Ore NSPS

(a) borve	Discrete City	Harringe From	Bererandree ore	1
Pollutant	or	Maximum for	Maximum for	
	property	·	monthly average	
			·	
			peryllium carbonate	٠,
	produced	from bertrand	ite ore (as Be)	•
Downlia		7 042 000	931 000	1
Beryllium Chromium		1,842.000	831.000	i
		831.000 2,875.000	336.900 1,370.000	
Copper Cyanide		449.200	179.700	•
Ammonia		299,400.000	131,600.000	
Fluoride		78,610.000	44,700.000	i i
TSS		33,690.000	26,950.000	ı
	Within		7.5 to 10.0 at all	+imoa.
рH	MICHILI	the range or	7.5 to 10.0 at all	cimes
	· · · · · · · · · · · · · · · · · · ·			
(h) Solve	nt Extraction	Raffinate from	m Beryl Ore NSPS	•
(D) BOTAE	LE DACTACCION	MALLITIAGE IIO	" TELAT OLE MOLD	
Pollutant	or	Maximum for	Maximum for	<del></del> ,
	property		monthly average	
F	Proporol	any one day	monenty average	
	ma/ka (lb/mi	llion lbs) of 1	peryllium carbonate	<del></del>
		ced from beryl		
	•			
*Berylliu	m	180.400	81.400	
*Chromium		81.400	33.000	
*Copper	4	281.600	134.200	
*Cyanide		44.000	17.600	
*Ammonia		29,330.000	12,890.000	
*Fluoride		7,700.000	4,378.000	
*TSS		3,300.000	2,640.000	
*pH	Within		7.5 to 10.0 at all	times
_ 				
(c) Beryl	lium Carbonat	<u>e Filtrate</u> NS	PS	
				1
Pollutant		Maximum for	Maximum for	1
pollutant	property	any one day	monthly average	
	·			<u> </u>
mg/kg (1)	b/million lbs	) of beryllium	carbonate produced	(as Be
<b></b>		105 000	<b>~~</b> ~~	
Beryllium		175.900	79.370	E .
Chromium		79.370	32.180	
Copper		274.600	130.800	
Cyanide		42.900	17.160	i
Ammonia		28,590.000	12,570.000	
Fluoride		7,508.000	4,269.000	
TSS		3,218.000	2,574.000	
Hq	Within	the range of	7.5 to 10.0 at all	times

## TABLE XI-2 (Continued)

## NSPS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

# (d) Beryllium Hydroxide Filtrate NSPS

( - )	<del></del>			
Pollutant	or	Maximum for	Maximum	for
	property	any one day		average
-		_ i		<b>.</b>
mg/kg (1)	o/million lbs	) of berylliu	ım hydroxide	produced (as B
Beryllium		111.520		50.320
Chromium		50.320		20.400
Copper	* .	174.080		82.960
Cyanide		27.200		10.880
Ammonia		18,128.800	7,9	969.600
Fluoride		4,760.000	2,	706.400
TSS		2,040.000	1,0	532.000
рH	Within	the range of	7.5 to 10.0	) at all times
(a) Barul	lium Oxide Ca	laining Eurna	Co Wet APC	NSPS
(C) DCI yi	Trum Oxide Ca.	reming runne	ice wee Arc	NOFO
Pollutant		Maximum for	Maximum	for
pollutant	property	any one day	monthly	average
·	· · · · · · · · · · · · · · · · · · ·		·	
mg/	kg (lb/millio	on lbs) of be	erylliumcoxio	de produced
Beryllium	÷ 4	216.200	•	97.570
Chromium	: '	97.570		39.560
Copper	:	337.500		160.900
Cyanide		52.740		21.100
Ammonia		35,150.000		450.000
Fluoride	*	9,230.000		248.000
TSS		3,956.000		164.000
pН	Within	the range of	7.5 to 10.0	) at all times
(f) Beryll	lium Hydroxide	e Supernatant	NSPS	
			<del>-</del>	
Pollutant		Maximum for		
pollutant	property	any one day	monthly	average
	ma/ka /:1 h/m:1	llion lbal of	horullium	vidrovido
	mg/kg (lb/mil			
	produced II	com scrap and	residues (c	is De)
Beryllium		188.600		85.100
Chromium		85.100		34.500
Copper		294.400	]	40.300
Cyanide		46.000		18.400
Ammonia		30,660.000	13,4	80.000
Fluoride	]	160,300.000	71,2	200.000
TSS		3,450.000		60.000
pН	Within	the range of	7.5 to 10.0	at all times

## TABLE XI-2 (Continued)

## NSPS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

## (g) Process Water NSPS

(g) Floces	ss water Nor			
Pollutant	or	Maximum for	Maximum for	
	property	any one day		
porracane	propercy	any one day	monenty average	
mg/l	kg (lb/millio	n lbs) of be	ryllium pebbles prod	uced
Damel 1 i		142 200	C4 C00	
Beryllium		143.300	64.680	
Chromium		64.680	26.220	
Copper		223.700	106.600	
Cyanide		34.960	13.980	
Ammonia		23,300.000	10,240.000	
Fluoride		6,118.000	3,479.000	
TSS		2,622.000	2,098.000	_
рH	Within	the range of	f 7.5 to 10.0 at all	times
(h) Fluor:	ide Furnace S	crubber NSP	S	
Pollutant	or	Maximum for	Maximum for	
	property			;
mg/l	kg (lb/million	n lbs) of be	ryllium pebbles prod	uced
	<b>5</b> , ,			
Beryllium		0.000	0.000	
Chromium		0.000	0.000	
Copper		0.000	0.000	
Cyanide		0.000	0.000	i
Ammonia		0.000	0.000	1
Fluoride		0.000	0.000	
TSS		0.000	0.000	
рH	Within	the range of	f 7.5 to 10.0 at all	times
(i) Chin T	Prestment Wast	tewater NSPS		
(1) <u>CITT</u>	reatment Wast	Lewater NSP	•	;
Pollutant	or	Maximum for	Maximum for	· · · · · · · · · · · · · · · · · · ·
pollutant	property	any one day	monthly average	i .
mg/kg	g (1b/million	lbs) of bery	yllium scrap chips t	reated
Beryllium		6.355	2.868	
Chromium		2.868	1.163	
Copper		9.920	4.728	- · · · · · · · · · · · · · · · · · · ·
Cyanide		1.550	.620	
Ammonia		1,033.000	454.200	
Fluoride		271.300	154.200	
TSS		116.300	93.000	
Hq	Within		7.5 to 10.0 at all	timoc
Ьп	MICHIL	the range of	1.5 to 10.0 at all	CTIMES

## TABLE XI-2 (Continued)

## NSPS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

## (j) Beryllium Pebble Plant Area Vent Wet APC NSPS

Pollutant	or	Maximum for	Maximum for	
		any one day	monthly averag	je
		- 11 ·	77.	
mg/I	d (Tp/million	n lbs) or bery	vllium pebbles pro	aucea
Beryllium		0.000	0.00	0
Chromium		0.000	0.00	00 -
Copper		0.000	0.00	0
Cyanide		0.000	0.00	
Ammonia		0.000	0.00	
Fluoride		0.000	0.00	0
TSS		0.000	0.00	
pН	Within	the range of	7.5 to 10.0 at al	.l times
	<u> </u>		· · · · · · · · · · · · · · · · · · ·	·
(le) Borrel	Oro Canaua D	ewatering NSI	oc.	
(x) per AT	Ore Gangue De	swatering No.		
Pollutant	or	Maximum for	Maximum for	
pollutant		any one day	monthly average	je
T.			<del>7</del> - 1	
mg/kg	(pounds per n	million pounds	s) of beryl ore pr	ocessed
Beryllium		0.855	0.386	
Chromium	Total)	0.386	0.156	
Copper		1.335	0.636	
Cyanide (		0.209	0.083	Ψ,
Ammonia (a	ıs N)	139.032	61.120	
Fluoride	· · · · · · · · · · · · · · · · · · ·	36.505	20.756	•
	pended Solids		12.516	
рH	Within t	the range of 7	7.5 to 10.0 at all	times
	<u> </u>			
(1) Bortro	andita Ora Car	ogus Dowstorir	ng NSPS	
(I) Bercia	multe ole Gai	ngue Dewaterin	ig NSFS	
Pollutant	or	Maximum for	Maximum for	
pollutant	the state of the s	any one day	monthly averag	e
	PP1			
ma/ka (po	unds per mill	ion pounds) c	of bertrandite ore	process
-3/ -23 (E)		1		£0
Beryllium		2.185	0.986	
Chromium (	Total)	0.986	0.400	
Copper	• • •	3.411	1.626	
Cyanide (7	otal)	0.533	0.213	
Ammonia (a		355.245	156.169	
Fluoride	· · · · · · · · · · · · · · · · · · ·	93.275	53.034	
	ended Solids	39.975	31.980	
pH			7.5 to 10.0 at al	1 times
եււ	MICHILI	the Lange OL	1.2 to to at at	T CIMES

## TABLE IX-2 (Continued)

#### NSPS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

## (m) Beryl Ore Processing NSPS

Pollutant or	Maximum for	Maximum for	
pollutant property			i
	:		
mg/kg (pounds per	million pounds	) of beryl ore proces	sed
Beryllium	5.988	2.702	1
Chromium (Total)	2.702	1.095	
Copper	9.348	4.455	
Cyanide (Total)	1.461	0.584	
Ammonia (as N)	973.490	427.956	
Fluoride	255.605	145.330	
Total Suspended Solids		87.636	
		7.5 to 10.0 at all time	mes
(n) Aluminum Iron Slude	ge (AIS) Area	<u>Wastewater</u> NSPS	
Pollutant or	Maximum for	Maximum for	
pollutant property	any one day	monthly average	-
	_ ,	<u>-</u>	:
mg/kg (pounds per mil			oona
	produced (as	Be)	:
Beryllium	383.760	173.160	
Chromium (Total)	173.160	70.200	
Copper	599.040	285.480	
Cyanide (Total)	93.600	37.440	,
Ammonia (as N)	62,384.400	27,424.800	;
Fluoride	16,380.000	9,313.200	,
Total Suspended Solids	7.020.000	5,616.000	• ;
		7.5 to 10.0 at all time	nes
(o) Bertrandite Ore Lea	aching Scrubbe	r NSPS	
(0) 201014114160 010 200	Jonathy Bordsbe		
Pollutant or	Maximum for	Maximum for	
pollutant property	any one day	monthly average	
mg/kg of	f bertrandite	ore processed	
Beryllium	1.239	0.559	
Chromium (Total)	0.559	0.227	
Copper	1.934	0.922	
Cyanide (Total)	0.302	0.121	
Ammonia (as N)	201.416	88.545	,
Fluoride	52.885	30.069	
Total Suspended Solids		18.132	
		7.5 to 10.0 at all times.	noc
bir Mrciirii	che Lange OL	7.5 CO 10.0 at all til	にてひ

# TABLE XI-2 (Continued)

# NSPS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

# 

Pollutant or pollutant proper	Maximum ty any one		for average
m	g/kg of bertran	dite ore process	sed
Beryllium Chromium (Total) Copper Cyanide (Total) Ammonia (as N) Fluoride Total Suspended pH	0.129 0.020 13.463 3.535 Solids 1.515		0.037 0.015 0.062 0.008 5.919 2.010 1.212 at all times

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#### SECTION XII

#### PRETREATMENT STANDARDS

This section describes the control and treatment technologies for pretreatment of process wastewaters from new sources in the primary beryllium subcategory. Pretreatment standards for regulated pollutants are presented based on the selected control and treatment technology. Pretreatment standards are to be technology based, analogous to the best available technology for removal of toxic pollutants.

EPA is not promulgating pretreatment standards for existing sources at this time because there are currently no indirect discharging facilities in this subcategory.

#### TECHNICAL APPROACH TO PRETREATMENT

Before proposing and promulgating 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.

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

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

#### PRETREATMENT STANDARDS FOR NEW SOURCES

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

options discussed in Section X.

Treatment technologies considered for the PSNS options are:

#### OPTION A

- o Recycle of scrubber liquors
- o Ammonia steam stripping and cyanide precipitation for selected waste streams
- o Chemical precipitation and sedimentation

#### OPTION C

- o Recycle of scrubber liquors
- o Ammonia steam stripping and cyanide precipitation pretreatment for selected waste streams
- o Chemical precipitation and sedimentation

#### PSNS OPTION SELECTION - PROPOSAL

EPA proposed that the pretreatment standards technology base for the primary beryllium subcategory be equivalent to Option C, inprocess flow reduction, chemical precipitation, sedimentation, and multimedia filtration. EPA was considering addition of ammonia steam stripping and cyanide precipitation for control of ammonia and cyanide.

The wastewater discharge rates proposed for PSNS were equivalent to the proposed BAT discharged races. No flow reduction was considered feasible beyond the recycle proposed for BAT. The pollutants proposed for regulation at PSNS were the same as those proposed for regulation at BAT.

#### PSNS OPTION SELECTION - PROMULGATION

The technology basis for promulgated PSNS is identical to It includes ammonia steam stripping and cyanide and BAT. precipitation pretreatment for selected waste streams, followed and precipitation, sedimentation, multimedia chemical filtration technology. It is necessary to promulgate PSNS to prevent passthrough of beryllium, chromium, copper, cyanide, ammonia, and fluoride. We know of no economically feasible, demonstrated technology that is better than BAT technology. additional flow reduction for new sources is feasible. PSNS does not include any additional costs compared to NSPS BAT, we do not believe it will prevent entry of new plants. PSNS discharge rates are shown in Table XII-1 (page 3808).

#### 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.

# PRETREATMENT STANDARDS FOR NEW SOURCES

Pretreatment standards for new sources 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 treatment effectiveness concentration from the model treatment (mg/l) and the production normalized wastewater discharge rate (l/kkg). The achievable treatment effectiveness concentrations for BAT are identical to those for PSNS. PSNS are presented in Table XII-2.

TABLE XII-1 PSNS WASTEWATER DISCHARGE RATES FOR THE PRIMARY BERYLLIUM SUBCATEGORY

Wastewater <u>Stream</u>		ormalized ge Rate 103 gal/ton	Productin Normalized Parameter	PRIMARY
Solvent extraction raffinate from bertrandite ore	2,246	538.2	Beryllium carbonate pro- duced from bertrandite ore as beryllium	-
Solvent extraction raffinate from beryl ore	220.0	52.72	Beryllium carbonate pro- duced from beryl ore as beryllium	BERYLLIUM
Beryllium carbonate filtrate	214.5	51.40	Beryllium carbonate pro- duced as beryllium	SUBC
Beryllium hydroxide filtrate	136.0	32.6	Beryllium hydroxide pro- duced as beryllium	SUBCATEGORY
Beryllium oxide calcining furnace wet air pollution control	ce 263.7	63.19	Beryllium oxide produced	ΥΥ
Beryllium hydroxide supernatant	230.0	55.12	Beryllium hydroxide pro- duced from scrap and residues as beryllium	SECT -
Process water	174.8	41.89	Beryllium pebbles produced	IIX
Fluoride furnace scrubber	0	0	Beryllium pebbles produced	
Chip treatment wastewater	7.75	1.86	Beryllium scrap chips treated	
Beryllium pebble plant area ven wet air pollution control	t 0	0	Beryllium pebbles produced	-

TABLE XII-1 (Continued)
PSNS WASTEWATER DISCHARGE RATES FOR THE PRIMARY BERYLLIUM SUBCATEGORY

<u>Wastewater</u> <u>Stream</u>		Normalized rge Rate 103 gal/ton	Productin Normalized Parameter
Beryllium ore gangue dewatering	1.043	0.25	Beryllium ore processed
Bertrandite ore gangue dewatering	2.665	0.639	Bertrandite ore processed
Beryllium ore processing	7.303	1.75	Beryllium ore processed
AIS area wastewater	468.0	112.1	Total beryllium carbonate produced as beryllium
Bertrandite ore leaching scrubber	1.511	0.362	Bertrandite ore processed
Bertrandite ore counter current decantation scrubber	0.101	0.024	Bertrandite ore processed

TABLE XII-2
PSNS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

## (a) Solvent Extraction Raffinate from Bertrandite Ore PSES

(a) Solve	nt Extraction	Rallinate IIC	m Bertrandite Ore PSE	5			
Pollutant	or	Maximum for	Maximum for	<del></del>			
	property	any one day	monthly average				
	mg/kg (lb/mi	llion lbs) of	beryllium carbonate	;			
	produced	from bertrand	lite ore (as Be)				
Beryllium		1,842.000	831.000				
Chromium		831.000	336.900				
Copper		2,875.000	1,370.000				
Cyanide		449.200	179.700				
Ammonia Fluoride		299,400.000	131,600.000 44,700.000				
riuoriae		78,610.000	44,700.000	ı			
(b) Solvent Extraction Raffinate from Beryl Ore PSES							
Pollutant		Maximum for	Maximum for				
pollutant	property	any one day	monthly average				
mg/kg (lb/million lbs) of beryllium carbonate produced from beryl ore (as Be)							
Beryllium		180.400	81.400	î			
Chromium		81.400	33.000				
Copper Cyanide		281.600 44.000	134.200 17.600				
Ammonia		29,330.000	12,890.000				
Fluoride		7,700.000	4,378.000				
		· · · · · · · · · · · · · · · · · · ·					
(c) Beryllium Carbonate Filtrate PSES							
Pollutant	or	Maximum for	Maximum for	<del></del> -			
pollutant	property	any one day	monthly average				
mg/kg (1)	o/million lbs	) of beryllium	carbonate produced (a	s Be			
Beryllium		175.900	79.370				
Chromium		79.370	32.180				
Copper		274.600	130.800				
Cyanide		42.900	17.160				
Ammonia Fluoride		28,590.000 7,508.000	12,570.000 4,269.000				
TTUOLIUG		7,750.000	4,203.000				

## TABLE XII-2 (Continued)

## PSNS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

# (d) Beryllium Hydroxide Filtrate PSES

P								
Pollutant	or	Maximum for	Maximum	for		_ `		
pollutant	· ·	any one day		average				
F	Proposition of	)						
mg/kg (1)	b/million lbs	) of beryllium	hydroxide	produced	(as	Be)		
Beryllium		111.520		50.320				
Chromium		50.320		20.400				
Copper		174.080		82.960				
Cyanide		27.200		10.880				
Ammonia		18,128.800	7.9	969.600		7		
Fluoride		4,760.000		706.400				
		;	<b>-</b> / :					
* .		` i	<del> </del>			<del>-</del>		
(e) Beryllium Oxide Calcining Furnace Wet APC PSES								
Pollutant	or	Maximum for	Maximum	for		_		
pollutant	property	any one day	monthly	average				
		10			<del></del>			
mg,	/kg (lb/millio	on lbs) of ber	yllium oxid	de produce	ed			
Danii 1111		216 200		07 570				
Beryllium	:	216.200		97.570				
Chromium	en e	97.570	•	39.560				
Copper		337.500	* .	160.900				
Cyanide		52.740		21.100				
Ammonia		35,150.000		450.000				
Fluoride	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	9,230.000	5,	248.000				
*			·	·		-		
(f) Beryllium Hydroxide Supernatant PSES								
Pollutant	or	Maximum for	Maximum	for		<u> </u>		
pollutant		any one day	monthly					
			<del>-</del>					
	mg/kg (lb/mi	llion lbs) of	beryllium h	ydroxide		<del>-</del>		
	produced fi	rom scrap and	residues (a	ıs Be)		-		
Beryllium		188.600		85.100				
Chromium		85.100	-	34.500				
Copper		294.400	1	.40.300		-		
Cyanide	*	46.000		18.400				
Ammonia		30,660.000	13,4	80.000				
Fluoride		L60,300.000	71,2	00.000				

## TABLE XII-2 (Continued)

# PSNS FOR THE PRIMARY BERYLLIUM SUBCATEGORY (g) Process Water PSES

		:						
Pollutant or	Maximum for	Maximum for						
pollutant property	any one day	monthly average						
mg/kg (lb/million lbs) of beryllium pebbles produced								
Beryllium	143.300	64.680						
Chromium	64.680	26.220						
Copper	223.700	106.600						
Cyanide	34.960	13.980						
Ammonia	23,300.000	10,240.000						
Fluoride	6,118.000	3,479.000						
11401140	0,110.000	3,1,3,000						
		:						
(h) <u>Fluoride</u> <u>Furnace</u>	Scrubber PSES							
Pollutant or	Maximum for	Maximum for						
pollutant property	any one day	monthly average						
mg/kg (lb/million lbs) of beryllium pebbles produced								
Daniel 1 i		0.000						
Beryllium	0.000 0.000	0.000 0.000						
Chromium	0.000	0.000						
Copper	0.000	0.000						
Cyanide Ammonia	0.000	0.000						
Fluoride	0.000	0.000						
riuoride	0.000	0.000						
(i) Treatment Wastewater PSES								
(1) 110000000 11000000								
Pollutant or	Maximum for	Maximum for						
pollutant property	any one day	monthly average						
mg/kg (lb/million lbs	) of beryllium	scrap chips treated						
g/g (12/11110 122	, 01 201,1114	borup onips treated						
Beryllium	6.355	2.868						
Chromium	2.868	1.163						
Copper	9.920	4.728						
Cyanide	1.550	.620						
Ammonia	1,033.000	454.200						
Fluoride	271.300	154.200						
		· · ·						

### PRIMARY BERYLLIUM SUBCATEGORY SECT - XII

### TABLE XII-2 (Continued)

### PSNS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

### (j) Beryllium Pebble Plant Area Vent Wet APC PSES

Pollutant or	Maximum for	Maximum for
pollutant property	any one day	monthly average
mg/kg (lb/millio	n lbs) of beryl	lium pebbles produced
Beryllium	0.000	0.000
Chromium	0.000	0.000
Copper	0.000	0.000
Cyanide	0.000	0.000
Ammonia	0.000	0.000
Fluoride	0.000	0.000
(k) Ore Gangue Dewate	ring PSES	
Pollutant or	Maximum for	Maximum for
pollutant property	any one day	monthly average
mg/kg (pounds per	million pounds)	of beryl ore processed
Beryllium	0.855	0.386
Chromium (Total)	0.386	0.156
Copper	1.335	0.636
Cyanide (Total)	0.209	0.083
Ammonia (as N)	139.032	61.120
Fluoride	36.505	20.756
(1) Bertrandite Ore Ga	ngue Dewatering	PSES
Pollutant or	Maximum for	Maximum for
pollutant property	any one day	monthly average
mg/kg (pounds per mill of bertrandite ore pro		
Beryllium	2.185	0.986
Chromium (Total)	0.986	0.400
Copper	3.411	1.626
Cyanide (Total)	0.533	0.213
Ammonia (as N)	355.245	156.169
Fluoride	93.275	5 <b>3.</b> 034
	1 1 1	

#### PRIMARY BERYLLIUM SUBCATEGORY SECT - XII

### TABLE XII-2 (Continued)

### PSNS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

### (m) Beryl Ore Processing PSES

Pollutant or pollutant property	Maximum for any one day	Maximum for monthly average
mg/kg (pounds per	million pounds)	of beryl ore processed
Beryllium Chromium (Total) Copper Cyanide (Total) Ammonia (as N) Fluoride	5.988 2.702 9.348 1.461 973.490 255.605	2.702 1.095 4.455 0.584 427.956 145.330

### (n) Aluminum Iron Sludge (AIS) Area Wastewater PSES

	J*		
Pollutant or	Maximum for	Maximum for	
pollutant property	any one day	monthly average	

mg/kg (pounds per million pounds) of total beryllium carbonate produced (as Be)

Beryllium	383.760	173.160
Chromium (Total)	173.160	70.200
Copper	599.040	285.480
Cyanide (Total)	93.600	37.440
Ammonia (as N)	62,384.400	27,424.800
Ammonia (as N) Fluoride	62,384.400 16,380.000	27,424.800 9,313.200

### (o) Bertrandite Ore Leaching Scrubber PSES

Pollutant or	Maximum for	Maximum for	
pollutant property	any one day	monthly average	
mg/kg	of bertrandite	ore processed	
Beryllium	1.239	0.559	
Chromium (Total)	0.559	0.227	1
Copper	1.934	0.922	
Cyanide (Total)	0.302	0.121	
Ammonia (as N)	201.416	88.545	1
Fluoride	52.885	30.069	
			į

### PRIMARY BERYLLIUM SUBCATEGORY SECT - XII

### TABLE XII-2 (Continued)

### PSNS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

# 

Pollutant or pollutant property	Maximum for any one day	Maximum for monthly average
mg/kg	of bertrandite	ore processed
Beryllium	0.083	0.037
Chromium (Total)	0.037	0.015
Copper	0.129	0.062
Cyanide (Total)	0.020	0.008
Ammonia (as N)	13.463	5.919
Fluoride	3.535	2.010

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# PRIMARY BERYLLIUM SUBCATEGORY SECT - XIII

### SECTION XIII

# BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY

EPA is not promulgating best conventional pollutant control technology (BCT) limitations for the primary beryllium subcategory at this time.

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### DEVELOPMENT DOCUMENT SUPPLEMENT

for the

Primary Nickel and Cobalt Subcategory

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May 1989

U.S. Environmental Protection Agency
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### TABLE OF CONTENTS

Section		Page
<b>1</b>	SUMMARY	3829
II	CONCLUSIONS	3831
III	SUBCATEGORY PROFILE	3837
	Description of Primary Nickel and Cobalt Production	3837
	Raw Materials Leaching	3837 3837
	Cobalt Precipitation and Reduction Nickel Reduction	3838 3838
	Process Wastewater Sources	3838
	Other Wastewater Sources Age, Production, and Process Profile	3838
	and Plocess Plotite	3839
IV	SUBCATEGORIZATION	3841
	Factors Considered in Subdividing the Primary Nickel and Cobalt Subcategory	3841
	Other Factors	3842
	Production Normalizing Parameters	3842
V	WATER USE AND WASTEWATER CHARACTERISTICS	3843
	Wastewater Flow Rates	3844
1.	Wastewater Characteristics Data Data Collection Portfolios	3844
	Field Sampling Data	3844
	Wastewater Characteristics and Flows by Subdivision	3845 3846
	Raw Material Dust Control	3846
	Cobalt Reduction Decant	3846
	Nickel Reduction Decant	3847
	Nickel Wash Water	3847

## TABLE OF CONTENTS (Continued)

Section		Page
VI	SELECTION OF POLLUTANTS	3873
	Conventional and Nonconventional Pollutant Parameters Selected	3873
	Toxic Priority Pollutants	3874
	Toxic Pollutants Never Detected	3874
	Toxic Pollutants Never Found Above Their Analytical Quantification Concentration	3874
	Toxic Pollutants Present Below Concentrations Achievable by Treatment	3875
	Priority Pollutants Selected for Further Consideration in Establishing Limitations and Standards	3875
	and Scandards	1
AII	CONTROL AND TREATMENT TECHNOLOGIES	3885
	Current Control and Treatment Practices	3885
	Raw Material Dust Control	3885
	Cobalt Reduction Decant	3885
	Nickel Reduction Decant	3886
	Nickel Wash Water	3886
	Control and Treatment Options	3886
		3886
	Option A Option C	3886
VIII	COSTS, ENERGY, AND NONWATER QUALITY ASPECTS	3889
	Treatment Options for Existing Sources	3889
	Option A	3889
	Option C	3889
	Cost Methodology	3889
	Nonwater Quality Aspects	3890
	Energy Requirements	3891
	THEIGY MEditiements	3891
	Solid Waste Air Pollution	3892

## TABLE OF CONTENTS (Continued)

<u>Section</u>		Page
IX	BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE	3895
	Technical Approach to BPT Industry Cost and Pollutant Removal Estimates BPT Option Selection Wastewater Discharge Rates Raw Material Dust Control Cobalt Reduction Decant Nickel Reduction Decant Nickel Wash Water Regulated Pollutant Parameters Effluent Limitations	3895 3897 3898 3899 3899 3899 3899 3899 3900
X	BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE	3905
	Technical Approach to BAT Option A Option C Industry Cost and Pollutant Removal Estimates	3905 3906 3906 3906
	Pollutant Removal Estimates Compliance Costs BAT Option Selection - Proposal BAT Option Selection - Promulgation Wastewater Discharge Rates Regulated Pollutant Parameters Effluent Limitations	3906 3907 3907 3908 3908 3909 3910
XI	NEW SOURCE PERFORMANCE STANDARDS	3919
	Technical Approach to NSPS NSPS Option Selection - Proposal NSPS Option Selection - Promulgation Regulated Pollutant Parameters New Source Performance Standards	3919 3920 3920 3920 3920

# TABLE OF CONTENTS (Continued)

Section		Page
XII	PRETREATMENT STANDARDS	3925
	Technical Approach to Pretreatment Pretreatment Standards for New Sources PSNS Option Selection - Proposal PSNS Option Selection - Promulgation Regulated Pollutant Parameters Pretreatment Standards for New Sources	3925 3926 3926 3926 3927
XIII	BEST CONVENTIONAL POLLUTANT CONTROL	3931

# LIST OF TABLES

<u>Table</u>	<u>Title</u>	Page
V-1	Water Use and Discharge Rates for Raw Material Dust Control	3848
V-2	Water Use and Discharge Rates for Cobalt Reduction Decant	3849
V-3	Water Use and Discharge Rates for Nickel Reduction Decant	3850
V-4	Water Use and Discharge Rates for Nickel Wash Water	3851
V-5	Primary Nickel and Cobalt Subcategory Combined Wastewater - Influent to Treatment Raw Wastewate Sampling Data	3852 er
V-6	Primary Nickel and Cobalt Subcategory Treated Plant Effluent	3862
VI-1	Frequency of Occurrence of Priority Pollutants Primary Nickel and Cobalt Subcategory Raw Wastewater	3877
VI-2	Toxic Pollutants Never Detected	3881
VIII-1	Cost of Compliance for the Primary Nickel and Cobalt Subcategory Direct Dischargers	3893
IX-1	BPT Wastewater Discharge Rates for the Primary Nickel and Cobalt Subcategory	3901
IX-2	BPT Mass Limitations for the Primary Nickel and Cobalt Subcategory	3902
X-1	Pollutant Removal Estimates for Direct Dischargers Primary Nickel and Cobalt Subcategor	3911 Y
X-2	Cost of Compliance for the Primary Nickel and Cobalt Subcategory Direct Dischargers	3912
X-3	BAT Wastewater Discharge Rates for the Primary Nickel and Cobalt Subcategory	3913
₹-4	BAT Mass Limitations for the Primary Nickel and Cobalt Subcategory	3914

### LIST OF TABLES

<u>Table</u>	<u>Title</u>	Page
XI-1	NSPS Wastewater Discharge Rates for the Primary Nickel and Cobalt Subcategory	3921
XI-2	NSPS for the Primary Nickel and Cobalt Subcategory	3922
XII-l	PSNS Wastewater Discharge Rates for the Primary Nickel and Cobalt Subcategory	3928
XII-2	PSNS for the Primary Nickel and Cobalt Subcategory	3929

### LIST OF FIGURES

<u>Figure</u>	<u>Title</u>	Page
III-1	Primary Nickel and Cobalt Manufacturing Process	3840
V-1	Sampling Sites at Primary Nickel and Cobalt Plant A	3872
IX-1	BPT Treatment Scheme for the Primary Nickel and Cobalt Subcategory	3904
x-1	BAT Treatment Scheme for Option A	3916
X-2	BAT Treatment Scheme for Option C	3917

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#### SECTION I

#### SUMMARY AND CONCLUSIONS

This document provides the technical basis for promulgating effluent limitations based on best practicable technology (BPT) and best available technology (BAT) for existing direct dischargers, pretreatment standards for new indirect dischargers (PSNS), and standards of performance for new source direct dischargers (NSPS) for plants in the primary nickel and cobalt subcategory.

The primary nickel and cobalt subcategory consists of one plant which discharges directly to a surface water. There are no indirect dischargers presently operating.

EPA first studied the primary nickel and cobalt 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 the sources and volume of water used, the processes used, the sources of pollutants and wastewaters in the plant, and the constituents of wastewaters, including toxic pollutants. As a result, four subdivisions have been identified for this subcategory that warrant separate effluent limitations. These include:

- o Raw material dust control,
- o Cobalt reduction decant,
- o Nickel reduction decant, and
- o Nickel wash water.

Several distinct control and treatment technologies (both inplant and end-of-pipe) applicable to the primary nickel and cobalt subcategory were identified. 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, the number of potential closures, number of employees affected, and impact on price were estimated. These

results are reported in a separate document entitled The Economic Impact Analysis of Effluent Limitations and Standards for the Nonferrous Metals Manufacturing 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. To meet the BPT effluent limitations based on this technology, the primary nickel and cobalt subcategory is expected to incur a capital cost of \$71,362 and an annual cost of \$27,184.

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 nickel and cobalt subcategory is estimated to incur a capital cost of \$86,500 and an annual cost of \$31,800.

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

The Agency is not promulgating PSES for this subcategory because there are no indirect dischargers. For PSNS, the Agency selected end-of-pipe treatment and in-process flow reduction control techniques equivalent to NSPS.

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

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

#### SECTION II

#### CONCLUSIONS

EPA has divided the primary nickel and cobalt subcategory into four subdivisions or building blocks for the purpose of effluent limitations and standards. These subdivisions are:

- (a) Raw material dust control,
- (b) Cobalt reduction decant,
- (c) Nickel reduction decant, and
- (d) Nickel wash water.

BPT is promulgated 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 for selected waste streams. The following BPT effluent limitations are promulgated:

### (a) Raw Material Dust Control BPT

Pollutant or	Maximum for	Maximum for
Pollutant property	Any One Day	Monthly Average

# mg/kg (lb/million lbs) of copper, nickel, and cobalt in the crushed raw material

Copper			0.14	16	* .	0.077
Nickel			0.14	18		0.098
Ammonia	(as N)	,	10.26	50		4.512
Cobalt			0.01	L <b>6</b>		0.007
TSS			3.15	57		1.502
рH	Within t	he ran	ige of 7	7.5 to	10.0 at	all times

### (b) Cobalt Reduction Decant BPT

	i e de la companya d	* •	
· ·	itant or	Maximum for	Maximum for
	it property	y Any One Day	Monthly Average
	mg/kg	(lb/million lbs)	of cobalt produced
Copper		40.660	21.400
Nickel		41.080	27.180
Ammonia	(as N)	2,852.000	1,254.000
Cobalt		4.494	1.926
TSS PH	Within	877.300	417.300 to 10.0 at all times

### (c) Nickel Reduction Decant BPT

	# · · · · · · · · · · · · · · · · · · ·
Maximum for	Maximum for Monthly Average
Any One Day	noncinity in the second
lb/million lbs) of	nickel produced
24 120	12.700
	16.120
	743.900
	1.143
	247.600
520:500	to 10 0 at all times
the range of 7.3 %	to 10.0 at a22 02
ater BPT	
Maximum for	Maximum for
Any One Day	Monthly Average
/million lbs) of n	ickel powder washed
0 064	0.034
	0.043
	1.985
	0.003
	0.660
1.309	to 10.0 at all times
the range of 7.3	
	Any One Day  1b/million 1bs) of  24.120 24.370 1,692.000 2.666 520.500 the range of 7.5  ater BPT  Maximum for Any One Day

BAT is promulgated 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 for selected waste streams. The following BAT effluent limitations are promulgated:

### (a) Raw Material Dust Control BAT

Pollutant or	Maximum for	Maximum for
Pollutant property	Any One Day	Monthly Average
mg/kg (lb/million th	lbs) of coppe	r, nickel, and cobalt in material
Copper	0.099	0.047
Nickel	0.042	0.028
Ammonia (as N)	10.260	4.512
Cobalt	0.011	0.005

### (b) Cobalt Reduction Decant BAT

	* * *		
Pollutant or	Maximum for	Maximum for	
Pollutant property	Any One Day	Monthly Average	
mg/kg (1b	o/million lbs) o	f cobalt produced	
Copper	27.390	13.050	
Nickel	11.770	7.917	
Ammonia (as N)	2,852.000	1,254.000	٠.
Cobalt	2.996	1.498	
(c) Nickel Reduction	Decant BAT		
Pollutant or	Maximum for	Maximum for	
Pollutant property	Any One Day	Monthly Average	
mg/kg (1b	o/million lbs) o	f nickel produced	
Copper	16.250	7.744	
Nickel	6.982	4.697	
Ammonia (as N)	1,692.000	743.900	. ·
Cobalt	1.777	0.889	
(d) <u>Nickel</u> Wash Wate	r BAT		
Pollutant or	Maximum for	Maximum for	
Pollutant property	Any One Day	Monthly Average	
mg/kg (lb/mi	llion lbs) of n	ickel powder washed	
Copper	0.043	0.021	
Nickel	0.019	0.013	
Ammonia (as N)	4.515	1.985	
Cobalt	0.005	0.002	

NSPS are promulgated 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 for selected waste streams. The following NSPS are promulgated for new sources:

7.744

### (a) Raw Material Dust Control NSPS

Pollutant or	Maximum for	Maximum for
Pollutant property	Any One Day	Monthly Average

### mg/kg (lb/million lbs) of copper, nickel, and cobalt in the crushed raw material

Copper				0.099				0.04	<b>1</b> 7
Nickel		1		0.042				0.02	28
Ammonia	(as N)			10.260				4.5]	L2
Cobalt	(45 11)			0.011				0.00	05
TSS			i.	1.155				0.92	24
pН	Within	the	range	of 7.	5 to	10.0	at	all	times

### (b) Cobalt Reduction Decant NSPS

Pollutant or	Maximum for	Maximum for
Pollutant property	Any One Day	Monthly Average

### mg/kg (lb/million lbs) of cobalt produced

Copper	(as N)	27.390	13.050
Nickel		11.770	7.917
Ammonia		2,852.000	1,254.000
Cobalt		2.996	1.498
TSS		321.000	256.800
pH	Within	the range of 7.5 to	10.0 at all times

#### (c) Nickel Reduction Decant NSPS

Pollutant or Pollutant property	Maximum for Any One Day	Maximum for Monthly Average	
	•		

## mg/kg (lb/million lbs) of nickel produced

Copper Nickel Ammonia Cobalt TSS pH		16.250 6.982				7.744 4.697			
	(as N)	1,692.000 1.777				743.900 0.889			
	Within	the	: 190 range o			to	10.0		52.30 all

### (d) Nickel Wash Water NSPS

Pollutant or Pollutant property		Maximum for Maximum for Any One Day Monthly Average				
	mg/kg (lb/mi	llion lbs) of nickel powder washed				
Copper Nickel Ammonia Cobalt TSS pH	(as N) Within the	0.043 0.021 0.019 0.013 4.515 1.985 0.005 0.002 0.508 0.406 e range of 7.5 to 10.0 at all times				

PSES are not promulgated for this subcategory since there are no indirect dischargers.

PSNS are promulgated 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 for selected waste streams. The following PSNS are promulgated for new sources:

## (a) Raw Material Dust Control PSNS

Pollutant or Pollutant property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/millic	on lbs) of copper the crushed raw m	, nickel, and cobalt in aterial
Copper Nickel Ammonia (as N) Cobalt	0.099 0.042 10.260 0.011	0.047 0.028 4.512 0.005
(b) Cobalt Reduction	Decant PSNS	

Pollutant or Pollutant property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (1)	o/million lbs) of	cobalt produced
Copper Nickel Ammonia (as N) Cobalt	27.390 11.770 2,852.000 2.996	13.050 7.917 1,254.000 1.498

### (c) Nickel Reduction Decant PSNS

Copper

Nickel

Cobalt

Ammonia (as N)

Pollutant or Pollutant property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/	million lbs) o	f nickel produced
Copper Nickel Ammonia (as N) Cobalt	16.250 6.982 1,692.000 1.777	7.744 4.697 743.900 0.889
(d) Nickel Wash Water	<u>r</u> PSNS	
Pollutant or Pollutant property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/mi	llion lbs) of m	nickel powder washed

EPA is not promulgating BCT for this subcategory at this time.

0.043

0.019

4.515

0.005

0.021

0.013

1.985

0.002

#### SECTION III

#### INDUSTRY PROFILE

This section of the primary nickel and cobalt supplement describes the raw materials and processes used in smelting and refining primary nickel and cobalt and presents a profile of the primary nickel and cobalt plants identified in this study.

Both nickel and cobalt can be produced from primary and secondary materials. Production of these metals is regulated under three distinct subcategories: production of nickel from secondary materials, production of cobalt from secondary materials, and production of nickel and cobalt from primary materials. This subcategory consists of one plant which manufactures primary nickel and cobalt. Secondary nickel is regulated as a separate subcategory, as is secondary cobalt (secondary cobalt is regulated with secondary tungsten).

The principle use for nickel is as an alloying agent, particularly in the iron and steel products. Nickel imparts strength and corrosion resistance over a wide range of temperatures. Cobalt's value is also as an alloying element, and is used for cutting tools, jet engine parts, electrical devices, permanent magnets, catalysts, and pigments and dyes. Cobalt imparts qualities such as heat resistance, high strength, wear resistance, and magnetic properties.

#### DESCRIPTION OF PRIMARY NICKEL AND COBALT PRODUCTION

The production of primary nickel and cobalt can be divided into three principal processing steps: leaching, cobalt precipitation and reduction, and nickel reduction. The primary nickel and cobalt production process is presented schematically in Figure III-1 (page 3840), and described below.

#### RAW MATERIALS

Domestic primary nickel and cobalt production begins with an imported copper-nickel-cobalt ore concentrate or matte.

#### LEACHING

The raw material, called matte, is crushed and then ground in a wet ball mill, prior to being fed to a sulfuric acid leaching system. Dust and particulate matter from the crushing and grinding area are controlled by a baghouse. The dust and fines are slurried with water to facilitate transporting them from the baghouse. Slurrying results in a process wastewater stream.

In the leaching process, the ground matte is reacted with a copper sulfate - sulfuric acid solution, in order to separate the copper as a solid from the nickel and cobalt, which remain in

solution. The solids, containing most of the copper, iron, and some nickel and cobalt, are sent to the copper recovery circuit. From this circuit, a recycle stream containing nickel and cobalt is returned to the acid leaching process. The liquids produced in the acid leaching process are sent to the nickel and cobalt recovery system.

#### COBALT PRECIPITATION AND REDUCTION

Separation of nickel from cobalt is accomplished by precipitating the cobalt and most impurities from solution with ammonium persulfate. The nickel-containing solution is routed to nickel reduction.

The solids from the cobalt precipitation step are routed to a cobalt purification system. Among other impurities, the solids contain a large nickel concentration. The solids are dissolved and then treated by the "pentammine process" in which ammonia is added to the solution to form cobalt pentammine and nickel diammine. After oxidizing the cobalt with air, acid is added to the solution which causes the nickel and un-oxidized cobalt to crystallize. These crystals are removed, and the cobaltic pentammine solution is passed through an ion-exchange column to remove any remaining traces of nickel. The nickel is recycled to the nickel reduction process. The nickel-free cobalt solution is converted to cobalt powder by reduction in a hydrogen autoclave The liquid effluent from the cobalt reduction furnace is routed to the ammonium sulfate by-product recovery system.

#### NICKEL REDUCTION

The nickel solution contains few impurities at this stage. Reduction of nickel in solution to nickel powder is effected in an autoclave. The liquid effluent from the autoclave contains a large concentration of ammonium sulfate and is sent to an ammonium sulfate by-product recovery process. The nickel powder produced in the reduction furnace is washed with water which is discharged to wastewater treatment.

#### PROCESS WASTEWATER SOURCES

Although a variety of processes are involved in primary nickel and cobalt production, the significant wastewater sources that are associated with the primary nickel and cobalt subcategory can be subdivided as follows:

- 1. Raw material dust control,
- Cobalt reduction decant,
- 3. Nickel reduction decant, and
- 4. Nickel wash water.

#### OTHER WASTEWATER SOURCES

There may be other wastewater streams associated with the primary nickel and cobalt subcategory. These streams may include

stormwater runoff, maintenance and cleanup water, and noncontact cooling and heating water (such as steam condensates from heat exchangers). These wastewaters are not considered as part of this rulemak-ing. EPA believes that the flows and pollutant loadings associ-ated with these wastewater streams are insignificant relative to the waste streams selected and are best handled by the appropriate permit authority on a case-by-case basis under authority of Section 402 of the Clean Water Act.

### AGE, PRODUCTION, AND PROCESS PROFILE

The one primary nickel and cobalt plant in the United States is located in Southern Louisiana in order to take advantage of shipping lanes. This plant began operations in 1959, and came under its present ownership in 1973. Nickel production is between 40,000 and 50,000 tons/year; and cobalt production is less than 1,000 tons/year.

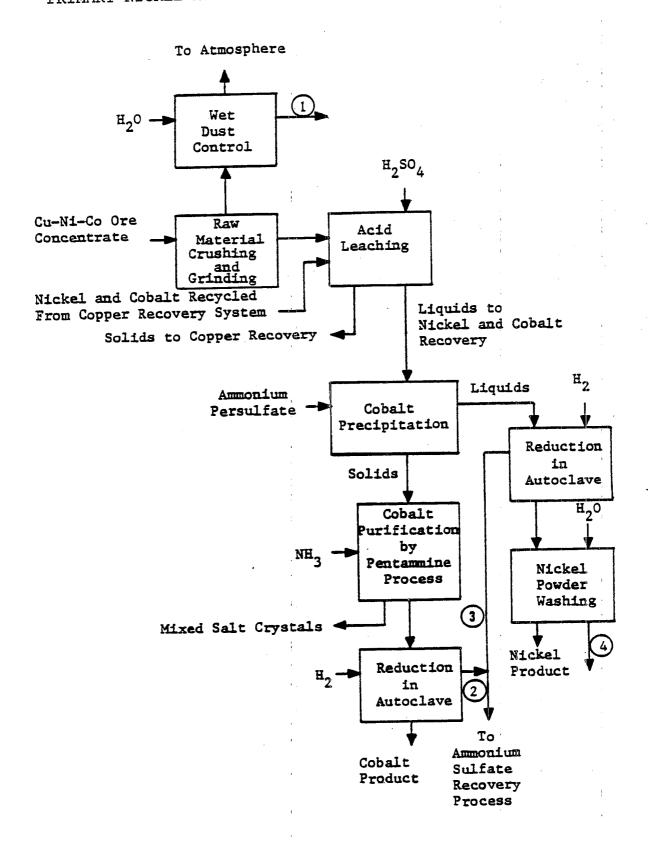


Figure III-1
PRIMARY NICKEL AND COBALT MANUFACTURING PROCESS
3840

#### SECTION IV

#### SUBCATEGORIZATION

This section summarizes the factors considered during the designation of the related subdivisions of the primary nickel and cobalt subcategory. Production normalizing parameters for each subdivision will also be discussed.

# FACTORS CONSIDERED IN SUBDIVIDING THE PRIMARY NICKEL AND COBALT SUBCATEGORY

The factors listed in Vol. I for general subcategorization were each evaluated when considering subdivision of the primary nickel and cobalt subcategory. In the discussion that follows, the factors will be described as they pertain to this particular subcategory.

The rationale for considering segmentation of the primary nickel and cobalt 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 nickel and cobalt is considered a single subcategory, a 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. Raw material dust control,
- Cobalt reduction decant,
- Nickel reduction decant, and
- Nickel wash water.

These subdivisions follow directly from differences between the processing steps of primary nickel and cobalt production. Leaching, cobalt precipitation and reduction, and nickel reduction each have various steps which may generate wastewaters.

Raw material crushing and grinding creates a need for the first subdivision - raw material dust control. Although a dry baghouse is used to control dust and particulate matter generated by the mills that crush and grind the raw material, water is used to slurry the solids collected by the baghouse to the treatment plant.

Washing the nickel powder produced in the hydrogen reduction furnace creates a need for the fourth subdivision - nickel wash water. This water is used to remove traces of acid and impurities from the nickel product. Excess solution containing significant concentrations of ammonium sulfate decanted from the nickel reduction autoclave creates a need for the third

subdivision - nickel reduction decant. Excess solution from the cobalt reduction autoclave creates a need for the second subdivision -cobalt reduction decant.

#### OTHER FACTORS

The other factors considered in this evaluation were shown to be inappropriate bases for further segmentation. Air pollution control methods, treatment costs, and total energy requirements are functions of the selected subcategorization factors—metal product, raw materials, and production processes. 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 the nonferrous metals category.

#### 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). The PNPs for the four subdivisions are as follows:

### Subdivision

#### PNP

1. Raw material dust control copper, nickel, and cobalt in the crushed raw material

Cobalt reduction decant cobalt produced

3. Nickel reduction decant nickel produced

4. Nickel wash water nickel powder washed

Other PNPs were considered. The use of production capacity instead of actual production was eliminated from consideration because the mass of pollutant generated is more a function of true production than of installed capacity.

The PNP selected for raw material dust control is metric tons of copper, nickel, and cobalt in the crushed raw material. This PNP was selected because the amount of water generated by this process is most directly related to the amount of raw material crushed, and the composition of the crushed raw material. Because this plant recovers copper as well as nickel and cobalt from the crushed raw material, the appropriate PNP to select is metric tons of copper, nickel, and cobalt in the crushed raw material.

#### SECTION V

#### WATER USE AND WASTEWATER CHARACTERISTICS

This section describes the characteristics of the wastewaters associated with the primary nickel and cobalt 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.

The two principal data sources used in the development of effluent limitations and standards for this subcategory are 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 nickel and cobalt 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 Vol. I. Samples were analyzed for 124 of the 126 priority 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 never analyzed for asbestos. There is no reason to expect that TCDD or asbestos would be present in nonferrous metals manufacturing wastewater. In general, the samples were analyzed for three classes of pollutants: organic toxic pollutants, metal toxic pollutants, and criteria pollutants (which includes both conventional and nonconventional pollutants).

No additional sampling data for this subcategory were obtained from EPA sampling efforts or industry comments between proposal and promulgation. Characterization of primary nickel and cobalt subcategory wastewaters (Section V), and selection of pollutant parameters for limitation (Section VI) is based upon the same data used at proposal.

As described in Section IV of this supplement, the primary nickel and cobalt subcategory has been divided into four subdivisions or wastewater sources, so that the promulgated regulation contains mass discharge limitations and standards for four 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. Raw material dust control,
- Cobalt reduction decant.

- 3. Nickel reduction decant, and
- 4. Nickel wash water.

#### WASTEWATER FLOW RATES

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

The production normalized 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-4 (pages 3848 - 3851) at the end of this section. Where appropriate, an attempt was made to identify factors that could account for variations in water use. This information is summarized in this section. A similar analysis of factors affecting the wastewater flows is presented in Sections IX X, XI, and XII where representative BPT, BAT, NSPS, and pretreatment discharge flows are selected for use in calculating the effluent limitations and standards.

#### WASTEWATER CHARACTERISTICS DATA

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

#### DATA COLLECTION PORTFOLIOS

In the data collection portfolio, the primary nickel and cobalt plant was asked to specify the presence or absence of toxic pollutants in its wastewater. The plant indicated that toxic organic pollutants were believed to be absent from the effluent. The plant stated that some of the priority metals were known to be present in their effluent. This plant listed chromium, copper, nickel, and zinc as known to be present in the effluent.

#### FIELD SAMPLING DATA

In order to quantify the concentrations of pollutants present in wastewater from primary nickel and cobalt plants, wastewater samples were collected at the one plant. A diagram indicating the sampling sites and contributing production processes is shown in Figure V-1 (page 3872).

The sampling data for the primary nickel and cobalt subcategory are presented in Tables V-5 and V-6 (pages 3852 and 3862). The stream codes displayed in Tables V-5 and V-6 may be used to identify the location of each of the samples on the process flow diagram in Figure V-1. Where no data are listed for a specific day of sampling, the wastewater samples for the stream were not collected.

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

Second, the detection limits shown on the data tables for 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 laboratoryequipment-specific, daily operator-specific and 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. Priority organic, nonconventional, and conventional pollutant data reported with a "less than" sign are considered as detected, but not further quantifiable. A value of zero is also used for averaging. If a pollutant is reported as not detected, it is assigned a value of zero in calculating the average. Finally, priority metal values reported as less than a certain value were considered as not quantifiable, 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 nickel and cobalt production involves four 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.

#### RAW MATERIAL DUST CONTROL

Primary nickel and cobalt raw material, called matte, is crushed and ground prior to undergoing copper separation via a leaching process. Dust and particulates generated by the crushing and grinding operations may be controlled by a baghouse. Water is used to slurry the collected material in the baghouse and transport it to treatment. One plant reported generating this waste stream, as shown in Table V-1 (page 3848). This table shows water use and discharge rates for this waste stream.

Sampling data were collected on a combined process waste stream which included raw material dust control water. The sampling data are presented in Table V-5 (page 3852). The data presented show copper, nickel, and ammonia above treatable concentrations.

#### COBALT REDUCTION DECANT

When cobalt is reduced in a hydrogen autoclave from a cobalt-rich solution, excess solution, containing significant quantities of ammonium sulfate, is decanted. Although the one plant currently generating this waste stream does not discharge it by means of a by-product recovery operation, it may be discharged at some time in the future. The need to discharge this waste stream may result from poor marketability of the by-product or excessive cost of operating the recovery plant. Water use and discharge rates for cobalt reduction decant are shown in Table V-2 (page 3849).

No samples were taken of this waste stream; however, it is expected to have high concentrations of ammonia (as  $\mathrm{NH_4}^+$ ) and sulfate (as  $\mathrm{SO_4}^=$ ), along with treatable concentrations of priority metals, cobalt, and suspended solids.

#### NICKEL REDUCTION DECANT

When nickel is reduced in a hydrogen autoclave from a nickel-rich solution, the excess solution, containing significant quantities of ammonium sulfate, is decanted. Although the one plant currently generating this waste stream does not discharge it by means of a by-product recovery operation, it may be discharged at some time in the future. The need to discharge this waste stream may result from poor marketability of the by-product or excessive cost of operating the recovery plant. Water use and discharge rates for this waste stream are shown in Table V-3 (page 3850).

No samples were taken of this waste stream; however, it is expected to have high concentrations of ammonia (as  $\mathrm{NH_4}^+$ ) and sulfate (as  $\mathrm{SO_4}^-$ ), along with treatable concentrations of priority metals (principally nickel) and suspended solids.

#### NICKEL WASH WATER

After reducing primary nickel raw material to a powder in a hydrogen autoclave, the nickel may be washed with water. This produces a waste stream. One plant reported this waste stream, and Table V-4 (page 3851) presents its water use and discharge rates.

Sampling data were collected on a combined process waste stream which included nickel wash water. The sampling data are presented in Table V-5 (page 3852). The data show copper, nickel, and ammonia above treatable concentrations; several priority organics were detected.

# PRIMARY NICKEL AND COBALT SUBCATEGORY SECT - V

### TABLE V-1

### WATER USE AND DISCHAGRE RATES FOR

### RAW MATERIAL DUST CONTROL

(1/kkg of copper, nickel and cobalt in the crushed raw materials)

Plant <u>Code</u>	Percent Recycle or reuse	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1062	0	77	77

## PRIMARY NICKEL AND COBALT SUBCATEGORY SECT - V

### TABLE V-2

### WATER USE AND DISCHAGRE RATES FOR

### COBALT REDUCTION DECANT

(1/kkg of cobalt produced)

Plant Code	Percent Recycle or reuse		Production Normalized Water Use Flow	Production Normalized Discharge Flow
1062	100	1 .	21398	0

## PRIMARY NICKEL AND COBALT SUBCATEGORY SECT - V

### TABLE V-3

## WATER USE AND DISCHAGRE RATES FOR

### NICKEL REDUCTION DECANT

(1/kkg of nickel produced)

Plant Code	Percent Recycle or reuse	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1062	100	12695	. 0

## PRIMARY NICKEL AND COBALT SUBCATEGORY SECT - V

### TABLE V-4

### WATER USE AND DISCHAGRE RATES FOR

### NICKEL WASH WATER

(1/kkg of nickel powder washed)

Plant Percent Recycle Code or reuse	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1062 0	33.87	33.87

Table V-5

		Stream	Sample	Conc	entrations (mg/l)	 MARY
	Pollutant	Code	Typet	Source	Day 1 Day 2	
Toxic	Pollutants					NICKEL
1.	acenaphthene	367	6		ND	_
2.	acrolein	367	-1		ND	AND
3.	acrylonitrile	367	1		ND.	 COBALT
4.	benzene	367	1		*	_
5.	benzidine	367	6		ND	SUBO
6.	carbon tetrachloride	367	1		ND	CATE
7.	chlorobenzene	367	1		ND	SUBCATEGORY
8.	1,2,4-trichlorobenzene	367	6		ND	K
9.	hexachlorobenzene	367	6		ND	 SECT
10.	1,2-dichloroethane	367	1		ND.	CH
11.	1,1,1-trichloroethane	367	1.		ND	<<
12.		367	6		ND	 
13.	1,1-dichloroethane	367	1		ND	

Table V-5 (Continued)

Type   Toxic   Pollutants   Continued   Type   Source   Day 1   Day 2   Day		Pollutant	Stream	Sample	Conc	entratio	ns (mg/l)	Day 3
10x1c Pollutants (Continued)         14. 1,1,2-trichloroethane       367       1       ND         15. 1,1,2,2-tetrachloroethane       367       1       ND         16. chloroethane       367       1       ND         17. bis(chloromethyl)ether       367       1       ND         18. bis(2-chloroethyl)ether       367       1       ND         19. 2-chloroethyl vinyl ether       367       1       ND         20. 2-chloroaphthalene       367       6       ND         21. 2,4,6-trichlorophenol       367       6       ND         22. p-chloro-m-cresol       367       6       ND         23. chloroform       367       1       ND         24. 2-chlorophenol       367       6       ND         25. 1,2-dichlorobenzene       367       6       ND         26. 1,3-dichlorobenzene       367       6       ND			Code	Typet	Source			Day 3
15. 1,1,2,2-tetrachloroethane 367 1 ND  16. chloroethane 367 1 ND  17. bis(chloromethyl)ether 367 1 ND  18. bis(2-chloroethyl)ether 367 1 ND  19. 2-chloroethyl vinyl ether 367 1 ND  20. 2-chloronaphthalene 367 6 ND  21. 2,4,6-trichlorophenol 367 6 ND  22. p-chloro-m-cresol 367 6 ND  23. chloroform 367 1 ND  24. 2-chlorophenol 367 6 ND  25. 1,2-dichlorobenzene 367 6 ND	Toxi	c Pollutants (Continued)			•			•
16. chloroethane       367       1       ND         17. bis(chloromethyl)ether       367       1       ND         18. bis(2-chloroethyl)ether       367       1       ND         19. 2-chloroethyl vinyl ether       367       1       ND         20. 2-chloronaphthalene       367       6       ND         21. 2,4,6-trichlorophenol       367       6       ND         22. p-chloro-m-cresol       367       6       ND         23. chloroform       367       1       ND         24. 2-chlorophenol       367       6       ND         25. 1,2-dichlorobenzene       367       6       ND         26. 1,3-dichlorobenzene       367       6       ND	14.	1,1,2-trichloroethane	367	1		ND		NICKEL
17. bis(chloromethyl)ether 367 1 ND  18. bis(2-chloroethyl)ether 367 1 ND  19. 2-chloroethyl vinyl ether 367 1 ND  20. 2-chloronaphthalene 367 6 ND  21. 2,4,6-trichlorophenol 367 6 ND  22. p-chloro-m-cresol 367 6 ND  23. chloroform 367 1 ND  24. 2-chlorophenol 367 6 ND  25. 1,2-dichlorobenzene 367 6 ND	15.	1,1,2,2-tetrachloroethane	367	1		ND		-
17. bis(chloromethyl)ether       367       1       ND         18. bis(2-chloroethyl)ether       367       1       ND         19. 2-chloroethyl vinyl ether       367       1       ND         20. 2-chloronaphthalene       367       6       ND         21. 2,4,6-trichlorophenol       367       6       ND         22. p-chloro-m-cresol       367       6       ND         23. chloroform       367       1       ND         24. 2-chlorophenol       367       6       ND         25. 1,2-dichlorobenzene       367       6       ND         26. 1,3-dichlorobenzene       367       6       ND	16. 	chloroethane	367	1		ND		AND C
18. bis(2-chloroethyl)ether       367       1       ND         19. 2-chloroethyl vinyl ether       367       1       ND         20. 2-chloronaphthalene       367       6       ND         21. 2,4,6-trichlorophenol       367       6       ND         22. p-chloro-m-cresol       367       6       ND         23. chloroform       367       1       ND         24. 2-chlorophenol       367       6       ND         25. 1,2-dichlorobenzene       367       6       ND         26. 1,3-dichlorobenzene       367       6       ND	17.	bis(chloromethyl)ether	367	1				COBALT
19. 2-chloroethyl vinyl ether       367       1       ND         20. 2-chloronaphthalene       367       6       ND         21. 2,4,6-trichlorophenol       367       6       ND         22. p-chloro-m-cresol       367       6       ND         23. chloroform       367       1       ND         24. 2-chlorophenol       367       6       ND         25. 1,2-dichlorobenzene       367       6       ND         26. 1,3-dichlorobenzene       367       6       ND	18.	bis(2-chloroethyl)ether	367	1				_
20.       2-chloronaphthalene       367       6       ND         21.       2,4,6-trichlorophenol       367       6       ND         22.       p-chloro-m-cresol       367       6       ND         23.       chloroform       367       1       ND         24.       2-chlorophenol       367       6       ND         25.       1,2-dichlorobenzene       367       6       ND         26.       1,3-dichlorobenzene       367       6       ND	19.	2-chloroethyl vinyl ether	367	1				SUBC
21. 2,4,6-trichlorophenol       367       6       ND         22. p-chloro-m-cresol       367       6       ND         23. chloroform       367       1       ND         24. 2-chlorophenol       367       6       ND         25. 1,2-dichlorobenzene       367       6       ND         26. 1,3-dichlorobenzene       367       6       ND	20.	2-chloronaphthalene	367	6				CATE
22. p-chloro-m-cresol       367       6       ND         23. chloroform       367       1       ND         24. 2-chlorophenol       367       6       ND         25. 1,2-dichlorobenzene       367       6       ND         26. 1,3-dichlorobenzene       367       6       ND	21.	2,4,6-trichlorophenol	367	6				SUBCATEGORY
23. chloroform       367       1       ND         24. 2-chlorophenol       367       6       ND         25. 1,2-dichlorobenzene       367       6       ND         26. 1,3-dichlorobenzene       367       6       ND	22.	p-chloro-m-cresol	367	6			·	7
24. 2-chlorophenol       367       6       ND         25. 1,2-dichlorobenzene       367       6       ND         26. 1,3-dichlorobenzene       367       6       ND	23.	chloroform	367	1		."		SECT
25. 1,2-dichlorobenzene 367 6 ND 26. 1,3-dichlorobenzene 367	24.	2-chlorophenol	367	6		•		H CH
26. 1,3-dichlorobenzene	25.	1,2-dichlorobenzene						< <
ND ND	26.	1,3-dichlorobenzene						
27. 1,4-dichlorobenzene 367 6 ND	27.	I		e e				

## Table V-5 (Continued)

RAW	WASTEWATER	SAMPLING DA	IIA				ŀd
<u>Pollutant</u>	Stream Code	Sample Typet	Conce Source	ntrations Day 1	(mg/1) Day 2	Day 3	~
Toxic Pollutants (Continued)							NICKEL
28. 3,3'-dichlorobenzidine	367	6		ND			
29. 1,1-dichloroethylene	367	1		ND			AND
30. 1,2-trans-dichloroethylene	367	1		ND	-		CO
	367	6		ND	. •		COBALT
	367	1		ND			
	367	1 :		ND ·			BCA.
33. 1,3-dichloropropene	367	6		ND			SUBCATEGORY
34. 2,4-dimethylphenol				ND	•	•	DRY
35. 2,4-dinitrotoluene	367	6			•		
36. 2,6-dinitrotoluene	367	6		ND			H N
37. 1,2-diphenylhydrazine	367	6		ND			SECT
38. ethylbenzene	367	1		ND		•	۱ <
	367	6		ND		<u>.                                    </u>	
<ul><li>39. fluoranthene</li><li>40. 4-chlorophenyl phenyl ether</li></ul>	367	6		ND			

Table V-5 (Continued)

		All the second of the second o			*		
Pollutant		ream Samp ode Type	-	trations	(mg/1)		PRIM
Toxic Pollutants (Continued		<u>-/pc</u>	Source	Day 1	Day 2	Day 3	RIMARY
41. 4-bromophenyl phenyl	•	67 6		ND			NIC
42. bis(2-chloroisopropyl	ether 3	67 6		ND			CKEL
43. bis(2-choroethoxy)meth	nane 3	67 6	en e	ND		* * * * * * * * * * * * * * * * * * *	AND
44. methylene chloride	3	67 1		ND			
45. methyl chloride (chlor	omethane) 3	67 1		ND			COBALT
46. methyl bromide (bromom	nethane) 3(	57 1		ND			
47. bromoform (tribromomet	hane) 36	57 1		ND			BCA!
48. dichlorobromomethane	36	57 1		ND			SUBCATEGORY
49. trichlorofluoromethane	36	57 1		ND			RY
50. dichlorodifluoromethan	e 36	7 1		* *			70
51. chlorodibromomethane	36			ND			SECT
52. hexachlorobutadiene	36			ND			1.
53. hexachlorocyclopentadi				ND			<
54. isophorone	36	_		ND			
	, JU	7 6		ND			

Table V-5 (Continued)

		Stream Sample		Concentrations (mg/1)					
		Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	
	Toxic	Pollutants (Continued)							
	55.	naphthalene	367	6		ND			
	56.	nitrobenzene	367	6		ND			
	57.	2-nitrophenol	367	6		ND			
<i>(.</i> )	58.	4-nitrophenol	367	6		ND			
3856		2,4-dinitrophenol	367	6		ND			
	59.	4,6-dinitro-o-cresol	367	6		ND			
	60.	·	367	6		ND			
	61.	N-nitrosodimethylamine	367	6		ND			
	62.	N-nitrosodiphenylamine				ND			
	63.	N-nitrosodi-n-propylamine	367	6					
	64.	pentachlorophenol	367	6		ND			-
	65.	pheno1	367	6		ND			
	66.	bis(2-ethylhexyl) phthalate	367	6		.010			
	67.		367	6		ND			
	68.		367	6	- , .	ND		er en man	

Table V-5 (Continued)

<u>Pollutant</u>	Stream _Code	Sample Typet	Conc Source	entration Day 1	s (mg/1) Day 2	Day 3
Toxic Pollutants (Continued)				227 1	Day Z	Day 3 R
69. di-n-octyl phthalate	367	6		ND		NICKEL
70. diethyl phthalate	367	6	•	ND		X H L
71. dimethyl phthalate	367	6	· · · · · · · · ·	ND		AND
72. benzo(a)anthracene	367	6		ND		1
73. benzo(a)pyrene	367	6		ND		COBALT
74. benzo(b)fluoranthene	367	6		ND		នបា
75. benzo(k)fluoranthane	367	6		ND		SUBCATEGORY
76. chrysene	367	6		ND		EGO]
77. acenaphthylene	367	6		ND		RY
78. anthracene	367	6		ND		Ñ
79. benzo(ghi)perylene	367	6	·	ND		SECT
80. fluorene	367	6		ND		ı <b>⊲</b>
81. phenanthrene	367	6		ND		·
82. dibenzo(a,h)anthracene	367	6		ND	e e	

### Table V-5 (Continued)

						PRI
	Stream	Sample		entration		
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3RRY
Toxic Pollutants (Continued)						NICKEL
83. indeno (1,2,3-c,d)pyrene	367	6		ND		KEL
84. pyrene	367	6		ND		AND
85. tetrachloroethylene	367	1		ND		
86. toluene	367	1		*		COBALT
87. trichloroethylene	367	. 1		ND		
88. vinyl chloride (chloroethylene)	367	1		ND		JBCA
89. aldrin	367	6		ND		SUBCATEGORY
90. dieldrin	367	6		ND		DRY
91. chlordane	367	6		ND		70
92. 4,4'-DDT	367	6		ND		SECT
93. 4,4'-DDE	367	6		ND	•	i
94. 4,4'-DDD	367	6		ND		< <
95. alpha-endosulfan	367	6		ND		
96. beta-endosulfan	367	6		ND	e e	

Table V-5 (Continued)

Pollutant	Stream _Code	Sample	Conce	ntrations (mg/l	PRII
Toxic Pollutants (Continued)	Code	Typet	Source	Day 1 Day 2	Day 3 PRIMARY
97. endosulfan sulfate	367	6		ND	NICKEL
98. endrin	367	6		ND	KEL
99. endrin aldehyde	367	6	e de la Companya de l	ND	AND
100. heptachlor	367	6		ND	COH
101. heptachlor epoxide	367	6	•	ND	COBALT
102. alpha-BHC	367	6	e e e e e e e e e e e e e e e e e e e	ND ·	SUE
103. beta-BHC	367	6		ND	SUBCATEGORY
104. gamma-BHC	367	6		ND	EGOH
105. delta-BHC	367	6		ND	¥
106. PCB-1242 (b)	367	6		ND	Ω
107. PCB-1254 (b)	367	6		ND	SECT
108. PCB-1221 (b)	367	6		ND	₹
109. PCB-1232 (c)	367	6		ND	•

### Table V-5 (Continued)

Pollutant	Stream Code	Sample Typet	Concentrations (mg/1) Source Day 1 Day 2	Day 3
Toxic Pollutants (Continued)				NHO
110. PCB-1248 (c)	367	6	ND	NICKEL
111. PCB-1260 (c)	367	6	ND	AND
112. PCB-1016 (c)	367	6	ND	
113. toxaphene	367	. 6 .	ND	COBALT
114. antimony	367	6	0.019	
115. arsenic	367	6	<0.10	SUBCATEGORY
117. beryllium	367	6	0.001	\TEG
118. cadmium	367	6	0.007	ORY
119. chromium (total)	367	6	<0.05	•
120. copper	367	6	1.43	SECT
122. lead	367	6	<0.005	l ⊢
123. mercury	367	6	0.0002	<
	367	6	40.0	
124. nickel 125. selenium	367	6	0.18	

Table V-5 (Continued)

Pollutant	Stream Code	Sample Typet	Concentrations (mg/l) Source Day 1 Day 2 Da	PRIMAI
Toxic Pollutants (Continued)			Day 1 Day 2 Day 2	
126. silver	367	6	<0.001	NICKEL
127. thallium	367	6	<0.05	. –
128. zinc	367	6	0.377	AND
Nonconventional Pollutants		•		COBALT
Ammonia Nitrogen	367	6	440	LI
Chemical Oxygen Demand	367	6	69.0	SUBO
Cobalt	367	6	4.6	SUBCATEGORY
Phosphorus	367	6	<0,2	GOR
Conventional Pollutants				K
pH (standard units)	367	6	7.6	SECT
				1

†Sample Type Code: 1 - One-time graf

1 - One-time grab6 - 24-hour automatic composite

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

\*Less than 0.01 mg/l.

Table V-6
PRIMARY NICKEL AND COBALT SUBCATEGORY
TREATED PLANT EFFLUENT

	Stream	Sample	Conce	entration	s (mg/l)	
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	364	6		ND		NICKEL
2. acrolein	364	1		ND		
3. acrylonitrile	364	1		ND		AND
4. benzene	364	. 1		ND		COBALT
5. benzidine	364	6		ND		ALT
6. carbon tetrachloride	364	1		ND		FUS
7. chlorobenzene	364	1	, ·	ND		3CAT
8. 1,2,4-trichlorobenzene	364	6		ND		SUBCATEGORY
9. hexachlorobenzene	364	6		ND		ጸሃ
10. 1,2-dichloroethane	364	1		ND		ω.
	364	1		ND	<u>-</u>	SECT
	364	6		ND		! <b>&lt;</b>
12. hexachloroethane		i		ND		7
13. 1,1-dichloroethane	364			ND		
14. 1.1.2-trichloroethane	364	ı		1415	•	

Table V-6 (Continued)

		Stream	Co 1 -					
	<u>Pollutant</u>	Code	Sample Typet	Source	entrations Day 1		- To	PR
Toxio	Pollutants (Continued)	te Til			<u> </u>	Day 2	Day 3	PRIMARY
19.	2-chloroethyl vinyl ether	364	1		ND			
20.	2-chloronaphthalene	364	6		ND			NICKEL
21.	2,4,6-trichlorophenol	364	6		ND			
22.	p-chloro-m-cresol	364	6		ND			AND C
23.	chloroform	364	1		*			COBALT
24.	2-chlorophenol	364	6		ND			_
25.	1,2-dichlorobenzene	364	6		ND	e de la companya de l		SUBCATEGORY
26.	1,3-dichlorobenzene	364	6		ND			ATE
27.	1,4-dichlorobenzene	364	6		ND			30RY
28.	3,3'-dichlorobenzidine	364	6		ND			
29.	1,1-dichloroethylene	364			*			SECT
30.	1,2-trans-dichloroethylene	364	1	: 81	ND			H
31.	2,4-dichlorophenol	364	6					<
32.	1,2-dichloropropane	364	1		N D N D			

Table V-6 (Continued)

	•••				
	Pollutant	Stream Code	Sample Typet	Concentrations (mg Source Day 1 Day	PRIMARY  Day 3
Toxic	Pollutants (Continued)				NIC
33.	1,3-dichloropropene	364	1	ŊD	NICKEL
34.	2,4-dimethylphenol	364	6	ŊD	AND
35.	2,4-dinitrotoluene	364	6	ND	
36.	2,6-dinitrotoluene	364	6	ND.	COBALT
	1,2-diphenylhydrazine	364	6	ND	_
37.		364	1	ND	SUBCATEGORY
38.	ethylbenzene	364	6	ИD	ATE(
39.	fluoranthene	364	6	ŊD	jory
40.	4-chlorophenyl phenyl ether	·		ŊD	
41.	4-bromophenyl phenyl ether	364	6	,	Ω
42.	bis(2-chloroisopropyl)ether	364	6	ND	SECT
43.	bis(2-choroethoxy)methane	364	6	ND	I <
44.	methylene chloride	364	1	*	· •
45.	methyl chloride (chloromethane	364	1	ND	
46.	methyl bromide (bromomethane)	364	1	ND	

Table V-6 (Continued)

Pollutant	Stream Code	Sample	Conce		PRI	
Toxic Pollutants (Continued)	_code	Typet	Source	Day 1	Day 2	Day 3 PRIMARY
47. bromoform (tribromomethane)	364	. 1		ND		
48. dichlorobromomethane	364	1 m		ND		NICKEL
49. trichlorofluoromethane	364	1		ND		AND
50. dichlorodifluoromethane	364	1		N D	• • • •	
51. chlorodibromomethane	364	1	,	ND		COBALT
52. hexachlorobutadiene	364	6		ND	-	• -
53. hexachlorocyclopentadiene	364	6		ND		3CAT
54. isophorone	364	6		ND		SUBCATEGORY
55. naphthalene	364	6		ND		77
56. nitrobenzene	364	6	C	.025		N H
57. 2-nitrophenol	364	6		ND		SECT .
58. 4-nitrophenol	364	<b>6</b>		ND		₹
59. 2,4-dinitrophenol 60. 4.6-dinitro-o-cresol	364	6		ND		
60. 4,6-dinitro-o-cresol	364	6		ND		

Table V-6 (Continued)

	Stream Sample Concentrations					Day 2	PR
Pollutant	Code	<u>Typet</u>	Source	Day 1	Day 2	Day 3	PRIMARY
Toxic Pollutants (Continued)							
61. N-nitrosodimethylamine	364	6		ND			NICKEL
62. N-nitrosodiphenylamine	364	6		ND			
63. N-nitrosodi-n-propylamine	364	6		ND			AND
64. pentachlorophenol	364	<b>.</b> 6.		ND			COE
65. phenol	364	6		ND			COBALT
66. bis(2-ethylhexyl) phthalate	364	6		ND			SUE
67. butyl benzyl phthalate	364	6		*			SUBCATEGORY
68. di-n-butyl phthalate	364	6		ND			EGOF
69. di-n-octyl phthalate	364	6		ND	•		X
70. diethyl phthalate	364	6		ND			SI
71. dimethyl phthalate	364	6		ND			SECT
72. benzo(a)anthracene	364	6		ИD			I <
73. benzo(a)pyrene	364	` 6		ИД			
74. benzo(b)fluoranthene	364	6		ND		-	-

Table V-6 (Continued)

	Pollutant	Stream Code	Sample	Conce	ntrations		Day 3
Toxic	Pollutants (Continued)	<u> </u>	Typet	Source	Day 1	Day 2	Day 3 PRY
75.	benzo(k)fluoranthane	364	6		ND		NICKEL
76.	chrysene	364	6		ND		KEL
77.	acenaphthylene	364	6		N.D		AND
78.	anthracene	364	6		ND		COE
79.	benzo(ghi)perylene	364	6		ND		COBALT
80.	fluorene	364	6	•	ND		SUE
81.	phenanthrene	364	6		ND	÷	SUBCATEGORY
82.	dibenzo(a,h)anthracene	364	6		ND	· ·	EGOF
83.	indeno (1,2,3-c,d)pyrene	364	6		ND		ĸ
84.	pyrene	364	6		ND		S
85.	tetrachloroethylene	364	1.		ND		SECT
86.	toluene	364	1.		*		< ! <
87.	trichloroethylene	364	1		ND		
88.	vinyl chloride (chloroethylene)	364	. 1		ND	****	

Table V-6 (Continued)

		Stream	Sample		Concentrations (mg/1)				
	Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3RY		
Toxic	Pollutants (Continued)								
89.	aldrin	364	6		**		NICKEL		
90.	dieldrin	364	6		**		AND		
91.	chlordane	364	6		**				
92.	4,4'-DDT	364	·6 .	· -	**		COBALT		
93.	4,4'-DDE	364	6		**				
94.	4,4'-DDD	364	6		**		SUBCATEGORY		
95.	alpha-endosulfan	364	6		**		ATEG		
96.	beta-endosulfan	364	6		**		ORY		
97.	endosulfan sulfate	364	6		**				
98.	endrin	364	6		**		SECT		
99.	endrin aldehyde	364	6		**				
100.	heptachlor	364	6		**		<		
101.	heptachlor epoxide	364	6		**				
102.	alpha-BHC	364	6		**				

Table V-6 (Continued)

				the state of the s	
Pollutant	Stream <u>Code</u>	Sample Typet	Concentration Source Day 1	s (mg/l) Day 2	Day 3
Toxic Pollutants (Continued)				<u> </u>	Jay )
103. beta-BHC	364	6	**	<i>:</i>	
104. gamma-BHC	364	6	**		NICKEL
105. delta-BHC		6	· · · · · · · · · · · · · · · · · · ·		AND
106. PCB-1242 (b)	364	6.	**	e e e e e e e e e e e e e e e e e e e	
107. PCB-1254 (b)	364	6	**	•	COBALT
108. PCB-1221 (b)	364	6	**	* •	
109. PCB-1232 (c)	364	6	**		JBCA
110. PCB-1248 (c)	364	6	**	•	SUBCATEGORY
111. PCB-1260 (c)	364	6	**		ORY
112. PCB-1016 (c)	364	6	**		
113. toxaphene	364	6	**		SECT
114. antimony	364	6	<0.1	÷	i
115. arsenic	364	6	<0.1		< 4
117. beryllium	364	6	0.0018		
		<del>-</del>	0.0010	a.	•

Table V-6 (Continued)

	Stream	Sample	Concentrations (mg/1)				
<u>Pollutant</u>	Code	Typet	Source	Day 1	Day 2	Day 3	
Toxic Pollutants (Continued)							
118. cadmium	364	6	-	<0.001			
119. chromium (total)	364	6		<0.056			
120. copper	364	6	-	0.225		-	
122. lead	364	6		<0.005			
123. mercury	364	6		0.0033			
124. nickel	364	6		5.60			
125. selenium	364	6		0.15			
126. silver	364	6		<0.001			
127. thallium	364	6		<0.05			
128. zinc	364	6		0.067			
Nonconventional Pollutants						•	
Ammonia Nitrogen	364	Ó	,	500			
Chemical Oxygen Demand	364	6		56.0			

SUBCATEGORY

Table V-6 (Continued)

### PRIMARY NICKEL AND COBALT SUBCATEGORY TREATED PLANT EFFLUENT

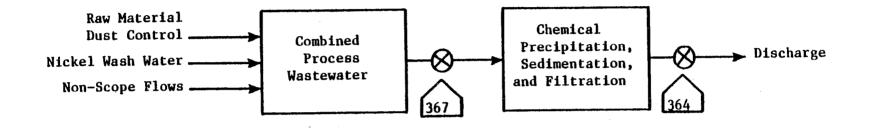
<u>Pollutant</u>	Stream Code	Sample Typet	Conce Source	ntrations Day 1	s (mg/1) Day 2	Day 3
Nonconventional Pollutants (Continued)		· .				N K
Cobalt	364	6		0.46		NICK
Phosphorus	364	6		<0.2		E
Conventional Pollutants		1			پيدسکتي د زيا مود د	AND
pH (standard units)	364	6		12.7		СОВА

tSample Type Code: 1 - One-time grab 6 - 24-hour automatic composite

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

\*Less than 0.01 mg/l.

\*\*Less than 0.005 mg/l.



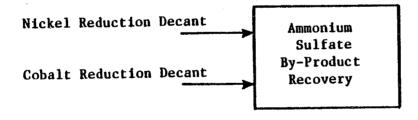


Figure V-1
SAMPLING SITES AT PRIMARY NICKEL AND COBALT PLANT A

#### SECTION VI

#### SELECTION OF POLLUTANTS

This section examines chemical analysis data presented in Section V and discusses the selection or exclusion of priority pollutants for potential limitation. Also, conventional and nonconventional pollutants are selected or excluded for limitation in this section. The basis for the regulation of toxic and other pollutants, along with a discussion of each pollutant selected for potential limitation, is discussed in Section VI of Vol. I. That discussion provides information about 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 priority pollutants for further consideration for limitations and standards. The data from wastewater samples are considered in this analysis. A combined wastewater sample was taken of the influent to treatment, which includes the two currently discharged process wastewater streams, and other non-scope streams. Priority pollutants will be selected for further consideration if they are present in concentrations treatable by the technologies considered in this analysis. In Sections IX through XII, a final selection of the pollutants to be limited will be made, based on relative factors.

#### CONVENTIONAL AND NONCONVENTIONAL POLLUTANT PARAMETERS SELECTED

This study examined samples one primary nickel and cobalt plant for two conventional pollutant parameters (TSS and pH) and two nonconventional pollutant parameters (ammonia and cobalt).

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

ammonia
cobalt
total suspended solids (TSS)
pH

Ammonia is used extensively throughout the primary nickel and cobalt manufacturing process. Two of the wastewater streams, nickel and cobalt reduction decants, contain very high concentrations of ammonia. Ammonia is selected for limitation in this subcategory because of its presence in high concentrations in the nickel and cobalt reduction decant streams.

Cobalt was observed in the one raw wastewater sample in this

subcategory at a concentration of 4.6 mg/l. This concentration is above the concentration considered achievable by treatment technology (0.034 mg/l), and cobalt is expected to be present in the raw wastewater as a result of raw materials used. For these reasons, cobalt is selected for regulation.

Although total suspended solids (TSS) was not analyzed for in this subcategory, it is selected for regulation. This is because TSS is expected to be present in the raw wastewater samples above treatable concentration (2.6 mg/l), and 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.

The pH value observed was 7.6. Although this pH value is within the 7.5 to 10.0 range considered desirable, effective removal of toxic metals by precipitation requires careful control of pH. Also, the combined waste stream may not accurately reflect the pH values of the raw waste streams which may be outside the desirable range. For these reasons, pH is selected for limitation in this subcategory.

#### TOXIC PRIORITY POLLUTANTS

The frequency of occurrence of the priority pollutants in the wastewater samples considered in this analysis is presented in Table VI-1 (page 3877). These data provide the basis for the categorization of specific pollutants, as discussed below. Table VI-1 is based on the raw wastewater sampling data from stream 367. Stream 364 was sampled after treatment and was not used in the frequency count.

#### TOXIC POLLUTANTS NEVER DETECTED

The priority pollutants listed in Table VI-2 (page 3881) were not detected in any wastewater samples from this subcategory. Therefore, they are not selected for consideration in establishing effluent limitations and standards.

TOXIC POLLUTANTS NEVER FOUND ABOVE THEIR ANALYTICAL QUANTIFICATION CONCENTRATION

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

- 4. benzene
- 86. toluene
- 114. antimony
- 115. arsenic
- 117. beryllium
- 119. chromium

#### PRIMARY NICKEL AND COBALT SUBCATEGORY SECT - VI

- 122. lead
- 126. silver
- 127. thallium

TOXIC POLLUTANTS PRESENT BELOW CONCENTRATIONS ACHIEVABLE BY TREATMENT

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

- 66. bis (2-ethylhexyl) phthalate
- 118. cadmium
- 123. mercury
- 125. selenium

Bis (2-ethylhexyl) phthalate was detected at its analytical quantification limit in the one sample analyzed. The observed concentration was 0.01 mg/l, and this is equal to the concentration achievable by treatment. Also, 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 these reasons, bis (2-ethylhexyl) phthalate was not selected for limitation.

Cadmium was detected above its analytical quantification limit in the one sample analyzed. The observed concentration was 0.007 mg/l. This value is below the concentration achievable by treatment (0.049 mg/l). Therefore, cadmium is not selected for limitation.

Mercury was detected above its analytical quantification limit in the one sample analyzed. The observed concentration was  $0.0002 \, \text{mg/l}$ . This value is below the concentration achievable by treatment (0.036 mg/l). Therefore, mercury is not selected for limitation.

Selenium was detected above its analytical quantification limit in the one sample analyzed. The observed concentration was 0.18 mg/l. This value is less than the treatable concentration (0.20 mg/l). Therefore, selenium is not selected for limitation.

## TOXIC POLLUTANTS SELECTED FOR FURTHER CONSIDERATION IN ESTABLISHING LIMITATIONS AND STANDARDS

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

- 120. copper
- 124. nickel

#### 122. zinc

Copper was detected above its treatable concentration (0.39 mg/l) in the one sample analyzed. The observed concentration was 1.43 mg/l. Since copper was present in a concentration exceeding the concentration achievable by identified treatment technology, it is selected for consideration for limitation.

Nickel was detected above its treatable concentration (0.22 mg/l) in the one sample analyzed. The observed concentration was 40.0 mg/l. Since nickel was present in a concentration exceeding the concentration achievable by identified treatment technology, it is selected for consideration for limitation.

Zinc was detected above its treatable concentration (0.23 mg/l) in the one sample analyzed. The observed concentration was 0.377 mg/l. Since zinc was present in a concentration exceeding the concentration achievable by identified treatment technology, it is selected for consideration for limitation.

# FREQUENCY OF OCCURRENCE OF PRIORITY POLLUTANTS PRIMARY NICKEL AND COBALT SUBCATEGORY RAW WASTEWATER

	<u>Pollutant</u>	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentra- tion (mg/l)(b)	Number of Streams Analyzed	Number of Samples Analyzed	<u>N</u> D	Detected Below Quantification Concentration	Detected Below Treat- able Concen- tration	Detected Above Treat- able Concen- tration	
	1. acenaphthene 2. acrolein	0.010	0.01	1	1	1			- CCGCTON	
	3. acrylonitrile	0.010	0.01	i	i	- ;				
	4. benzene	0.010	0.01	1 ,	i	i	•			
	5. benzidine	0.010 0.010	0.01	1	1	•	1			
	6. carbon tetrachloride	0.010	0.01	1	1	1	•			
	7. chlorobenzene	0.010	0.01 0.01		<u></u>	1	and a second second			
	8. 1,2,4-trichlorobenzene	0.010	0.01		1	1	,			
ມ ,	9. hexachlorobenzene	0.010	0.01	ď	. !	!	,			
ָן אָ	0. 1,2-dichloroethane	0.010	0.01	. 1	1	!				
7 1	1. 1,1,1-trichloroethane 2. hexachloroethane	0.010	0.01	i	ľ	- !				
ì	3. 1,1-dichloroethane	0.010	0.01	i	i	i				
	4. 1,1,2-trichloroethane	0.010	0.01	1	i	i				
	5. 1,1,2,2-tetrachloroethane	0.010 0.010	0.01	1	1	i			4	
1	6. chloroethane	0.010	0.01 0.01	!	1	İ				
1	7. bis(chloromethyl) ether	0.010	0.01	ļ	1	1				
!	8. bis(2-chloroethyl) ether	0.010	0.01		!	1				
	9. 2-chloroethyl vinyl ether	0.010	0.01		!	!				
. 2	0. 2-chloronaphthalene	0.010	0.01	i	i	-		· K		
2	1. 2,4,6-trichlorophenol 2. parachlorometa cresol	0.010	0.01	i	i	-		2		
	3. chloroform	0.010	0.01	1	i	i				
2	4. 2-chlorophenol	0.010 0.010	0.01	1 .	1	i	*	1		
2:	5. 1,2-dichlorobenzene	0.010	0.01	1	1	ĺ		•		
2	6. 1,3-dichlorobenzene	0.010	0.01 0.01	1	1	1		2	1	
2	7. 1,4-dichlorobenzene	0.010	0.01	!	!	1		•		
	3.3'-dichlorobenzidine	0.010	0.01	1	!	!				-
-	1,1-dichloroethylene	0.010	0.01	i	<u> </u>	!				
	0. 1,2-trans-dichloroethylene 1. 2,4-dichlorophenol	0.010	0.01	i	i	i	,			
32	1,2-dichloropropane	0.010	0.01	i	i	i				
33	1,3-dichloropropylene	0.010	0.01	1	1	i			*	•
34	2,4-dimethylphenol	0.010 0.010	0.01	1.	1	i				ł
	A - Lumina	. บ.บเบ	0.01	1	1	1				

SECT

# FREQUENCY OF OCCURRENCE OF PRIORITY POLLUTANTS PRIMARY NICKEL AND COBALT SUBCATEGORY RAW WASTEWATER

	<u>Pollutant</u>	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentra- tion (mg/l)(b)	Number of Streams Analyzed	Number of Samples Analyzed	ND	Detected Below Quantification Concentration	Detected Below Treat- able Concen- tration	Detected Above Treat- able Concen- tration
	35. 2,4-dinitrotoluene	0.010	0.01	1	1	1			
	36. 2,6-dinitrotoluene	0.010	0.01	1	1	1			
	37. 1,2-diphenylhydrazine	0.010	0.01	. 1	1	1			
	38. ethylbenzene	0.010	0.01			1		*	,
	39. fluoranthene	0.010	0.01	1	ļ	- ;			
	40. 4-chlorophenyl phenyl ether	0.010	0.01	!	!	- ;			
	41. 4-bromophenyl phenyl ether	_0.010	0.01	. !	1	. 1			
	42. bis(2-chloroisopropyl) ether	0.010	0.01	i	i	i			
ω	43. bis(2-chloroethoxy) methane	0.010	0.01 0.01	1	i	i			
00	44. methylene chloride	0.010 0.010	0.01	•	i	i	•		
78	45. methyl chloride	0.010	0.01	i	1	1			
ω	46. methyl bromide	0.010	0.01	1	1	1			
	47. bromoform 48. dichlorobromomethane	0.010	0.01	1	1	. !			
	49. trichlorofluoromethane	0.010	0.01	1	1	1			
	50. dichlorodifluoromethane	0.010	0.01	1	1	!			
	51. chlorodibromomethane	0.010	0.01	1 .	ļ	1			
	52. hexachlorobutadiene	0.010	0.01	!	!	- 1			
	53. hexachlorocyclopentadiene	0.010	0.01		1	i			
	54. isophorone	0.010	0.01 0.01	<b>'</b>	i	i		•	
	55. naphthalene	0.010	0.01	;	i	1			
	56. nitrobenzene	0.010 0.010	0.01	i	i	1			
	57. 2-nitrophenol	0.010	0.01	i	1	1			
-	58. 4-nitrophenol	0.010	0.01	1	1	1			
	59. 2,4-dinitrophenol 60. 4,6-dinitro-o-cresol	0.010	0.01	1	1	1			
	61. N-nitrosodimethylamine	0.010	0.01	1	!	1			
	62. N-nitrosodiphenylamine	0.010	0.01	1 .	]	1	•		
	63. N-nitrosodi-n-propylamine	0.010	0.01	1	1	1			
	64. pentachlorophenol	0.010	0.01	1	1				
	65. phenol	0.010	0.01	- 1	i	•			
	66. bis(2-ethylhexyl) phthalate	0.010	0.01	1		1.		see a	
	67. butyl benzyl phthalate	0.010	0.01	i	i	i			
	68. di-n-butyl phthalate	0.010	0.01	•	•	·			

### Table VI-1 (Continued)

# FREQUENCY OF OCCURRENCE OF PRIORITY POLLUTANTS PRIMARY NICKEL AND COBALT SUBCATEGORY RAW WASTEWATER

	<u>Pollutant</u>		Analytical Quantification Concentration (mg/l)(a)	Treatable Concentra- tion (mg/l)(b)		Number of Streams Analyzed	San	er of ples yzed	<u>ND</u>	Detected Below Quantification Concentration	Detected Below Treat- able Concen- tration	Detected Above Treat- able Concen- tration	
69	. di-n-octyl phthalate		0.010	0, 01		1	•	1	1				ָר בּירוּ
70	. diethyl phthalate		0.010	0.01		i.		1	- 1		9.00		7
	. dimethyl phthalate		0.010	0.01		i		i	i i				Ë
	. benzo(a)anthracene		0.010	0.01		i		1	i				
/3	. benzo(a)pyrene		0 <b>-</b> 010	0.01	ŧ ·		- S	i			والسابقي ثيران والماياتين	ستناشر بالماليا با	- AIV
74	. 3,4-benzofluoranthene		0.010	0.01		i .		i .	i		4.5		ŕ
/)	. benzo(k)fluoranthene		0.010	0.01		. 1		i	i			·	
	chrysene		0.010	0.01		1		i	i				. Č
	acenaphthylene		0.010	0.01		1 .		i	i				TTWGOO
	anthracene (c)		0.010	0.01		1		Ì	i		* 1		ĭ
79.	. benzo(gni)perylene . fluorene		0.010	0, 01		1		1	i		•	-	F
			0.010	0.01		· 1		İ	i				-
	phenanthrene (c)	•	0.010	0.01		1		1	i	•	9		Ū
83.	dlbenzo(a,h)anthracene		0.010	0.01		1		1	i				Č
84.	· · · · · · · · · · · · · · · · · · ·		0.010	0.01		1		1	i				SUBCATEGURY
	tetrachloroethylene		0.010	0.01		1	•	1	1				È
86.	toluene		0.010	0.01		1 '		l	1				H
87.			0.010	0.01		1		1					Ē
88.		2 N _	0.010	0.01		1	,		1 .			•	بخ
	aldrin		0.010	0.01		1		l	1				⊸≍
	dieldrin		0.005	0.01		1 .	1	}	1				ĸ
	chlordane		0.005	0, 01		1,			1		A STATE OF THE STA		
	4, 4'-DDF		0.005	0.01		1	1		1	•	* A - 0	•	
	4, 4' -DDE		0.005	0.01		1	. 1	·	· 1				
	4, 4'-DDD		0.005	0.01		1	1		1				SECT
95.			0. 005 0. 005	0.01		1	1		1				Ĉ
	beta-endosul fan		0.005	0.01		]	. 1		1				$\vdash$
97.			0.005	0.01		Į.	(		1				
	endrin		0.005	0.01	100	!	1		1			w *	1
99.			0.005	0.01		ļ	. !		1				٧H
100.	heptachlor		0.005	0.01	,	1	1		1				Н
101.	heptachlor epoxide		0.005	0.01		1	1		1	**	75		
102.	alpha-BIC		0.005	0.01		<u> </u>	1		1				
	beta-B(C		0.005	0.01		!	!		1	•			
			V. 003	0.01		1	1		1				

### Table VI-1 (Continued)

# FREQUENCY OF OCCURRENCE OF PRIORITY POLLUTANTS PRIMARY NICKEL AND COBALT SUBCATEGORY RAW WASTEWATER

<u>Pollutant</u>	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentra- tion (mg/l)(b)	Number of Streams Analyzed	Number of Samples Analyzed	ND	Detected Below Quantification Concentration	Detected Below Treat- able Concen- tration	Detected Above Treat- able Concen- tration
104. gamma-BHC 105. delta-BHC 106. PCB-1242 (d)	0.005 0.005 0.005	0.01 0.01 0.01	1 1 1	1 1 1	1 1			
107. PCB-1254 (d) 108. PCB-1221 (d) 109. PCB-1232 (e)	0.005 0.005 0.005	0.01 0.01 0.01	1 1 1	1 1	1			
110. PCB-1248 (e) 111. PCB-1260 (e) 112. PCB-1016 (e)	0.005 0.005 0.005	0.01 0.01 0.01	1 1 1	1 1	. 1 . 1	1		
113. toxaphene 114. antimony 115. arsenic	0.005 0.100 0.010	0.01 0.47 0.34	1 1. 1	1	'	1		
116. asbestos 117. beryllium 118. cadmium	10 MFL 0.010 0.002	10 MFL 0.20 0.049	1	1 1		1	1 -	
119. chromium 120. copper 121. cyanide	0.005 0.009 0.02	0.07 0.39 0.047 0.08	1 0 1	i 1		1	`	1
122. lead 123. mercury 124. nickel	0.020 0.0001 0.005	0.036 0.22 0.20	; 1 1	i 1 1			1	1
125. selenium 126. silver 127. thallium	0.01 0.02 0.100	0.07 0.34 0.23	1 1 1	i 1 1		1		1
128. zinc 129. 2,3,7,8-tetrachlorodibenzo- p-dioxin (TCDD)	0.050	<b>0.23</b>	. 0					

- (a) Analytical quantification concentration was reported with the data (see Section V).
- (b) Treatable concentrations for metals are based on performance of lime precipitation, sedimentation, and filtration; for organics, treatable concentrations are based on performance of activated carbon.
- (c), (d), (e) Reported together.

#### TABLE VI-2

### TOXIC POLLUTANTS NEVER DETECTED

- 1. acenaphthene
- 2. acrolein
- 3. acrylonitrile
- 5. benzidine
- 6. carbon tetrachloride (tetrachloromethane)
- 7. chlorobenzene
- 8. 1,2,4-trichlorobenzene
- 9. hexachlorobenzene
- 10. 1,2-dichloroethane
- 11. 1,1,1-trichloroethane
- 12. hexachloroethane
- 13. 1,1-dichloroethane
- 14. 1,1,2-trichloroethane
- 15. 1.1,2,2-tetrachloroethane
- 16. chloroethane
- 17. bis (chloromethyl) ether (deleted)
- 18. bis (2-chloroethyl) ether
- 19. 2-chloroethyl vinyl ether (mixed)
- 20. 2-chloronaphthalene
- 21. 4,6-trichlorophenol
- 22. parachlorometa cresol
- 23. chloroform (trichloromethane)
- 24. 2-chlorophenol
- 25. 1,2-dichlorobenzene
- 26. 1,3-dichlorobenzene
- 27. 1,4-dichlorobenzene
- 28. 3,3'-dichlorobenzidine
- 29. 1,1-dichloroethylene
- 30. 1,2-trans-dichloroethylene
- 31. 2,4-dichlorophenol
- 32. 1,2-dichloropropane
- 33. 1,2-dichloropropylene (1,3-dichloropropene)
- 34. 2,4-dimethylphenol
- 35. 2,4-dinitrotoluene
- 36. 2,6-dinitrotoluene
- 37. 1,2-diphenylhydrazine
- 38. ethylbenzene
- 39. fluoranthene
- 40. 4-chlorophenyl phenyl ether
- 41. 4-bromophenyl phenyl ether
- 42. bis(2-chloroisopropyl) ether
- 43. bis(2-choroethoxy) methane
- 44. methylene chloride (dichloromethane)
- 45. methyl chloride (chloromethane)
- 46. methyl bromide (bromomethane)
- 47. bromoform (tribromomethane)
- 48. dichlorobromomethane
- 49. trichlorofluoromethane (deleted)

### TABLE VI-2 (Continued)

### TOXIC POLLUTANTS NEVER DETECTED

dichlorodifluoromethane (deleted) 50. chlorodibromomethane 51. hexachlorobutadiene 52. hexachlorocyclopentadiene 53. 54. isophorone 55. naphthalene 56. nitrobenzene 57. 2-nitrophenol 4-nitrophenol 58. 2,6-dinitrophenol 59. 4,6-dinitro-o-cresol 60. N-nitrosodimethylamine 61. 62. N-nitrosodiphenylamine 63. N.nitrosodi-n-propylamine 64. pentachlorophenol phenol 65. 67. butyl benzyl phthalate di-n-butyl phthalate 68. 69. di-n-octyl phthalate diethyl phthalate 70. 71. dimethyl phthalate benzo (a)anthracene (1,2-benzanthracene) 72. benzo (a)pyrene (3,4-benzopyrene) 73. 3,4-benzofluoranthene 74. benzo(k)fluoranthane (11,12-benzofluoranthene) 75. 76. chrysene 77. acenaphthylene 78. anthracene benzo(ghi)perylene (1,11-benzoperylene) 79. fluorene 80. phenanthrene 81. dibenzo (a,h)anthracene (1,2,5,6-dibenzanthracene) 82. indeno (1,2,3-cd)pyrene (w,e,-o-phenylenepyrene) 83. pyrene 84. 85. tetrachloroethylene 87. trichloroethylene vinyl chloride (chloroethylene) 88. aldrin 89. dieldrin 90. chlordane (technical mixture and metabolites) 91. 4,4'-DDT 92. 93. 4,4 -DDE(p,p'DDX) 4,4'-DDD(p.p'TDE) 94. 95. Alpha-endosulfan Beta-endosulfan 96. 97. endosulfan sulfate 98. endrin 99. endrin aldehyde

### TABLE VI-2 (Continued)

### TOXIC POLLUTANTS NEVER DETECTED

- 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 (Fibrous)
- 121. cyanide\*
- 129. 2,3,7,8-tetra chlorodibenzo-p-dioxin (TCDD)

\*We did not analyze for this pollutant in samples of raw wastewater from this subcategory. This pollutant is not believed to be present based on the Agency's best engineering judgment which includes consideration of raw materials and process operations.

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### SECTION VII

### CONTROL AND TREATMENT TECHNOLOGIES

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

### CURRENT CONTROL AND TREATMENT PRACTICES

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 nickel and cobalt subcategory is characterized by the presence of the toxic pollutants and suspended solids. This analysis supported by raw (untreated) wastewater data presented for a combined waste stream in Section V. Generally, these pollutants present in each of the waste streams at concentrations, and these waste streams are commonly combined for treatment. Construction of one wastewater treatment system for combined treatment allows plants to take advantage of of scale and, in some instances, to combine streams of differing alkalinity to reduce treatment chemical requirements. The one plant in this subcategory currently has a combined wastewater treatment system, consisting of chemical precipitation, sedimentation, and filtration. 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.

#### RAW MATERIAL DUST CONTROL

Copper matte is crushed and ground as a preliminary step in the processing of primary nickel and cobalt. Dust and particulates generated by the crushing and grinding operations are controlled with a dry baghouse, and then slurried with water for transportation to treatment. One plant treats this waste stream as a combined wastewater with chemical precipitation, sedimentation, and filtration prior to direct discharge.

### COBALT REDUCTION DECANT

The excess solution from the cobalt reduction autoclave furnace is discharged, along with the nickel reduction decant, to a by-product recovery system. In by-product recovery, the ammonium

sulfate values are recovered in a fertilizer product. There is no wastewater treatment for this stream.

### NICKEL REDUCTION DECANT

The excess solution from the nickel reduction autoclave furnace is discharged to a by-product recovery system. In by-product recovery, the ammonium sulfate values are recovered in a fertilizer product. There is no wastewater treatment for this stream.

#### NICKEL WASH WATER

After reducing nickel to powder in a hydrogen furnace, the powder is washed with water. The wastewater produced here is combined with other wastes and treated using lime, settle, and filter technology described for the previous waste stream. Nickel wash water is discharged directly after treatment.

### CONTROL AND TREATMENT OPTIONS

The Agency examined two control and treatment technology options that are applicable to the primary nickel and cobalt subcategory. The options selected for evaluation represent a combination of preliminary treatment technologies applicable to individual waste screams and end-of-pipe treatment technologies. The effectiveness of these technologies is presented in Section VII of the General Development Document.

#### OPTION A

Option A for the primary nickel and cobalt subcategory requires control and treatment technologies to reduce the discharge of wastewater pollutant mass.

The Option A treatment scheme consists of ammonia steam stripping preliminary treatment to reduce the concentration of ammonia in selected streams, and chemical precipitation and sedimentation technology. Specifically, lime or some other alkaline compound is used to precipitate metal ions as metal hydroxides. The metal hydroxides and suspended solids settle out and the sludge is collected. Vacuum filtration is used to dewater sludge.

### OPTION C

Option C for the primary nickel and cobalt subcategory consists of all control and treatment requirements of Option A (ammonia steam stripping, 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, beyond the concentration attainable by gravity sedimentation. The filter suggested is of the gravity, mixed-media type, although other forms of filters, such as rapid sand filters or pressure filters would perform satisfactorily. The addition of filters also

# PRIMARY NICKEL AND COBALT SUBCATEGORY SECT - VII

provides consistent removal during periods of time in which there are rapid increases in flows or loadings of pollutants to the treatment system.

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### SECTION VIII

### COSTS, ENERGY AND NONWATER QUALITY ASPECTS

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

### TREATMENT OPTIONS FOR EXISTING SOURCES

As discussed in Section VII, two treatment options have been developed for existing primary nickel and cobalt sources. The treatment schemes for each option are summarized below and schematically presented in Figures X-1 and X-2 (pages 3916 and 3917).

#### OPTION A

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

### OPTION C

Option C consists of all control and treatment technology for Option A (ammonia steam stripping preliminary treatment, chemical precipitation and sedimentation) plus multimedia filtration technology added at 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 for the nonferrous metals manufacturing category have been revised as necessary following proposal. These revisions calculate incremental costs, above treatment already in place, necessary to comply with the promulgated effluent limitations and standards and are presented in the administrative record supporting this regulation. A comparison of the costs developed for proposal and the revised costs for the final regulation are presented in Table VIII-1 (page 3893) for the direct discharger.

Each of the general assumptions used to develop compliance costs is presented in Section VIII of the General Development Document. Each subcategory contains a unique set of waste streams requiring certain subcategory-specific assumptions to develop compliance costs. The major assumptions relevant to cost estimates for the primary nickel and cobalt subcategory are discussed briefly below.

- (1) Caustic is used instead of lime in chemical precipitation for this plant, because the one direct discharger in the subcategory currently uses caustic.
- (2) Raw material dust control wastewater is assumed to have a pH = 5 because of sulfides present, and a concentration of TSS = 12 mg/l. Nickel wash water is also assumed to have pH = 5 and a concentration of TSS = 12 mg/l.
- (3) Sampling data indicate that the raw material dust control and nickel wash waste streams contain treatable concentrations of ammonia. However, examination of the processes involved and correspondence with plant personnel indicate that the reported ammonia level is not due to the presence of ammonia in the process streams. Rather, ammonia enters the treatment system influent (sample number 367) through spills in the process areas. Consequently, these two process streams do not require ammonia steam stripping.

Revised direct discharge compliance cost estimates for subcategory reflect a correction in the treatment-in-place credit assumptions made at proposal. Plant 1062 presently operates chemical precipitation, sedimentation, and filtration, and treats wastewater consisting of combined nonferrous manufacturing Because wastewater and plant stormwater. stormwater is the major component of the wastewater, and because it is not in the scope of this regulation, compliance costing at proposal estimated the cost to segregate process wastewater and treat it in a separate treatment system. However, treatmentinplace credit for lime and settle was incorrectly attributed to plant; therefore, proposal costs did not accurately reflect the cost to the direct discharger for compliance with the proposed and promulgated rulemaking. EPA believes that the existing filter can continue to be used if a holding tank is installed after lime and settle treatment of raw material dust slurry water and nickel wash water. The costs for this holding tank are included in EPA's compliance cost estimate. The revised compliance cost estimates prepared for promulgation are presented in Table VIII-1.

### NONWATER QUALITY ASPECTS

Nonwater quality impacts specific to the primary nickel and cobalt subcategory, including energy requirements, solid waste and air pollution, are discussed below.

### **ENERGY REQUIREMENTS**

The methodology used for determining the energy requirements for the various options is discussed in Section VIII of the General Development Document. Energy requirements for the two options considered are estimated at 20,600 kwh/yr and 28,570 kwh/yr for Options A and C, respectively. Option C, which includes filtration, increases energy consumption over Option A by approximately 39 percent. Option C represents less than 1 percent of a typical plant's electrical energy usage. It is therefore concluded that the energy requirements of the treatment options considered will have no significant impact on total plant energy consumption.

### SOLID WASTE

Sludge generated in the primary nickel and cobalt subcategory is due to the precipitation of metal hydroxides and carbonates using lime or various other chemicals. Sludges associated with the primary nickel and cobalt subcategory will necessarily contain quantities of toxic metal pollutants. These sludges are not subject to regulation as hazardous wastes since wastes generated by primary smelters and refiners are currently exempt from regulation by Act of Congress (Resource Conservation and Recovery Act (RCRA), Section 3001(b)), as interpreted by EPA. If a small excess of lime is added during treatment, the Agency does not believe these sludges would be identified as hazardous under RCRA in any case. (Compliance costs include this amount of This judgment is based on the results of Extraction Procedure (EP) toxicity tests performed on similar sludges (toxic metalbearing sludges) generated by other categories 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 8261.24. Thus, the Agency believes that the wastewater sludges will similarly not be EP toxic if the recommended technology is applied.

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

If these wastes should be identified or are listed as hazardous, they will come within the scope of RCRA's "cradle to grave" hazardous waste management program, requiring regulation, from the point of generation to point of final disposition. EPA's gener-ator 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 treat-ment, 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 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.

Sludge generation for the primary nickel and cobalt subcategory is estimated at 10.41 metric tons per year when implementing the promulgated BPT technology. Sludge generation for promulgated BAT is not expected to be significantly different.

### AIR POLLUTION

There is no reason to believe that any substantial air pollution problems will result from implementation of ammonia steam stripping, 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.

# COST OF COMPLIANCE FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY DIRECT DISCHARGERS

(March, 1982 Dollars)

	Proposa	l Costs	Promulgation Costs		
<u>Option</u>	Capital Cost	Annual Cost	Capital Cost	Annual Cost	
A	31,075	20,053	71,400	27,200	
С	31,075	27,844	86,500	31,800	

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### 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). BPT reflects the existing performance by plants of various sizes, ages, and manufacturing processes within the primary nickel and cobalt subcategory, as well as the established performance of the recommended BPT systems. Particular consideration is given to the treatment already in place at plants within the data base.

The factors considered in identifying BPT include the total cost of applying the technology in relation to the effluent reduction benefits from such application, the age of equipment facilities involved, the manufacturing processes used, nonwater quality environmental impacts (including energy requirements), and other factors the Administrator considers appropriate. general, the BPT level represents the average of the existing performances of plants of various ages, sizes, processes, other common characteristics. Where existing performance 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 it will be capable of achieving the prescribed effluent limits 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 sampled and the wastewaters analyzed. In making technical assessments of data, reviewing manufacturing processes, assessing wastewater treatment technology options, both indirect 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 indirect. As explained in Section IV, the primary nickel and cobalt subcategory has been subdivided into four potential wastewater sources. Since the water use, discharge and pollutant characteristics of each wastewaters is potentially unique, effluent limitations will be developed for each of the four 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. Each process within the subcategory was then analyzed to determine which subdivisions were present, the specific flow rates generated for each subdivision, and the specific production normalized flows for each subdivision. This analysis is discussed in detail in Section V. Nonprocess wastewaters such as rainfall runoff and noncontact cooling water are not considered in the analysis.

Production normalized flows for each subdivision were then analyzed to determine the flow to be used as part of the basis for BPT mass limitations. The selected flow (sometimes referred to as a BPT regulatory flow or BPT discharge flow) 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) and a combination of reuse and recycle to reduce flow. Ammonia steam stripping is applied to streams with treatable concentrations of ammonia.

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 kilogram of production - mg/kg) are based on multiplying the BPT regulatory flow (1/kkg) by the concentration achievable by the BPT level of treatment technology (mg/l) for each pollutant parameter to be limited under BPT. These mass loadings are published in the Federal Register and in CFR Part 421 as the effluent limitations.

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 nickel and cobalt 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 pollutant removal estimates. EPA considers the volume and nature of existing discharges, the volume and nature of discharges expected after application of BPT, the general environmental effects of the pollutants, and the cost and economic impacts of the required pollution control level. The Act does not require or permit consideration of water quality problems attributable to particular point sources or industries, or water quality improvements in particular water quality bodies. Accordingly, water quality considerations were not the basis for selecting the proposed or promulgated BPT.

The methodology for calculating pollutant removal estimates and plant compliance costs is discussed in Section X. Table X-1 (page 3911) shows the pollutant removal estimates for each treatment option. Compliance costs are presented in Table X-2 (page 3912).

### BPT OPTION SELECTION

The technology basis for the proposed and promulgated BPT limitations is Option A, chemical precipitation and sedimentation technology to remove metals and solids from combined wastewaters and to control pH, and ammonia steam stripping to remove ammonia.

Chemical precipitation and sedimentation technology is already in-place in the subcategory. The pollutants specifically promulgated for regulation at BPT are copper, nickel, cobalt, ammonia, TSS, and pH.

Ammonia steam stripping is demonstrated at six 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, 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 with 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 raw untreated wastewater samples from the coke facility contained ammonia concentrations of 599, 226, 819, 502, 984, and 797 mg/l. Raw untreated wastewater samples from the primary nickel and cobalt subcategory should have ammonia concentrations on a similar order of magnitude.

The Agency has verified the promulgated 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.

In addition, data submitted by a primary columbium-tantalum plant, which also has significant raw ammonia levels, verifies the promulgated steam stripping performance values.

Implementation of the promulgated BPT limitations will remove annually an estimated 241 kg of toxic metals. The Agency projects capital and annual costs of \$71,400 and \$27,200 (1982 dollars), respectively for the discharging facility to achieve the promulgated BPT regulations. The BPT treatment configuration is presented in Figure IX-1 (page 3904).

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

### WASTEWATER DISCHARGE RATES

A BPT discharge rate is calculated for each subdivision based on the average of the flows of the existing plants, as determined from analysis of 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 four wastewater sources are discussed below and summarized in Table IX-1 (page 3901). 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 subdivision by plant in Tables V-1 through V-4.

### RAW MATERIAL DUST CONTROL

The BPT wastewater discharge rate used at proposal and promulgation for raw material dust control is 77 liters/kkg (18.5 gal/ton) of copper, nickel, and cobalt in the crushed raw material. This rate is allocated only for those plants which produce nickel and cobalt from an ore concentrate raw material and transport dust from the baghouse over the crushing and grinding operations with a water slurry system. Water use and wastewater discharge rates are presented in Table V-1 (page 3848). The BPT flow is based on the reported rate of 77 liters/kkg).

### COBALT REDUCTION DECANT

The BPT wastewater discharge rate used at proposal and promulgation for cobalt reduction decant is 21,398 liters/kkg (5.128 gal/ton) of cobalt produced. The BPT flow is based on the water use rate reported, as shown in Table V-2 (page 3849). This rate is allocated only for those plants which reduce cobalt from solution in a hydrogen autoclave, and decant excess solution.

#### NICKEL REDUCTION DECANT

The proposed and promulgated BPT wastewater discharge rate for nickel reduction decant is 12,695 liters/kkg (3,042 gal/ton) of nickel produced. The BPT flow is based on the water use rate reported by the only plant with this process waste stream, as shown in Table V-3 (page 3850). This rate is allocated only for those plants which reduce nickel from solution in a hydrogen autoclave, and decant excess solution.

### NICKEL WASH WATER

The proposed and promulgated BPT wastewater discharge rate for nickel wash water is 33.87 liters/kkg (8.12 gal/ton) of nickel powder washed. This rate is allocated only for those plants which produce nickel from primary sources via a hydrogen reduction autoclave, and then wash the product with water. Water use and wastewater discharge rates are presented in Table V-4 (page 3851). The BPT flow is based on the reported rate of 33.87 liters/kkg.

### REGULATED POLLUTANT PARAMETERS

The raw wastewater concentrations from individual operations and the subcategory as a whole were examined to select certain pollutant parameters for limitation. This examination and

evaluation was presented in Section VI. A total of six pollutants or pollutant parameters were selected for limitation under the promulgated BPT and are listed below:

120. copper
124. nickel
ammonia (as N)
cobalt
total suspended solids (TSS)
pH

### EFFLUENT LIMITATIONS

The pollutant concentrations achievable by application of the BPT technology are discussed in Section VII of this supplement. These achievable 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 (page 3902) for each individual waste stream.

SECT -

Table IX-1

BPT WASTEWATER DISCHARGE RATES FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

. <u>V</u>	Jastewater Stream	BPT Norm Discharg 1/kkg		Production Normalizing Parameter
1.	Raw Material Dust Control	77	18.5	Copper, nickel, and cobalt in the crushed raw material
2.	Cobalt Reduction Decant	21,398	5,128	Cobalt produced
3.	Nickel Reduction Decant	12,695	3.042	Nickel produced
4.	Nickel Wash Water	33.87	8.12	Nickel powder washed

### TABLE IX-2

# BPT MASS LIMITATIONS FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

# (a) Raw Material Dust Control BPT

Pollutant pollutant		Maximum for any one day	Maximum for monthly ave	
	mg/kg (lb/mi cobalt	llion lbs) of co in the crushed r	pper, nickel aw material	L, and
*Copper *Nickel Zinc *Ammonia *Cobalt *TSS *PH	Within	0.146 0.148 0.112 10.260 0.016 3.157 the range of 7.5	i to 10.0 at	0.077 0.098 0.047 4.512 0.007 1.502 all times

### (b) Cobalt Reduction Decant BPT

Pollutant pollutant		Maximum for any one day	Maximum for monthly average
	mg/kg (1)	o/million lbs) of	cobalt produced
*Copper *Nickel Zinc *Ammonia *Cobalt *TSS *pH	Withi	40.660 41.080 31.240 2,852.000 4.494 877.300 n the range of 7.	21.400 27.180 13.050 1,254.000 1.926 417.300 5 to 10.0 at all time

<sup>\*</sup>Regulated Pollutant

### TABLE IX-2 (Continued)

### BPT MASS LIMITATIONS FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

# (c) Nickel Reduction Decant BPT

Pollutant or pollutant property	Maximum for any one day	Maximum for monthly average
	(lb/million lbs) of	nickel produced
*Copper *Nickel Zinc *Ammonia *Cobalt *TSS *pH Wit	24.120 24.370 18.530 1,692.000 2.666 520.500 hin the range of 7.	12.700 16.120 7.744 743.900 1.143 247.600 5 to 10.0 at all times

# (d) Nickel Wash Water BPT

Pollutan pollutan	t or t prope	erty		imum one o		Maximum monthly		
	mg/kg	(lb/mi	llion	lbs)	of nic	ckel powde	r washed	
*Copper *Nickel Zinc *Ammonia				0. 0.	064 065 050		0.034 0.043 0.021	

4.515

0.007

1.389

Within the range of 7.5 to 10.0 at all times

1.985

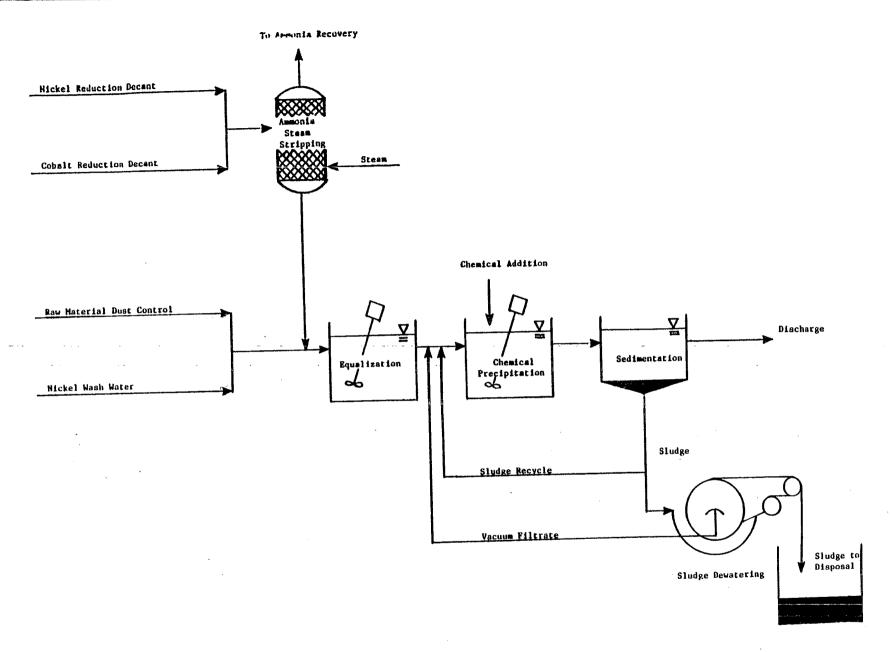
0.003

\*Cobalt

\*TSS

\*pH

<sup>\*</sup>Regulated Pollutant



3904

Figure IX-1

BPT TREATMENT SCHEME FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

#### SECTION X

#### BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE

These effluent limitations 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 from which it is 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. BAT represents the best available technology economically achievable at plants of various ages, sizes, processes, or other characteristics. Where the Agency has found the existing performance to be uniformly inadequate, BAT may be transferred from a different subcategory or category. BAT may include feasible process changes or internal controls, even when not in common industry practice.

The required assessment of BAT considers costs, but does not require a balancing of costs against pollutant removals However, in assessing the proposed and promulgated BAT the Agency has given substantial weight to the economic achievability of the technology.

### TECHNICAL APPROACH TO BAT

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

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

The treatment technologies considered for BAT are summarized below:

Option A (Figure X-1, page 3916) is based on:

- o Ammonia steam stripping preliminary treatment (where required)
- o Chemical precipitation and sedimentation

Option C (Figure X-2, page 3917) is based on:

- o Ammonia steam stripping preliminary treatment (where required)
- o Chemical precipitation and sedimentation
- o Multimedia filtration

The first option considered (Option A) is the same as the BPT treatment and control technology which was presented in the previous section. The second option represents substantial progress toward the reduction of pollutant discharges above and beyond the progress achievable by BPT.

#### OPTION A

Option A for the primary nickel and cobalt subcategory is equivalent to the control and treatment technologies which were analyzed for BPT in Section IX (see Figures IX-1 or X-1). The BPT end-of-pipe treatment scheme includes ammonia steam stripping pretreatment, chemical precipitation, and sedimentation. 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 nickel and cobalt subcategory consists of all control and treatment requirements of Option A (ammonia steam stripping, 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 forms of filters, such as rapid sand filters or pressure filters, would perform satisfactorily.

### INDUSTRY COST AND POLLUTANT REMOVAL ESTIMATES

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

### POLLUTANT REMOVAL ESTIMATES

A complete description of the methodology used to calculate the

pollutant removal, or benefit, achieved by application of the various treatment options is presented in Section X of Vol. I. In short, sampling data collected during field sampling program were used to characterize the major waste streams considered for regulation. At each facility the sampling data were 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, to estimate the mass of toxic pollutants generated within the primary nickel and cobalt subcategory. The pollutant removal estimates were calculated for each plant by first estimating the total mass of each pollutant in the untreated 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.

The volume of wastewater discharged after the application of each treatment option was estimated for each operation at each plant by comparing the actual discharge to the regulatory flow. The smaller of the two values was selected and summed with the other plant flows. The mass of pollutant discharged was then estimated by multiplying the achievable concentration values attainable with the option (mg/l) by the estimated volume of process wastewater discharged by the subcategory. The mass of pollutant removed is the difference between the estimated mass of pollutant generated within the subcategory and the mass of pollutant discharged after application of the treatment option. The pollutant removal estimates for direct dischargers in the primary nickel and cobalt subcategory are presented in Table X-l (page 3911). These pollutant removal estimates are equivalent to those presented at proposal.

### COMPLIANCE COSTS

In estimating subcategory-wide compliance costs, the first step was to develop a cost estimation model, relating the total costs associated with installation and operation of wastewater treatment technologies to plant process wastewater discharge. EPA applied the model to each plant. The plant's investment operating costs are determined by what treatment it has in place and by its individual process wastewater discharge flow. discussed above, this flow is either the actual or the regulatory flow, whichever is lesser. The final step was annualize the capital costs, and to sum the annualized capital costs, and the operating and maintenance costs for each plant, yielding the cost of compliance for the subcategory (see Table 3912). These costs were used in assessing economic X-2, page achievability.

### BAT OPTION SELECTION - PROPOSAL

EPA proposed BAT limitations for the primary nickel and cobalt subcategory based on Option C, preliminary treatment consisting of ammonia steam stripping followed by end-of-pipe treatment

consisting of chemical precipitation, sedimentation, and filtration. The pollutants specifically proposed for regulation under BAT were copper, nickel, ammonia, and cobalt.

Implementation of the proposed BAT limitations was estimated to remove 246 kilograms of priority metals annually. The projected capital and annual costs for the proposed BAT technology were estimated to be \$31,075 and \$27,844 (1982 dollars), respectively.

### BAT OPTION SELECTION - PROMULGATION

Our promulgated BAT limitations for this Subcategory are based on Option C, preliminary treatment of ammonia steam stripping followed by end-of-pipe treatment consisting of chemical precipitation and sedimentation (BPT technology), and filtration. Filters are presently utilized by the one plant in this subcategory.

We are promulgating filtration as part of the BAT technology because this technology is demonstrated in the primary nickel and cobalt subcategory (the one discharger in this subcategory presently has a filter, and a total of 25 facilities in eight nonferrous metals manufacturing subcategories currently have filters), and results in additional removals of toxic metals. In addition, filtration adds reliability to the treatment system by making it less susceptible to operator error and to sudden changes in raw wastewater flows and concentrations.

The pollutants specifically limited under BAT are cobalt, copper, nickel, and ammonia. The toxic pollutant zinc was also considered for regulation because it was found at treatable concentrations in the raw wastewaters from this subcategory. This pollutant was not selected for specific regulation because it will be effectively controlled when the regulated toxic metals are treated to the concentrations achievable by the model BAT technology.

Implementation of the promulgated BAT limitations would remove annually an estimated 246 kg of priority metals, which is 5 kg of toxic metals greater than the estimated BPT removal. The Agency projects capital and annual costs of \$86,500 and \$31,800 (1982 dollars), respectively for technology required to achieve the promulgated BAT regulations. The BAT treatment scheme is presented in Figure X-2.

### WASTEWATER DISCHARGE RATES

A BAT discharge rate was calculated for each subdivision based upon the flows of the existing plants, as determined from analysis of the data collection portfolios. The discharge rate is used with the achievable treatment concentrations to determine BAT effluent limitations. Since the discharge rate may be different for each wastewater source, separate production normalized discharge rates for each of the four wastewater sources were determined and are summarized in Table X-3 (page

3913). 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 X-3.

The BAT discharge rates reflect the flow reduction requirements of the selected BAT option. Since no flow reduction beyond the flow reduction practices of BPT is required for this subcategory, BAT discharge rates are identical to BPT discharge rates.

### REGULATED POLLUTANT PARAMETERS

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 three 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 promulgating effluent mass limitations only for those pollutants generated in the greatest quantities as shown by the pollutant removal estimates. The pollutants selected for specific limitation are listed below:

- 120. copper 124. nickel
  - cobalt

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

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

The toxic metal pollutants selected for specific limitation in the primary nickel and cobalt subcategory to control the discharges of toxic metal pollutants are copper and nickel. The

following toxic metal pollutant is excluded from limitation on the basis that it is effectively controlled by the limitations developed for copper and nickel:

### 128. zinc

The nonconventional pollutants ammonia and cobalt will be limited in the primary nickel and cobalt subcategory along with the priority pollutants nickel and copper. It is necessary to limit ammonia because the treatment technology used to control copper and nickel (chemical precipitation and sedimentation) does not remove ammonia. The priority metal pollutants copper and nickel, as well as the nonconventional metal pollutant cobalt, are specifically limited to ensure the control of the excluded priority metal pollutant. These pollutants are indicators of the performance of the treatment technology.

### EFFLUENT LIMITATIONS

The concentrations achievable by application of BAT are discussed in Section VII of this supplement. The treatable 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 (page 3914) for each waste stream.

Table X-1

POLLUTANT REMOVAL ESTIMATES FOR DIRECT DISCHARGERS
PRIMARY NICKEL AND COBALT SUBCATEGORY

<u>Pollutant</u>	Raw Waste (kg/yr)	Option A Discharge (kg/yr)	Option A Removed (kg/yr)	Option C Discharge (kg/yr)	Option C Removed (kg/yr)	
Antimony Arsenic Cadmium Chromium (Total) Copper Cyanide (Total)	0.11 0 0.04 0 8.58	0.11 0 0.04 0 3.47	0 0 0 0 5.11	0.11 0 0.04 0 2.34	0 0 0 0 6.24	
Lead Mercury Nickel Selenium Silver Thallium Zinc	0 0 239.96 1.08 0 0 2.26	0 0 4,43 1.08 0 0	0 0 235.53 0 0 0	0 0 1.32 1.08 0 0	0 0 0 238.64 0 0 0	
TOTAL PRIORITY POLLUTANTS	5 252.04	11.12	240.92	6.27	245.77	
Ammonia Cobalt	2,639.55 27.60	2,635.23 0.30	4.32 27.30	2,635.23 0.20	4.32 27.39	
TOTAL NONCONVENTIONALS	2,667.15	2,635.53	31.62	2,635.43	31.71	
TSS	71.98	71.87	0.11	15.57	56.41	
TOTAL CONVENTIONALS	71.98	71.87	0.11	15.57	56.41	
TOTAL POLLUTANTS	2,991.16	2,718.51	272,65	2,657.27	333.89	

Option A - Ammonia steam stripping, chemical precipitation, and sedimentation Option C - Ammonia steam stripping, chemical precipitation, sedimentation, and filtration

Table X-2 COST OF COMPLIANCE FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY DIRECT DISCHARGERS

(March, 1982 Dollars)

	Proposal Costs		Promulgation Costs	
Option	Capital Cost	Annual Cost	Capital Cost	Annual Cost
A	31,075	20,053	71,400	27,200
C	31,075	27,844	86,500	31,800

Table X-3

BAT WASTEWATER DISCHARGE RATES FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

<u> </u>	Jastewater Stream	BAT Norm Discharg 1/kkg		Production Normalizing Parameter
1.	Raw Material Dust Control	77	18.5	Copper, nickel, and cobalt in the crushed raw material
2.	Cobalt Reduction Decant	21,398	5,128	Cobalt produced
3.	Nickel Reduction Decant	12,695	3,042	Nickel produced
4.	Nickel Wash Water	33.87	8.12	Nickel powder washed

TABLE X-4 BAT MASS LIMITATIONS FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

# (a) Raw Material Dust Control BAT

Pollutant pollutant		Maximum for any one day	Maximum fo monthly av	
mg/kg	(lb/millio in	n lbs) of coppe the crushed raw	r, nickel, material	and cobalt
*Copper *Nickel Zinc *Ammonia *Cobalt		0.099 0.042 0.079 10.260 0.011		0.047 0.029 0.032 4.512 0.005
(b) Cobalt	Reduction	Decant BAT		
Pollutant pollutant		Maximum for any one day	Maximum fo monthly a	· ·
	mg/kg (lk	/million lbs) of	cobalt pro	duced
*Copper *Nickel Zinc		27.390 11.770 21.830	1,	13.050 7.917 8.987

2.996

1.498

\*Cobalt

<sup>\*</sup>Regulated Pollutant

### TABLE X-4 (Continued)

# BAT MASS LIMITATIONS FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

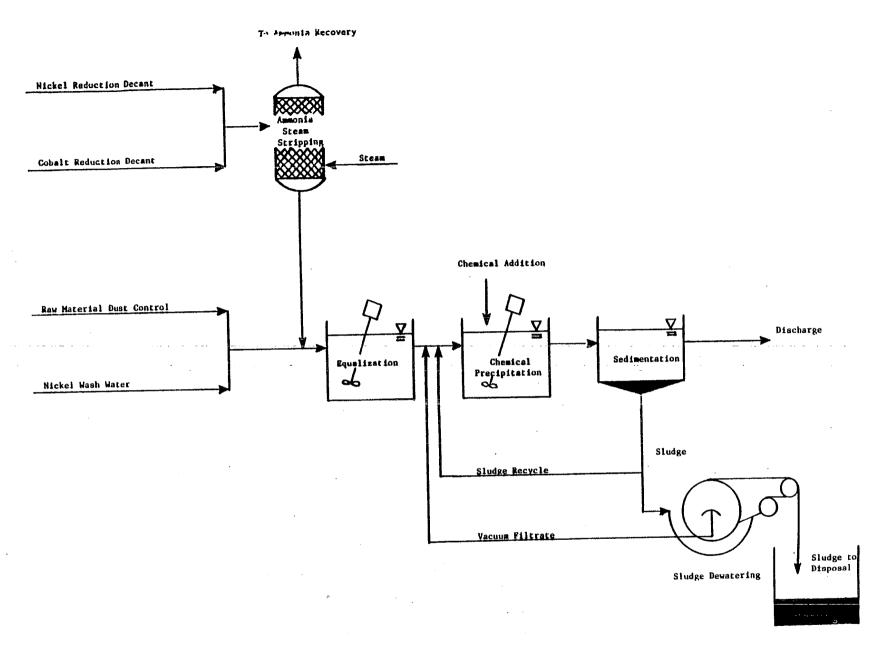
### (c) Nickel Reduction Decant BAT

Pollutant pollutant		Maximum for any one day	Maximum for monthly average	
	mg/kg	(lb/million lbs) of	nickel produced	
*Copper *Nickel Zinc *Ammonia *Cobalt		16.250 6.982 12.950 1,692.000 1.777	7.744 4.697 5.332 743.900 0.889	

### (d) Nickel Wash Water BAT

Pollutant pollutant		Maximum for any one day	Maximum for monthly average
η	ng/kg (lb/mi	llion lbs) of ni	ckel powder washed
*Copper *Nickel Zinc *Ammonia *Cobalt		0.043 0.019 0.035 4.515 0.005	0.021 0.013 0.014 1.985 0.002

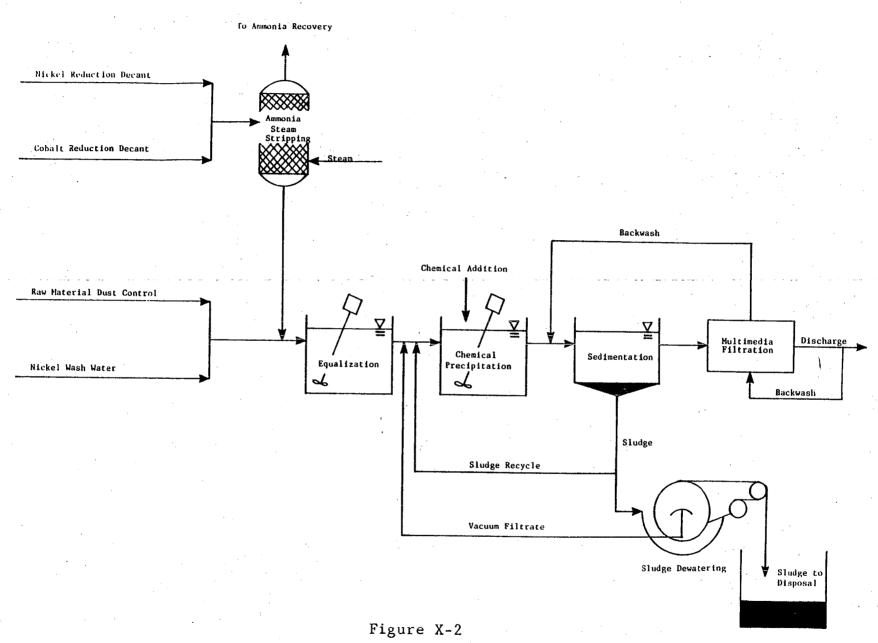
<sup>\*</sup>Regulated Pollutant



3916

Figure X-1
BAT TREATMENT SCHEME FOR OPTION A

PRIMARY NICKEL AND COBALT SUBCATEGORY



BAT TREATMENT SCHEME FOR OPTION C

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#### SECTION XI

### NEW SOURCE PERFORMANCE STANDARDS

The basis for new source performance standards (NSPS) 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, EPA has considered 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 regulated pollutants for NSPS in the primary nickel and cobalt 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 nickel and cobalt plants. This result is a consequence of careful review by the Agency of a wide range of technical options for new source treatment systems. 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 (page 3921).

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 (where required)
- Chemical precipitation and sedimentation

### OPTION C

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

### NSPS OPTION SELECTION - PROPOSAL

EPA proposed that the technology basis for NSPS be equal to that for BAT (preliminary treatment consisting of ammonia steam stripping, chemical precipitation, sedimentation, and filtration). The same pollutants were proposed for regulation at NSPS as at BAT, and the proposed wastewater discharge rates for NSPS were equivalent to those proposed for BAT.

# NSPS OPTION SELECTION - PROMULGATION

We are promulgating NSPS equal to BAT. We believe that new plants could not achieve any flow reduction beyond the allowances promulgated for BAT. Because NSPS is equal to BAT we believe that the promulgated 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 on the product of the appropriate treatable concentration (mg/l) and the production normalized wastewater discharge flows (l/kkg). The results of these calculations are the production-based new source performance standards. These standards are presented in Table XI-2 (page 3922).

Table XI-1

NSPS WASTEWATER DISCHARGE RATES FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

	Vastewater Stream	NSPS Norm Discharg 1/kkg	ge Rate	Production
		1/KKg	gal/ton	Normalizing Parameter
1.	Raw Material Dust Control	77	18.5	Copper, nickel, and cobalt in the crushed raw material
2.	Cobalt Reduction Decant	21,398	5,128	Cobalt produced
3.	Nickel Reduction Decant	12,695	3.042	Nickel produced
4.	Nickel Wash Water	33.87	8.12	Nickel powder washed

Table XI-2

NSPS FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

# (a) Raw Material Dust Control NSPS

Pollutant pollutant		Maximum for any one day	Maximum for monthly average
	mg/kg (lb/mi cobalt	illion lbs) of co in the crushed r	opper, nickel, and aw material
*Copper *Nickel Zinc *Ammonia *Cobalt *TSS *pH	Within	0.099 0.042 0.079 10.260 0.011 1.155 the range of 7.5	0.047 0.029 0.032 4.512 0.005 0.924 5 to 10.0 at all times

# (b) Cobalt Reduction Decant NSPS

Maximum for any one day	Maximum for monthly average
27.390 11.770 21.830 2,852.000 2.996	cobalt produced  13.050 7.917 8.987 1,254.000 1.498 256.800
	any one day nillion lbs) of  27.390 11.770 21.830 2,852.000 2.996

<sup>\*</sup>Regulated Pollutant

## PRIMARY NICKEL AND COBALT SUBCATEGORY SECT - XI

## TABLE XI-2 (Continued)

### NSPS FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

# (c) Nickel Reduction Decant NSPS

Pollutant pollutant	-	Maximum for any one day	Maximum for monthly average
	mg/kg (1b	/million lbs) of	nickel produced
*Copper *Nickel Zinc *Ammonia *Cobalt *TSS *pH	Within	16.250 6.982 12.950 1,692.000 1.777 190.400 the range of 7.	7.744 4.697 5.332 743.900 0.889 152.300 5 to 10.0 at all times

## (d) Nickel Wash Water NSPS

Pollutan pollutan	t or t property	Maximum for any one day	Maximum for monthly average
	mg/kg (lb,	/million lbs) of	nickel powder washed
*Copper *Nickel Zinc *Ammonia *Cobalt *TSS *pH	Wit	0.043 0.019 0.035 4.515 0.005 0.508 nin the range of	0.021 0.013 0.014 1.985 0.002 0.406 7.5 to 10.0 at all times

<sup>\*</sup>Regulated Pollutant

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#### SECTION XII

#### PRETREATMENT STANDARDS

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 requires pretreatment for pollutants, such as toxic metals, that limit POTW sludge management alternatives. 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 co ensure adequate treatment system installation. Pretreatment standards are to be technology based, analogous to the best available technology for removal of toxic pollutants.

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

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

#### TECHNICAL APPROACH TO PRETREATMENT

Before proposing and promulgating 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.

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

The Agency compares percentage removal rather than the mass or

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

#### PRETREATMENT STANDARDS FOR NEW SOURCES

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

A description of each option is presented in 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 options are:

#### OPTION A

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

#### OPTION C

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

#### PSNS OPTION SELECTION - PROPOSAL

EPA proposed the technology basis for PSNS equal to BAT (preliminary treatment consisting of ammonia steam stripping, chemical precipitation, sedimentation, and filtration). The same pollutants were proposed for regulation at PSNS as at BAT, and the proposed wastewater discharge rates for PSNS were equivalent to those proposed for BAT.

#### PSNS OPTION SELECTION - PROMULGATION

We are promulgating PSNS equal to BAT and NSPS for this subcategory. It is necessary to promulgate PSNS to prevent pass-through of copper, nickel, cobalt, and ammonia. These toxic pollutants are removed by a well-operated POTW at an average of 26 percent, while BAT technology removes approximately 58 percent.

The technology basis for PSNS thus is chemical precipitation and sedimentation, ammonia steam stripping, and filtration. The achievable concentration for ammonia steam stripping is based on iron and steel manufacturing category data, as explained in the discussion of BPT for this subcategory.

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

The PSNS discharge rates are shown in Table XII-1 (page 3928).

## 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 promulgate PSNS to prevent the pass-through of copper, nickel, ammonia, and cobalt.

## PRETREATMENT STANDARDS FOR NEW SOURCES

Pretreatment standards for new sources are based on the treatable concentrations from the selected treatment technology, (Option C), and the discharge rates determined in Sections X and XI for BAT and NSPS, respectively. 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 promulgated treatment (mg/l) and the production normalized wastewater discharge rate (l/kkg). The achievable treatment concentrations for PSNS are identical to those for BAT. PSNS are presented in Table XII-2 (page 3929).

Table XII-1

PSNS WASTEWATER DISCHARGE RATES FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

<b>G</b>	Jastewater Stream	PSNS Norm Discharg 1/kkg		Production Normalizing Parameter
1.	Raw Material Dust Control	77	18.5	Copper, nickel, and cobalt in the crushed raw material
2.	Cobalt Reduction Decant	21,398	5,128	Cobalt produced
3.	Nickel Reduction Decant	12,695	3,042	Nickel produced
4.	Nickel Wash Water	33,87	8.12	Nickel powder washed

TABLE XII-2
PSNS FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

## (a) Raw Material Dust Control PSNS

Pollutant pollutant	· ·	Maximum for any one day	Maximum for monthly average
		llion lbs) of co	opper, nickel, and caw material
*Copper *Nickel Zinc *Ammonia *Cobalt		0.099 0.042 0.079 10.260 0.011	0.047 0.029 0.032 4.512 0.005

# (b) Cobalt Reduction Decant PSNS

Pollutant pollutant		Maximum for any one day	Maximum for monthly average
· · · · · · · · · · · · · · · · · · ·	mg/kg (]	lb/million lbs) of	cobalt produced
*Copper		27.390	13.050
*Nickel		11.770	7.917
Zinc		21.830	8.987
*Ammonia		2,852.000	1,254.000
*Cobalt	•	2.996	1.498

<sup>\*</sup>Regulated Pollutant

# TABLE XII-2 (Continued)

# PSNS FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

# (c) Nickel Reduction Decant PSNS

Pollutant or pollutant property	Maximum for any one day	Maximum for monthly average
mg/kg (lb,	/million lbs) of	nickel produced
*Copper *Nickel Zinc *Ammonia *Cobalt	16.250 6.982 12.950 1,692.000 1.777	7.744 4.697 5.332 743.900 0.889
(d) <u>Nickel Wash Water</u> Pollutant or  pollutant property	PSNS  Maximum for any one day	Maximum for monthly average
mg/kg (lb/mi	0.043	ickel powder washed 0.021 0.013
*Nickel Zinc	0.019 0.035 4.515	0.014 1.985

<sup>\*</sup>Regulated Pollutant

#### SECTION XIII

## BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY

EPA is not promulgating best conventional pollutant control technology (BCT) for the primary nickel and cobalt subcategory at this time.

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## DEVELOPMENT DOCUMENT SUPPLEMENT

for the

Secondary Nickel Subcategory

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May 1989

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# TABLE OF CONTENTS

Section		Page
I	SUMMARY	3941
II	CONCLUSIONS	3943
III	SUBCATEGORY PROFILE	3947
		334/
	Description of Secondary Nickel Production Raw Materials	3947
•		3947
	Slag Reclamation	3947
	Acid Reclamation	3948
	Scrap Reclamation	3948
	Process Wastewater Sources	3948
	Other Wastewater Sources	3948
	Age, Production, and Process Profile	3948
IV	SUBCATEGORIZATION	3955
	Factors Considered in Subdividing the Secondary Nickel Subcategory	3955
	Other Factors	3956
	Production Normalizing Parameters	3956
<b>V</b> , ,	WATER USE AND WASTEWATER CHARACTERISTICS	3959
	Wastewater Flow Rates	20-0
	Wastewater Characteristics Data	3958
	Data Collection Portfolios	3958
	Field Sampling Data	3958
	Wastewater Characteristics and an	3959
*	Wastewater Characteristics and Flow by Subdivision	3960
	Slag Reclaim Tailings	3960
	Acid Reclaim Leaching Filtrate	
	Acid Reclaim Leaching Belt Filter Backwash	3960
	belt filter backwash	3960
AI .	SELECTION OF POLLUTANTS	3975
	Conventional and Nonconventional Pollutant	2055
	Parameters Selected	3975
v.*	Toxic Priority Pollutants	225
	Toxic Pollutants Never Detected	3976
	Toxic Pollutants Never Detected Toxic Pollutants Never Found Above Their	3976
	Analytical Ovantification Com	3976
	Analytical Quantification Concentration	
	Toxic Pollutants Selected for for Further	3976
	Consideration in Establishing Limitations and Standards	
	and otalicates	

# TABLE OF CONTENTS (Continued)

Section		Page
VII	CONTROL AND TREATMENT TECHNOLOGIES	3983
	Current Control and Treatment Practices Slag Reclaim Tailings Acid Reclaim Leaching Filtrate Acid Reclaim Leaching Belt Filter Backwash Control and Treatment Options Option A Option C	3983 3983 3984 3984 3984 3984
VIII	COSTS, ENERGY, AND NONWATER QUALITY ASPECTS	3985
	Treatment Options for Existing Sources Option A Option C Cost Methodology Nonwater Quality Aspects Energy Requirements Solid Waste Air Pollution	3985 3985 3985 3985 3986 3986 3986
IX	BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE	3991
x	BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE	3991
XI	NEW SOURCE PERFORMANCE STANDARDS	3993
	Technical Approach to NSPS Pollutant Removal Estimates Compliance Costs NSPS Option Selection - Proposal NSPS Option Selection - Promulgation Wastewater Discharge Rates Slag Reclaim Tailings Acid Reclaim Leaching Filtrate Acid Reclaim Leaching Belt Filter Backwash Regulated Pollutant Parameters New Source Performance Standards	3993 3995 3996 3996 3997 3997 3997 3997 3999

# TABLE OF CONTENTS (Continued)

Section		Page
XII	PRETREATMENT STANDARDS	4003
	Technical Approach to Pretreatment Industry Cost and Pollutant Removal Estimates Pretreatment Standards for Existing and New Sources	4003 4004 4004
	PSES Option Selection - Proposal PSES Option Selection - Promulgation PSNS Option Selection - Proposal PSNS Option Selection - Promulgation Pretreatment Standards	4004 4005 4005 4005 4006
XIII	BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY	4013

## LIST OF TABLES

<u>Table</u>	<u>Title</u>	Page
III-1	Initial Operating Year Summary of Plants in the Secondary Nickel Subcategory by Discharge Type	3950
III-2	Production Ranges for the Secondary Nickel Subcategory	3951
ıiı-3	Summary of Secondary Nickel Subcategory Processes and Associated Waste Streams	3952
V-1	Water Use and Discharge Rates for Slag Reclaim Tailings	3962
V-2	Water Use and Discharge Rates for Acid Reclaim Leaching Filtrate	3963
V-3	Water Use and Discharge Rates for Acid Reclaim Leaching Belt filter Removal	3964
V-4	Secondary Nickel Sampling Data Slag Reclaim Tailings Pond Influent Raw Wastewater Sampling Data	3965
<b>V</b> −5	Secondary Nickel Sampling Data Slag Reclaim Tailings Pond Effluent Raw Wastewater Sampling Data	3965
V-6	Secondary Nickel Sampling Data Acid Reclaim Leaching Filtrate Raw Wastewater Sampling Data	3970
<b>V-7</b>	Secondary Nickel Sampling Data Acid Reclaim Leaching Belt Filter Backwash Raw Wastewater Sampling Data	3972
VI-1	Frequency of Occurrence of Priority Pollutants Secondary Nickel Subcategory Raw Wastewater	3978
VI-2	Toxic Pollutants Never Detected	3979
vIII-1	Cost of Compliance for the Secondary Nickel Subcategory Indirect Dischargers	3989
xI-1	NSPS Wastewater Discharge Rates for the Secondary Nickel Subcategory	4000

# LIST OF TABLES (Continued)

Table	<u>Title</u>	Page
XI-2	NSPS for the Secondary Nickel Subcategory	4001
XII-1	Pollutant Removal Estimates for Indirect Dischargers in the Secondary Nickel Subcategory	4009
XII-2	Cost of Compliance for the Secondary Nickel Subcategory Indirect Dischargers	4010
XII-3	PSES and PSNS Wastewater Discharge Rates for the Secondary Nickel Subcategory	4011
XII-4	PSES for the Secondary Nickel Subcategory	4012
XII-5	PSNS for the Secondary Nickel Subcategory	4013

# LIST OF FIGURES

Figure	<u>Title</u>	Page
III-1	Secondary Nickel Manufacturing Processes	3953
III-2	Geographic Locations of Secondary Nickel Subcategory Plants	3954
V-1	Sampling Sites at Secondary Nickel Plant A	3974
XI-1	NSPS Treatment Scheme for Option A	4002
XI-2	NSPS Treatment Scheme for Option C	4003
XI-3	NSPS Treatment Scheme for Option C Without Filtration for Slag Reclaim Tailings	4004

#### SECTION I

#### SUMMARY

This document provides the technical basis for promulgating pretreatment standards for existing indirect dischargers (PSES), pretreatment standards for new indirect dischargers (PSNS), and standards of performance for new source direct dischargers (NSPS) for plants in the secondary nickel subcategory.

The secondary nickel subcategory consists of two plants. One of the two plants discharges to a publicly-owned treatment works, and one achieves zero discharge of process wastewater. There are no plants discharging directly to rivers, streams, or lakes.

EPA first studied the secondary nickel 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 the sources and volume of water used, the processes used, the sources of pollutants and wastewaters in the plant, and the constituents of wastewaters, including toxic pollutants. As a result, three subdivisions have been identified for this subcategory that warrant separate effluent limitations. These include:

- o Slag reclaim tailings,
- o Acid reclaim leaching filtrate, and
- o Acid reclaim leaching belt filter backwash.

Several distinct control and treatment technologies (both in plant and end-of-pipe) applicable to the secondary nickel subcategory were identified. 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 than 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, the number of potential closures, number of employees affected, and impact on price were estimated. These results are reported in a separate document entitled "The Economic Impact Analysis of Effluent Limitations and Standards

for the Nonferrous Metals Manufacturing Industry."

Because there are no direct dischargers in the secondary nickel subcategory, EPA is not promulgating BPT, BAT or BCT.

After examining the various treatment technologies, the Agency selected PSES to consist of metals removal based on chemical precipitation and sedimentation technology. Chemical precipitation and sedimentation technology represents the best existing technology in this subcategory. To meet the pretreatment standards for existing sources, the secondary nickel subcategory is estimated to incur a capital cost of \$320,100 and an annual cost of \$161,200.

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

For PSNS, the Agency selected end-of-pipe treatment equivalent to NSPS.

The best conventional technology (BCT) replaces BAT for the control of conventional pollutants. Although the methodology for BCT has not yet been finalized, BCT is not promulgated for this subcategory because there are no direct discharges.

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

#### SECTION II

#### CONCLUSIONS

EPA has divided the secondary nickel subcategory into three subdivisions or building blocks for the purpose of effluent limitations and standards. These subdivisions are:

- (a) Slag reclaim tailings,
- (b) Acid reclaim leaching filtrate, and
- (c) Acid reclaim leaching belt filter backwash.

BPT is not promulgated for this subcategory because there are no direct dischargers.

BAT is not promulgated because there are no direct dischargers.

NSPS are promulgated based on the performance achievable by the application of chemical precipitation and sedimentation technology (lime and settle). The following new source performance standards are promulgated:

### (a) Slag Reclaim Tailings NSPS

	P -			
Pollutant Pollutant Property	Maximum Any One		Maximum For nthly Average	· .
mg/kg (lb/million	lbs) of	slag input	to reclaim pr	ocess
Chromium (total) Copper Nickel TSS pH Within the r	5.65 24.43 24.67 526.80 ange of 7	10 70 00	2.313 12.850 16.320 250.500 at all times	

#### (b) Acid Reclaim Leaching Filtrate NSPS

Pollutant Pollutant Property	Maximum For Any One Day	
mg/kg (lb/million	lbs) of acid	d reclaim nickel produced
Chromium (total)	2.198	0.089
Copper	9.491	4.995
Nickel	9.590	6.344
TSS	214.800	87.400
pH Within the r	ange of 7.5 t	to 10.0 at all times

### (c) Acid Reclaim Leaching Belt Filter Backwash NSPS

Polluta Pollutant P		Maximum Any One			ximum Fo	
mg/kg	(lb/million	lbs) of	acid	reclaim	nickel	produced
Chromium (t Copper Nickel TSS pH	otal) Within the	0.5 2.2 2.3 49.1 range of	78 02 60	co 10.0 a	0.216 1.199 1.523 23.380 at all	times

PSES are promulgated based on the performance achievable by the application of chemical precipitation and sedimentation technology (lime and settle). The following pretreatment standards for existing sources are promulgated:

### (a) Slag Reclaim Tailings PSES

Pollutant	Maximum For	Maximum For
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/millio	on lbs) of slag	input to reclaim process
Chromium (total)	5.653	2.313
Copper	24.410	12.850
Nickel	24.670	16.320
(b) Acid Reclaim Lea	ching Filtrate	PSES
Pollutant	Maximum For	Maximum For

Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/million	lbs) of acid	reclaim nickel produced
Chromium (total) Copper Nickel	2.198 9.491 9.590	0.899 4.995 6.344

#### (c) Acid Reclaim Leaching Belt Filter Backwash PSES

Pollutant	Maximum For	Maximum For
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/million	lbs) of acid	reclaim nickel produced
Chromium (total)	0.528	0.216
Copper	2.278	1.199
Nickel	2.302	1.523
· ·		*

PSNS are promulgated based on the performance achievable by application of chemical precipitation and sedimentation (lime and settle). The following pretreatment standards for new sources are promulgated:

### (a) Slag Reclaim Tailings PSNS

Pollutant Pollutant Property	Maximum For Any One Day	Maximum For Monthly Average
mg/kg (lb/milli	on lbs) of slag	input to reclaim process
Chromium (total) Copper	5.653 24.410	2.313 12.850
Nickel	24.670	16.320

### (b) Acid Reclaim Leaching Filtrate PSNS

	Maximum Any On			kimum Fo hly Ave	
mg/kg (lb/million	lbs) o	f acid	reclaim	nickel	produced
Chromium (total) Copper Nickel		198 491 590		0.899 4.995 6.344	

## (c) Acid Reclaim Leaching Belt Filter Backwash PSNS

Pollutant	Maximum For	Maximum For
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/million lbs)	of acid reclaim	nickel produced
Chromium (total)	0.528	0.216
Copper	2.278	1.199
Nickel	2.302	1.523

BCT is not promulgated for this subcategory at this time.

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#### SECTION III

#### SUBCATEGORY PROFILE

This section of the secondary nickel supplement describes the raw materials and processes used in smelting and refining secondary nickel and presents a profile of the secondary nickel plants identified in this study.

#### DESCRIPTION OF SECONDARY NICKEL PRODUCTION

Secondary nickel production can be divided into three distinct operations -- slag reclamation. acid reclamation. and scrap reclamation. Slag reclamation is a wet mechanical granulation operation. Acid reclamation and scrap reclamation are hydrometallurgical refining processes. One plant in the U.S. reclaims nickel from slag and pickling acids, and a second plant reclaims nickel from scrap. Secondary nickel production processes are presented schematically in Figure III-1 (Page 3953) and described below.

#### RAW MATERIALS

Secondary nickel is reclaimed from three raw materials; nickel melt furnace slag. nickel carbonate produced from waste pickling acids and wastewater treatment sludges from nickel forming operations, and solid nickel scrap from other manufacturing operations. Nickel alloy scrap generated at steel mills may also be recycled within the mills however, no refining of the nickel scrap takes place prior to recycle and therefore, direct recycle of nickel scrap is not considered within this subcategory.

#### SLAG RECLAMATION

The objective of slag reclamation is to recover the nickel values from the dross or slag produced in nickel melt furnaces. When the nickel ingots are smelted in the presence of fluxing agents, the oxidized metals and impurities rise to the surface of the liquid metal and are removed from the furnace. This slag contains approximately 10 percent metallics.

The dross or slag is first air cooled and solidified, and then mechanically granulated with a jaw crusher and a wet rod mill. It is then fed onto a wet mineral jig, which uses specific gravity differences to recover a nickel concentrate product. The mineral jig is a shaking table. Large volumes of water wash over the crushed slag on the table carrying away the lighter (less dense) non-metallics. The denser, nickel-containing solids are the product. A large volume of tailings wastewater is produced. The nickel product is returned to the melt furnace and the wastewater is discharged.

#### ACID RECLAMATION

In the acid reclamation process, spent pickling acids and wastewater treatment sludges from nickel forming operations are introduced into a vessel with soda ash (Na<sub>2</sub>CO<sub>3</sub>) which precipitates the nickel as nickel carbonate. The impure nickel carbonate, which is separated from the liquid phase by filtration, is the raw material for the acid reclaim process.

Impure nickel carbonate is slurried with water to produce a homogeneous solution, and then roasted in an open hearth furnace to produce nickel oxide. The nickel oxide produced by roasting is then leached with water to remove impurities, and filtered. The leaching filtrate may be discharged as a waste stream. After filtering, the filter is backwashed and the backwash water may also be discharged as a waste stream. The nickel oxide product is approximately 35 percent nickel, and is returned to the nickel melting furnaces.

#### SCRAP RECLAMATION

Scrap resulting from the manufacture of nickel products may be recycled to recover the nickel values. The scrap is fed into a digestion unit with nitric acid and water. The acid removes silver and other impurities, and a 95 percent nickel product is either sold or returned to the manufacturing facility. The resultant solution, which contains significant silver values, is routed to a silver recovery process. The silver recovery process and resultant wastewater are covered by the regulations for secondary silver refining which is part of the nonferrous metals manufacturing category. There are no wastewater streams associated with nickel scrap reclamation which are within the scope of the secondary nickel subcategory.

#### PROCESS WASTEWATER SOURCES

Although a variety of processes are involved in secondary nickel production, the significant wastewater sources that are associated with the secondary nickel subcategory can be subdivided into the following building blocks:

- Slag reclaim tailings,
- 2. Acid reclaim leaching filtrate, and
- 3. Acid reclaim leaching belt filter backwash.

#### OTHER WASTEWATER SOURCES

There may be other wastewater streams associated with the secondary nickel subcategory. These streams include but are not limited to stormwater runoff, maintenance and cleanup water, and noncontact cooling water. These wastewater streams are not considered as a part of this rulemaking. EPA believes that the flows and pollutant loadings associated with these wastewaters are insignificant relative to waste streams selected and are best handled by the appropriate permit authority on a case-by-case

# SECONDARY NICKEL SUBCATEGORY SECT - III

basis under authority of Section 403 of the Clean Water Act.

AGE, PRODUCTION, AND PROCESS PROFILE

Figure III-2 (Page 3954) shows the locations of the two secondary nickel plants operating in the United States. Both are located east of the Mississippi River, near the industrial centers of western Pennsylvania.

Table III-1 (Page 3950) illustrates the relative age and discharge status of the secondary nickel plants in the United States. One plant was built in 1923, and the other was built in 1976.

From Table III-2 (Page 3951) it can be seen that of the two facilities which reclaim nickel, one plant reclaims between 500 and 1,000 tons per year, and the other less than 50 tons per year.

Table III-3 (Page 3952) provides a summary of the number of plants generating wastewater for the waste streams associated with the various processes and the number of plants with the process.

## TABLE III-1

INITIAL OPERATING YEAR SUMMARY OF PLANTS IN THE SECONDARY NICKEL SUBCATEGORY BY DISCHARGE TYPE

# Initial Operating Year (Plant Age in Years)

Type of Plant	1982- 1966 <u>(0-15)</u>	1965- 1946 (15-35)	1945- 1926 <u>(35-55)</u>	1925- 1906 <u>(55-75)</u>	<u>Total</u>
Direct	0	0	0	0	0
Indirect	0	0	0	1	1
Zero	1	: . <b>0</b>	0	0	1
Total	1.	0	. 0	1	2

TABLE III-2

# PRODUCTION RANGES FOR THE SECONDARY NICKEL SUBCATEGORY

Production Ranges for (Tons/Year)a		of Plants
0 - 50		1.,
50 - 100	en de la companya de la companya de la companya de la companya de la companya de la companya de la companya de La companya de la co	0
500 - 1,000		1
Total		2

(a) Based on production of reclaimed nickel

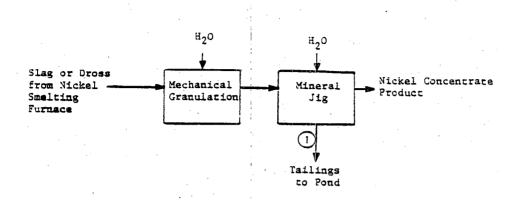
Table 111-3
SUMMARY OF SECONDARY NICKEL SUBCATEGORY PROCESSES AND ASSOCIATED WASTE STREAMS

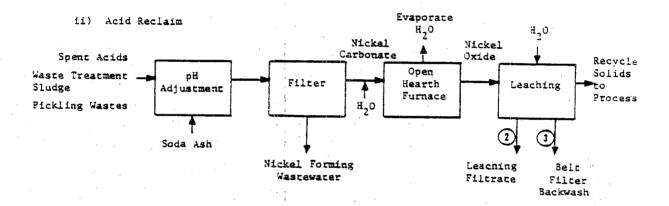
Process	Number of Plants With the Process	Number of Plants Reporting Generation of Wastewater*
Slag Reclaim	1	
Slag Reclaim Tailings	1	1
Acid Reclaim	1	1
Acid Reclaim Leaching Filtrate	·	
Acid Reclaim Belt Filter Backwash	. 1	<b>i</b>
Scrap Reclaim	1	•

3952

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

#### i) Slag Reclaim





#### iii) Scrap Reclaim

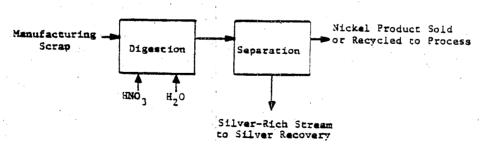


Figure III-1

SECONDARY NICKEL MANUFACTURING PROCESSES

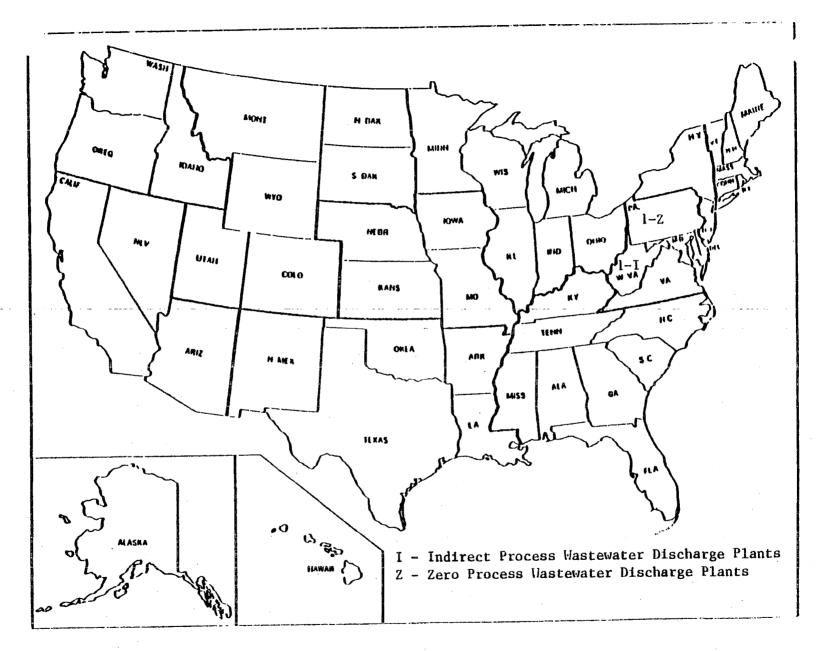


Figure III-2
GEOGRAPHIC LOCATIONS OF SECONDARY NICKEL SUBCATEGORY PLANTS

#### SECTION IV

#### SUBCATEGORIZATION

This section summarizes the factors considered during the designation of the subdivision of the secondary nickel subcategory. Production normalizing parameters for each subdivision are also discussed.

# FACTORS CONSIDERED IN SUBDIVIDING THE SECONDARY NICKEL SUBCATEGORY

The factors listed for general subcategorization were each evaluated when considering subdivision of the secondary nickel subcategory. In the discussion that follows, the factors will be described as they pertain to this particular subcategory.

The rationale for considering segmentation of the secondary nickel 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 secondary nickel is 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. Slag reclaim tailings,
- 2. Acid reclaim leaching filtrate, and
- 3. Acid reclaim leaching belt filter backwash.

These subdivisions follow directly from differences between the processing steps of secondary nickel production. Slag reclaim and acid reclaim both have various steps which generate wastewater.

Slag reclamation establishes the need for the first subdivision slag reclaim tailings. After crushing and milling the nickel rich slag, a nickel concentrate is separated from impurities with a wet mineral jig. This produces a tailings waste stream which is discharged.

Acid reclamation establishes the need for the second and third subdivisions — acid reclaim leaching filtrate, and acid reclaim leaching belt filter backwash. Spent pickling acids and wastewater treatment sludges are added to a tank containing soda ash in order to precipitate nickel as nickel carbonate. After filtration, the precipitate is slurried with water and roasted in an open hearth furnace in order to oxidize the nickel. The nickel oxide is leached with water to remove impurities and then filtered on a belt filter. The acid reclaim leaching filtrate is discharged as a waste stream. The belt filter is backwashed with

water, and the backwash water is also discharged as a waste stream.

## OTHER FACTORS

The other factors considered in this evaluation were shown to be inappropriate bases for further segmentation. Air pollution control methods, treatment costs, and total energy requirements are functions of the selected subcategorization factors -- metal product, raw materials, and production processes. 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 the basis for subdivision of the nonferrous metals subcategory.

# 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). The PNPs for the three subdivisions are as follows:

# Subdivision

PNP

1. Slag reclaim tailings

slag input to reclaim process

2. Acid reclaim leaching filtrate

acid reclaim nickel produced

3. Acid reclaim leaching belt filter acid reclaim nickel backwash

produced

At proposal the production normalizing parameter for reclaim tailings was the mass of slag reclaim nickel produced. Industry comments on the choice of PNP prompted EPA to consider other parameters. The industry comments included flow production information which allowed EPA to recalculate the production normalized flow. Based on the new information, concluded that the generation of slag reclaim tailings wastewater is more closely related to raw material input to the reclaim Therefore, for promulgation, the PNP for slag reclaim tailings has been changed to the quantity of slag input to the reclaim process.

#### SECTION V

#### WATER USE AND WASTEWATER CHARACTERISTICS

This section describes the characteristics of the wastewaters associated with the secondary nickel 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.

The two principal data sources used in the development of effluent limitations and standards for this subcategory are data collection portfolios and field sampling results. Data collection portfolios contain information regarding wastewater flows and production levels.

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

No additional sampling data for this subcategory were obtained from EPA sampling efforts or industry comments between proposal and promulgation. Characterization of secondary nickel subcategory wastewaters (Section V), and selection of pollutant parameters for limitation (Section VI) has been based on the same data used at proposal.

As described in Section IV of this supplement, the secondary nickel subcategory has been divided into three subdivisions, so that the promulgated regulation contains mass discharge limitations and standards for three 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. Slag reclaim tailings,
- 2. Acid reclaim leaching filtrate, and
- 3. Acid reclaim leaching belt filter backwash.

#### WASTEWATER FLOW RATES

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

The production normalized 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-3 (pages 3962 -3964). Where appropriate, an attempt was made to identify factors that could account for variations in water use. This information is summarized in this section. A similar analysis of factors affecting the wastewater values is presented in Sections XI and XII where representative NSPS and pretreatment discharge flows are selected for use in calculating the effluent limitations and standards.

#### WASTEWATER CHARACTERISTICS DATA

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

#### DATA COLLECTION PORTFOLIOS

In the data collection portfolios, plants were asked to indicate whether or not any of the priority pollutants were present in their effluent. The one discharging plant indicated that most toxic organic pollutants were believed to be absent from their effluent. The plant indicated that a few of the priority organic pollutants are believed to be present in its effluent. The plant stated that some of the priority metals were known to be present

#### SECONDARY NICKEL SUBCATEGORY SECT - V

in their effluent. The responses for the toxic metals are summarized below.

Pol1	<u>utant</u>	Known	Present	Believed	Present
Antimony Arsenic Beryllium Cadmium Chromium Copper Lead Mercury Nickel Selenium Silver Thallium Zinc			0 0 0 0 1 1 0 0 0 1 0		0 0 0 0 1 1 0 0 1 0 0

#### FIELD SAMPLING DATA

In order to quantify the concentrations of pollutants present in wastewater from secondary nickel plants, wastewater samples were collected at one plant. A diagram indicating the sampling sites and contributing production processes is shown in Figure V-1 (Page 3974).

The sampling data for the secondary nickel subcategory are presented in Tables V-4 through V-7 (pages 3965 - 3972). The stream codes displayed in Tables V.4 through V-7 may be used to identify the location of each of the samples on process flow diagrams in Figure V.1. Where no data are listed for a specific day of sampling, the wastewater samples for the stream were not collected.

The detection limits shown on the data tables 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.

The statistical analysis of data includes some samples measured at concentrations considered not quantifiable. Priority metal and conventional and nonconventional pollutant values reported as less than a certain value were considered as not quantifiable and a value of zero is used in the calculation of the average.

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 secondary nickel production involves three 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.

#### SLAG RECLAIM TAILINGS

Nickel is recovered from dross or slag generated in nickel smelting furnaces by a wet granulation operation. After recovering the nickel values from the granulated slag, the wet residue is discharged to a railings pond and the overflow from the tailings pond is discharged as a waste stream. One plant reported generating this waste stream, and its water use and discharge rates are presented in Table V-1 (Page 3962).

Sampling data for slag reclaim tailings is presented in Table V-4 (page 3965). This waste stream is characterized by the presence of treatable concentrations of arsenic, chromium, copper, nickel, suspended solids, and pH. Sampling data for tailings pond effluent is presented in Table V-5 (page 3967).

#### ACID RECLAIM LEACHING FILTRATE

After nickel is precipitated from waste pickling acids with sodium carbonate and roasted to produce nickel oxide, the nickel oxide is leached with water to remove impurities. The wet nickel oxide is dewatered on a belt filter and the filtrate is discarded. One plant reported generating this waste stream, and its water use and discharge rates are presented in Table V-2 (page 3963).

Sampling data for acid reclaim leaching belt filtrate is presented in Table V-6 (page 3970). This waste stream is characterized by the presence of treatable concentrations of chromium, copper, nickel, and suspended solids.

#### ACID RECLAIM LEACHING BELT FILTER BACKWASH

In the acid reclaim process, after the dewatered nickel oxide is scraped from the belt filter, the filter is backwashed with water and the backwash water may be discharged. One plant reported

# SECONDARY NICKEL SUBCATEGORY SECT - V

generating this waste stream, and its water use and discharge rates are presented in Table V-3 (page 3964).

Sampling data for acid reclaim leaching belt filter backwash is presented in Table V-7 (page 3972). This waste stream is characterized by the presence of treatable concentrations of chromium, copper, nickel, and suspended solids.

# SECONDARY NICKEL SUBCATEGORY SECT - V

TABLE V-1

# WATER USE AND DISCHARGE RATES FOR SLAG RECLAIM TAILINGS (1/kkg of slag input to reclaim process)

Plant Code	Percent Recycle or Reuse	Production Normalized <u>Water Use</u> Flow	Normalized <u>Discharge Flow</u>
1169	0	12,848	12,848

### TABLE V-2

# WATER USE AND DISCHARGE RATES FOR ACID RECLAIM LEACHING FILTRATE

(1/kkg of acid reclaim nickel produced)

	Recycle Reuse	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1169	0	4,995	4,995

#### TABLE V-3

# WATER USE AND DISCHARGE RATES FOR ACID RECLAIM LEACHING BELT FILTER BACKWASH

(1/kkg of acid reclaim nickel produced)

Plant Code	Percent Recycle or Reuse	: : :	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1169	0	1	1,199	1,199

Table V-4

# SECONDARY NICKEL SAMPLING DATA SLAG RECLAIM TAILINGS POND INFLUENT RAW WASTEWATER SAMPLING DATA

					:		$\Sigma$
	Pollutant	Stream Code	Sample Typet	Con Source	centration		- CO
Toxio	Pollutants		<u>- / pc   </u>	bource	Day 1	Day 2	SECOMBARY Day
114.	antimony	986	1	<0.002	<0.002	 -	
115.	arsenic	986	1	<0.005	0.93	,	NICKEL
117.	beryllium	986	1	<0.01	<0.02		
118.	cadmium	986	1	<0.05	<0.027		SUBCATEGORY
119.	chromium (total)	986	1	<0.10	5.35		EGOR
120.	copper	986	1	0.170	0.59		Ķ
121.	cyanide (total)	986	1	<0.02	<0.02		N E
122.	lead	986	1	<0.10	<0.2		SECT -
123.	mercury	986	1	<0.002	<0.002		<
124.	nickel	986	1	0.20	7.5	e e e e e e e e e e e e e e e e e e e	
125.	selenium	986	1	<0.01	<0.01		·
126.	silver	986	1	<0.002	<0.002		
127.	thallium	986	1	<0.005	<0.002		
128.	zinc	986	1	<0.05	0.15		

Table V-4 (Continued)

## SECONDARY NICKEL SAMPLING DATA SLAG RECLAIM TAILINGS POND INFLUENT RAW WASTEWATER SAMPLING DATA

<u>Pollutant</u>	Stream Code	Sample Typet	Concentrations (mg/1) Source Day 1 Day 2 Day 3
Nonconventional Pollutants			·
acidity	986	1	<1 <1 <1 CKE 61 9,000
alkalinity	986	1	
chloride	986	1	12 550 SUB
fluoride	986	1	0.43 22
sulfate	986	. 1	12 550 SUBCATEGORY 130 42 PEGORY
total solids (TS)	986	1	330 16,000
Conventional Pollutants			S E C C
oil and grease	986	1	<1 10 <sup>岩</sup>
total suspended solids (TSS)	986	1	22 16,000 <
pH (standard units)	986	1	6.64 11.38

†Sample Type Code: 1 - One-time grab

## SECONDARY NICKEL SAMPLING DATA SLAG RECLAIM TAILINGS POND EFFLUENT RAW WASTEWATER SAMPLING DATA

<u>Pollutant</u>	Stream _Code	Sample Typet	Con Source	centrations Day 1	(mg/l) Day 2	Day 3
Toxic Pollutants					<u> </u>	DAR
114. antimony	987	1	<0.002	<0.002	÷.	
115. arsenic	987		<0.005	0.290		NICKEL
117. beryllium	987	1	<0.01	<0.02		EDS
118. cadmium	987	1	<0.05	<0.02		SUBCATEGORY
119. chromium (total)	987	1	<0.10	0.170		EGOI
120. copper	987	1	0.170	27.0	4 	Ϋ́S
121. cyanide (total)	987	1	<0.02	<0.02		SI
122. lead	987	1	<0.10	<0.20		SECT
123. mercury	987	1	<0.002	<0.002		I <
124. nickel	987	1	0.20	0.10		
125. selenium	987	1	<0.01	<0.01		: :
126. silver	987	1	<0.002	<0.002		
127. thallium	987	1	<0.005	<0.002		
128. zinc	987	<b>1</b>	<0.05	<0.02		• • • • • • • • • • • • • • • • • • • •

# Table V-5 (Continued)

## SECONDARY NICKEL SAMPLING DATA SLAG RECLAIM TAILINGS POND EFFLUENT RAW WASTEWATER SAMPLING DATA

Pollutant	Stream <u>Code</u>	Sample Typet	Concentrations (mg/1) Source Day 1 Day 2 Day	SECONDARY
Nonconventional Pollutants				-
acidity	987	1	⟨1	NICKEL
alkalinity	987	1	61 880	KEL
chloride	987	1	12 25	SUB
fluoride	987	1	0.43 0.41	SUBCATEGORY
sulfate	987	1	130 18	3GOR
total solids (TS)	987	1	330 1,800	K
Conventional Pollutants	·			SECT
oil and grease	987	1	<1 12	I H
total suspended solids (TSS)	987	1 -	22 670	<
pH (standard units)	987	1	6.64 11.01	

tSample Type Code: 1 - One-time grab

WASTEWATER SAMPLING DATA

004

004

<0.005

<0.05

<0.002

0.26

127.

128.

thallium

zinc

Table V-6 (Continued)

## SECONDARY NICKEL SAMPLING DATA ACID RECLAIM LEACHING FILTRATE RAW WASTEWATER SAMPLING DATA

<u>Pollutant</u>	Stream Code	Sample Typet	Co Source	ncentration Day 1	s (mg/l) Day 2	Day 3
Nonconventional Pollutants				•		RY
acidity	004	1	<1	<1		NICKEL
alkalinity	004	1	61	52		KEL
chloride	004	1	12	68		SUB
fluoride	004	1	0.43	1.7	•	SUBCATEGORY
sulfate	004	1	130	1,000		IGOR
total solids (TS)	004	1	330	2,800		K
Conventional Pollutants						E SE
oil and grease	004	. 1 .	<1	10		
total suspended solids (TSS)	004	1	22	350		<
pH (standard units)	004	1	6.64	7.39	•	

tSample Type Code: 1 - One-time grab

# SECONDARY NICKEL SAMPLING DATA ACID RECLAIM LEACHING BELT FILTER BACKWASH RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample	Con	centration:		SECO:
Toxic Pollutants	Code	Typet	Source	Day 1	Day 2	Day 3 ONDARY
114. antimony	005	1	<0.002	0.004		
115. arsenic	005		<0.005	0.013		NICKEL
117. beryllium	005	1	<0.01	<0.02		н С
118. cadmium	005	1	<0.05	<0.02		SUBCATEGORY
119. chromium (total)	005	1	<0.10	0.88		∃GOR
120. copper	005	1	0.170	60.0		K
121. cyanide (total)	005	1	<0.02	<0.02		SECT
122. lead	005	1	<0.10	<0.2		C.F.
123. mercury	005	1. <b>1</b>	<0.002	<0.002		<
124. nickel	005	1	0.20	96.0		
125. selenium	005	1	<0.01	<0.01		
126. silver	005	ĭ	<0.002	0.008		
127. thallium	005	1	<0.005	<0.002		
128. zinc	005	1	<0.05	0.12		

3971

Table V-7 (Continued)

# SECONDARY NICKEL SAMPLING DATA ACID RECLAIM LEACHING BELT FILTER BACKWASH RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Typet	Concentrations (mg/l)  Source Day 1 Day 2 Day 3
Nonconventional Pollutants			RY
acidity	005	1	<1 <1 \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\
alkalinity	005	1	61 51 E
chloride	005	1	12 22
fluoride	005	1	0.43 1.7
sulfate	005	1	12 22 0.43 1.7 130 98
total solids (TS)	005	1	330 3,760
Conventional Pollutants			
oil and grease	005	1	<1 9
total suspended solids (TSS)	005	1	22 2,900
pH (standard units)	005	1	6.64 6.61

tSample Type Code: 1 - One-time grab

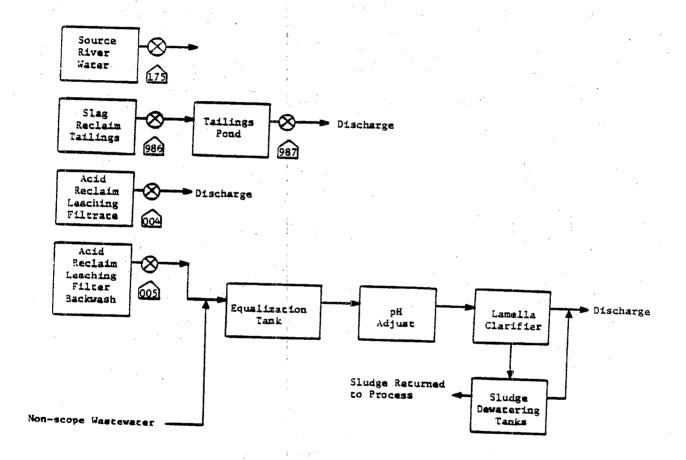


Figure V-1
SAMPLING SITES AT SECONDARY NICKEL PLANT A

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#### SECTION VI

#### SELECTION OF POLLUTANTS

This section examines chemical analysis presented in Section V and discusses the selection or exclusion of priority pollutants for potential limitation. Conventional and nonconventional pollutants are selected or excluded for regulation in this section. The basis for the selection of toxic and other pollutants, along with a discussion of each pollutant selected for potential limitation, is discussed in Section VI of Vol. I. That discussion provides information about 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 pollutants 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 priority pollutants for further consideration for limitations and standards. The data from three wastewater samples collected at one nickel plant were considered in this analysis. All samples are raw wastewater samples collected on one day at one of the plants. Pollutants will be selected for further consideration if they are present in concentrations treatable by the technologies considered in this analysis. In Sections IX through XII, a final selection of the pollutants to be limited will be made, based on relative factors.

#### CONVENTIONAL AND NONCONVENTIONAL POLLUTANT PARAMETERS SELECTED

This study examined samples from secondary nickel plants for conventional pollutant parameters (oil and grease, total suspended solids, and pH). The conventional and nonconventional pollutants or pollutant parameters selected for limitation in this subcategory are:

total suspended solids (TSS) pH

Total suspended solids (TSS) concentrations in the three samples ranged from 350 mg/l to 16,000 mg/l. All of the observed concentrations are above the 2.6 mg/l concentration considered achievable by identified treatment technology. Furthermore, most of the technologies used to remove toxic metals do so by converting these metals to precipitates. A limitation on total suspended solids ensures that sedimentation to remove precipitated toxic metals is effectively operating. For these reasons, total suspended solids is a pollutant parameter selected for limitation in this subcategory.

The pH values observed ranged from 6.6 to 11.4. Effective

removal of toxic metals by precipitation requires careful control of pH. Therefore pH is selected for limitation in this subcategory

### TOXIC PRIORITY POLLUTANTS

The frequency of occurrence of the toxic pollutants in the wastewater samples considered in this analysis is presented in Table VI-1 (Page 3978). These data provide the basis for the categorization of specific pollutants, as discussed below. Table VI-1 is based on the raw wastewater sampling data from streams 986.004. and 005. Stream 987 was sampled after settling and was not used in the frequency count.

## TOXIC POLLUTANTS NEVER DETECTED

The toxic pollutants listed in table VI-2 (page 3979) were not detected in any raw wastewater samples from this subcategory; therefore, they are not selected for consideration in establishing limitations:

# TOXIC POLLUTANTS NEVER FOUND ABOVE THEIR ANALYTICAL QUANTIFICATION CONCENTRATION

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

- 114. antimony
- 117. beryllium
- 118. cadmium
- 121. cyanide
- 122. lead
- 123. mercury
- 125. selenium
- 126. silver
- 127. thallium

# TOXIC POLLUTANTS SELECTED FOR FURTHER CONSIDERATION IN ESTABLISHING LIMITATIONS AND STANDARDS

The toxic pollutants selected for further consideration in establishing limitations and standards for this subcategory are listed below:

- 115. arsenic
- 119. chromium
- 120. copper
- 124. nickel
- 128. zinc

Arsenic was detected above its treatable concentration (0.34 mg/l) in one of three samples. The quantifiable concentrations

#### SECONDARY NICKEL SUBCATEGORY SECT - VI

ranged from 0.013 mg/l to 0.93 mg/l. Since arsenic was present in concentrations exceeding the concentration achievable by identified treatment technology, it is selected for consideration for limitation.

Chromium was detected above its treatable concentration (0.07 mg/l) in three of three samples. The quantifiable concentrations ranged from 0.88 mg/l to 5.35 mg/l. Since chromium was present in concentrations exceeding the concentration achievable by identified treatment technology, it is selected for consideration for limitation.

Copper was detected above its treatable concentration (0.39 mg/l) in three of three samples. The quantifiable concentrations ranged from 0.59 mg/l to 60 mg/l. Since copper was present in concentrations exceeding the concentration achievable by identified treatment technology, it is selected for consideration for limitation.

Nickel was detected above its treatable concentration (0.22 mg/l) in three of three samples. The quantifiable concentrations ranged from 7.5 mg/l to 96 mg/l. Since nickel was present in concentrations exceeding the concentration achievable by identified treatment technology, it is selected for consideration for limitation.

Zinc was detected above its treatable concentration (0.23 mg/l) in one of three samples. The quantifiable concentrations ranged from 0.12 mg/l to 0.26 mg/l. Since zinc was present in concentrations exceeding the concentration achievable by identified treatment technology, it is selected for consideration for limitation.

Table VI-1

# FREQUENCY OF OCCURRENCE OF PRIORITY POLLUTANTS SECONDARY NICKEL SUBCATEGORY RAW WASTEWATER

Pollut	<u>ant</u>	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentration (mg/1)(b)	Number of Streams Analyzed	Number of Samples Analyzed	Not Detected	Detected Below Quantification Concentration	Detected Below Treatable Concentration	MECONDARIAN MECONDARIAN METON MET
T 1 .2 1	ant Livony	0, 100 0, 010	0.47 0.34	3 3	3 3		3 0	0 2	0 CKEL
	arsenic beryllium	0,010	0.20	<b>3</b>			3	U	
	cadmium	0.002	0.049	3	3		3	'n	3 0
	chronium	0.005	0.07	3	3		n .	0	SUBCATEGORY
•	copper	0.009	0. 39	3	3		. 3	ŏ	ō α
121.	cyanide (c)	0.02	0.047	. 3	.3		3	Õ	υ <del>Σ</del>
122.	lead	0.020	0.08	) )	3		3	0	υ H
123.	gercury	0.0001	0.036 0.22	3	. 3		Ö	0	3 ក <u></u> ៉ី
124.	nickel	0.005	0. 22 0. 20	3	3 .		3 .	U	0 ဋ
125.	selenium	0. 0i	0. 23	3	ž		3	0	0 🔀
126.	ailver	0, 02 0, 100	0.34	3	· 3		3	0	0
127.	thallium	0. 050	0. 23	3	3		0	2	1
128.	zinc	5.0	10.0	3	3		0	3	0
	oil and grease total suspended solids (TSS		2.6	3	3		Û		SEC

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

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

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

#### TABLE VI-2

#### TOXIC POLLUTANTS NEVER DETECTED

acenaphthene\* 2. acrolein\* 3. acrylonitrile\* 4. benzene\* 5. benzedine\* 6. carbon tetrachloride (tetrachloromethane)\* 7. chlorobenzene\* 8. 1,2,4-thrichlorobenzene\* 9. hexachlorobenzene\* 10. 1,2,-dichloroethane\* 11. 1,1,1,-thrichloroethane\* 12. hexachloroethane\* 13. 1,1-dichloroethane\* 14. 1,1,2-thrichloroethane\* 15. 1,1,2-tetrachloroethane\* 16. chloroethane\* 17. bis (chloromethyl) ether (deleted)\* 18. bis (2-chloroethyl) ether\* 2-chloroethyl vinyl ether (mixed)\* 19. 20. 2-chloronaphthalene\* 21. 2,4,6-trichlorophenol\* 22. para-chloro meta-cresol\* 23. chloroform (trichloromethane)\* 24. 2-chlorophenol\* 25. 1,2-dichlorobenzene\* 26. 1,3-dichlorobenzene\* 27. 1,4-dichlorobenzene\* 28. 3,3-dichlorobenzidine\* 29. 1,1-dichloroethylene\* 30. 1,2-trans-dichloroethylene\* 31. 2,4-dichlorophenol\* 32. 1,2-dichloropropane\* 33. 1,3-dichloropropylene (1,3-dichloropropene)\* 34. 2,4-dimerhylphenol\* 35. 2,4-dinitrotoluene\* 36. 2,6-dinitrotoluene\* 37. 1,2-diphenylhydrazine\* 38. ethylbenzene\* 39. fluoranrhene\* 40. 4-chlorophenyl phenyl ether\* 41. 4-bromophenyl phenyl ether\* 42. bis (2-chloroisopropyl) ether\* 43. bis (2-chloroethoxy) methane\* 44 methylene chloride (dichloromethane)\* 45. methyl chloride (chloromethane)\* 46. methyl bromide (bromomethane)\* 47. bromoform (tribromomethane)\* 48. dichlorobromomethane\* 49.

trichlorofluoromethane (deleted)\*

#### TABLE VI-2 (Continued)

#### TOXIC POLLUTANTS NEVER DETECTED

dichlorodifluoromethane (deleted)\* 50. chlorodibromomerhane\* 51. hexachlorobutadiene\* 52. hexachlorocyclopenradiene\* 53. isophorone\* 54. 55. naphthalene\* 56. nitrobenzene\* 2-nitrophenol\* 57. 4-nitrophenol\* 58. 59. 2,4-dinitrophenol\* 4,5-dinirro-o-cresol\* 60. N-nitrosodimethylamine\* 61. N-nitrosodiphenylamine\* 62. N-nitrosodi-n-propylamine\* 63. pentachlorophenol\* 64. 65. phenol\* bis (2-ethylhexyl) phthalate\* 66. buryl benzyl phthalate\* 67. di-n-butyl phthalate\* 68. di-n-octyl phthalate\* 69. diethyl phthalate\* 70. dimethyl phthalare\* 71. benzo (a) anthracene (1,2-benzanthracene)\* 72. benzo (a) pyrene (3,4-benzopyrene)\* 73. 3,4-benzofluoranthene\* 74. benzo (k) fluoranthene\* 75. chrysene\* 76. acenaphthylene\* 77. anthracene\* 78. benzo (ghi) perylene (1,12-benzoperylene)\* 79. fluorene\* 80. phenanthrene\* 81. dibenzo (a,h) anthracene (1,2 5,o-dibenzanthracene)\* 82. ideno (1,2,3-cd) pyrene (2,3,-o-phenylenepyrene)\* 83. pyrene\* 84. tetrachloroethylene\* 85. 86. roluene. trichloroethylene\* 87. vinyl chloride (chloroethylene)\* 88. 89. aldrin\* dieldrin\* 90. chlordan'e (technical mixture and metabclites)\* 91. 4,4'-DDT\* 92. 4,4'-DDE (p,p'DDX)\* 93. 4,4'-DDD (p,p'TDE)\* 94. Alpha-endosulfah\* 95. Beta-endosulfan\* 96. endosulfan sulfate\* 97. endrin\* 98. endrin aldehyde\* 99.

### TABLE VI-2 (Continued)

#### TOXIC POLLUTANTS NEVER DETECTED

- 100. heptachlor\*
  101. heptachlor epoxide\*
  102. Alpha-8HC\*
  103. Beta-BHC\*
  104. Gamma-BHC (lindane)\*
  105. Delta-BHC\*
  106. PCB-1242 (Arochlor 1242)\*
- 107. FCB-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)

\*The Agency did not analyze for these pollutants in samples of raw wastewater from this subcategory. These pollutants are not believed to be present based on the Agency's best engineering judgment which includes consideration of raw materials and process operations.

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#### SECTION VII

#### CONTROL AND TREATMENT TECHNOLOGIES

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

#### CURRENT CONTROL AND TREATMENT PRACTICES

This section presents a summary of the control and treatment technologies that are currently being applied to each of the sources generating wastewater in this subcategory. As discussed Section V, wastewater associated with the secondary nickel subcategory is characterized by the presence of the toxic metal pollutants 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 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 economic scale and in some instances of different alkalinity to reduce treatment combine streams chemical requirements. The one discharging plant in subcategory currently has a combined wastewater treatment treating nickel forming and acid reclaim wastewater, consisting lime precipitation and sedimentation. Two options have been selected for consideration for NSPS and pretreatment based on combined treatment of these compatible waste streams.

#### SLAG RECLAIM TAILINGS

Slag or dross from a nickel smelting furnace may be reclaimed for its nickel values with a wet granulation operation. The tailings generated by this operation are discharged to a railings pond where solids are settled. The tailings pond overflows and discharges to a POTW. The tailings pond acts as a primary settling unit, and no additional treatment is performed on this wastewater. One plant has this waste stream and treatment. The raw waste is characterized by toxic metals and suspended solids.

#### ACID RECLAIM LEACHING FILTRATE

After nickel is precipitated from spent pickling acids with sodium carbonate and roasted to produce nickel oxide, the nickel oxide is leached with water to remove impurities and then dewatered on a belt filter. One plant discharges the resultant leaching filtrate without treatment to a POTW.

#### ACID RECLAIM LEACHING BELT FILTER BACKWASH

In the acid reclaim process, after the dewatered nickel oxide is scraped from the belt filter, the filter is backwashed with water. The resultant backwash water is treated as a combined waste stream along with nickel forming wastewaters in a lime precipitation and sedimentation system prior to discharge.

Recycle is not practiced on these three wastewater streams and all are indirectly discharged. All have toxic metals and suspended solids above treatable concentrations.

#### CONTROL AND TREATMENT OPTIONS

The Agency examined two control and treatment technology options that are applicable to the secondary nickel subcategory. The options selected for evaluation represent a combination of preliminary treatment technologies applicable to individual waste streams and end-of-pipe treatment technologies. The effectiveness of these technologies is presented in Section VII of the General Development Document.

#### OPTION A

Option A for the secondary nickel subcategory requires control and treatment technologies to reduce the discharge of wastewater pollutant mass.

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

Slag reclaim and acid reclaim wastewaters are treated separately because of economic considerations.

#### OPTION C

Option C for the secondary nickel subcategory consists of all control and treatment requirements of Option A (chemical precipitation and sedimentation, separate treatment of slag and acid reclaim wastewater) 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, beyond the concentration attainable by gravity sedimentation. The filter suggested is of the gravity, mixed-media type, although other forms of filters, such as rapid sand filters or pressure filters would perform satisfactorily. The addition of filters also provides consistent removal during periods of time in which there are rapid increases in flows or loadings of pollutants to the treatment system.

#### SECTION VIII

#### COSTS, ENERGY, AND NONWATER QUALITY ASPECTS

This section presents a summary of compliance costs for the secondary nickel subcategory and a description of the treatment options and subcategory-specific assumptions used to develop these estimates. Together with the estimated pollutant reduction performance presented in Sections 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 secondary nickel subcategory.

#### TREATMENT OPTIONS FOR EXISTING SOURCES

As discussed in Section VII, two treatment options have been developed for existing secondary nickel sources. The treatment schemes for each option are summarized below and schematically presented in Figures XI-1 and XI-2 (pages 4002 - 4003).

#### OPTION A

Option A consists of chemical precipitation and sedimentation end-of-pipe technology. Slag reclaim tailings is treated separately from acid reclaim wastewater.

#### OPTION C

Option C consists of Option A (chemical precipitation and sedimentation, and separate treatment of slag and acid reclaim wastewater) with the addition of multimedia filtration to the end of the Option A treatment scheme.

#### COST METHODOLOGY

Plant-by-plant compliance costs for the nonferrous metals manufacturing category have been revised following proposal because of new flow and production data for slag reclaim wastewater received through industry comments. These revisions calculate incremental costs, above treatment already in place, necessary to comply with the promulgated effluent limitations and standards and are presented in the administrative record supporting this regulation. A comparison of the costs developed for proposal and the revised costs for the final regulation are presented in Table VIII-1 (Page 3989) for the one indirect discharger in the secondary nickel subcategory. Each subcategory contains a unique set of waste streams requiring certain subcategory-specific assumptions to develop compliance costs.

The major assumptions relevant to cost estimates for the secondary nickel subcategory are discussed briefly below.

- (1) Compliance costs are based on integrated treatment of the two acid reclaim waste streams (with forming streams) and separate treatment of the slag reclaim tailings stream. Costs attributable to treating the streams associated with acid reclaim operations at this plant are based on flow weighting the integrated treatment costs.
- (2) The slag reclaim tailings stream is not recycled at BAT since recycling is not demonstrated on this waste stream. Plant operation shows that numerous attempts have been made to recycle this stream without success.
- (3) Costs of treating the slag reclaim railings stream are based on primary settling and removal of the majority of settleable solids in the existing lagoon prior to entering chemical precipitation. Chemical precipitation is accomplished using sulfuric acid as the precipitant rather than lime due to the high pH of the influent (pH 11).

#### 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 secondary nickel subcategory, including energy requirements, solid waste and air pollution are discussed below.

#### **ENERGY REQUIREMENTS**

The methodology used for determining the energy requirements for the various options is discussed in Section VIII of the General Development Document. Energy requirements for the two options considered are estimated at 89,000 kwh/yr and 112,000 kwh/yr for Options A and C, respectively. Option C represents less than one percent of a typical plant's electrical energy usage. It is therefore concluded that the energy requirements of the treatment options considered will not have a significant impact on total plant energy consumption.

#### SOLID WASTE

Sludge generated in the secondary nickel subcategory is due to the precipitation of metal hydroxides and carbonates using lime or sulfuric acid. Sludges associated with the secondary nickel subcategory will necessarily contain quantities of toxic metal pollutants. Wastes generated by secondary metal industries can be regulated as hazardous. However, the Agency examined the solid wastes that would be generated 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 the

Resource Conservation and Recovery Act. The one exception to this is solid wastes generated by cyanide precipitation. These sludges are expected to be hazardous and this judgment was included in this study. None of the non-cyanide wastes are listed specifically as hazardous. Nor are they likely to exhibit a characteristic of hazardous waste. This judgment is made based on the recommended technology of lime precipitation and filtration. By the addition of a small excess of lime during treatment, similar sludges, specifically toxic metal bearing sludges, generated by other industries such as the iron and steel industry passed the Extraction Procedure (EP) toxicity test. See 40 CFR \$261.24. Thus, the Agency believes that the wastewater sludges will similarly not be EP toxic if the recommended technology is applied.

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

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

Even if these wastes are not identified as hazardous, they still must be disposed of in compliance with the Subtitle D open dumping standards, implementing S4004 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.

The Agency estimates that the promulgated PSES regulation for secondary nickel manufacturing facilities will generate 423 metric tons of solid wastes (wet basis) in 1982 as a result of wastewater treatment.

AIR POLLUTION

## SECONDARY NICKEL SUBCATEGORY SECT - VIII

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

Table VIII-1

# COST OF COMPLIANCE FOR THE SECONDARY NICKEL SUBCATEGORY INDIRECT DISCHARGERS

(March, 1982 Dollars)

<u>Option</u>	Proposal Costs		Promulgation Costs	
	Capital Cost	Annual Cost	Capital Cost	Annual Cost
A	286,137	119,339	320,100	161,200
C	341,274	147,750	387,300	196,200
	(286,549)*	(119,616)*	(320,500)*	(161,500)*

<sup>\*</sup>These costs represent Option C without filtration for slag reclaim tailings.

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#### SECTION XI

#### NEW SOURCE PERFORMANCE STANDARDS

section describes the technologies for treatment wastewater from new sources and presents mass discharge standards for regulated pollutants for NSPS in the secondary nickel subcategory, based on the selected treatment technology. basis for new source performance standards (NSPS) is the best available demonstrated technology (BDT). New plants opportunity to design the best and most efficient production processes and wastewater treatment technologies without the added costs and restrictions encountered in retrofitting Therefore, EPA has considered existing plant. demonstrated process changes, in-plant controls, and end-of-pipe treatment technologies which reduce pollution to the maximum extent feasible.

#### TECHNICAL APPROACH TO NSPS

New source performance standards are based on the most effective and beneficial technologies currently available. The Agency reviewed and evaluated a wide range of technology options for new sources. The Agency elected to examine two technology options. applied to combined wastewater streams, which could be applied to the secondary nickel subcategory as alternatives for the basis of NSPS.

Treatment technologies considered for the NSPS options are summarized below:

OPTION A (Figure XI-1, page 4000) is based on:

Chemical precipitation and sedimentation Separate treatment of slag reclaim tailings wastewater

OPTION C (Figure XI-2, page 4001) is based on:

Chemical precipitation and sedimentation Multimedia filtration Separate treatment of slag reclaim tailings wastewater

As explained in Section IV, the secondary nickel subcategory has been subdivided into three potential wastewater sources or building blocks. 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 three subdivisions.

For each of the building blocks a specific approach was followed for the development of NSPS. 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. Each plant within the subcategory was then analyzed to determine which subdivisions were present, specific flow rates generated for each subdivision, and the specific production normalized flows for each subdivision. This analysis is discussed in detail in Section V. Nonprocess wastewater such as rainfall runoff and noncontact cooling water is not considered in the analysis.

Production normalized flows for each subdivision were analyzed to determine which flow was to be used as part of the basis for NSPS. The selected flow (sometimes referred to as a NSPS regulatory flow or NSPS discharge flow) reflected the water use controls which are common practice within the industry, The NSPS normalized flow is based on the average of all applicable data. Nothing was 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.

The second requirement to calculate new source performance standards is the set of concentrations that are achievable by application of NSPS level 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.

Using theses regulatory flows and the achievable concentrations, the next step is to calculate mass loadings for each wastewater source by subdivision or building block. 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 -- mg/kkg) were calculated by multiplying the NSPS regulatory flow (1/kkg) by the concentration achievable by the NSPS level of treatment technology (mg/l) for each pollutant parameter limited under NSPS. These mass loadings are published in the Federal Register and in 40 CFR part 421 as the effluent limitations.

The mass loadings which are allowed under NSPS 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 secondary nickel 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 subcategory.

#### POLLUTANT REMOVAL ESTIMATES

As one means of evaluating each technology option, EPA developed estimates of the pollutant removal and the compliance costs associated with each option. Since there are no existing direct dischargers in the secondary nickel subcategory, the estimated pollutant removal analysis was only carried out for indirect dischargers.

A complete description of the methodology used to calculate the estimated pollutant removal, or benefit, achieved by application of the various treatment options is presented in Section X of Vol. I. 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 mass of pollutant generated per mass of protured). This value, referred to as the raw waste, product manufactured). used to estimate the mass of toxic pollutants generated within secondary nickel subcategory. pollutant The estimates were calculated for each plant by first estimating 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.

The volume of wastewater discharged after the application of each treatment option was estimated for each operation at each plant by comparing the actual discharge to the regulatory flow. The smaller of the two values was selected and summed with the other plant flows. The mass of pollutant discharged was then estimated by multiplying the achievable concentration values attainable with the option (mg/l) by the estimated volume of process wastewater discharged by the subcategory. The mass of pollutant removed is the difference between the estimated mass of pollutant generated within the subcategory and the mass of pollutant discharged after application of the treatment option. The pollutant removal estimates for indirect dischargers in the secondary nickel subcategory have been revised since proposal based on new flow and production data and are presented in Table XII-1 (Page 4009).

#### COMPLIANCE COSTS

In estimating subcategory-wide compliance costs, the first step was to develop a cost estimation model, relating the total costs with installation and operation of wastewater treatment technologies to plant process wastewater, discharge. EPA applied the model to each plant. The plant's investment and operating costs are determined by what treatment it has in place its individual process wastewater discharge flow. discussed above, this flow is either the actual or the NSPS regulatory flow, whichever is lesser. The final step was annualize the capital costs, and to sum the annualized capital and the operating and maintenance costs for each plant, yielding the cost of compliance for the subcategory. comparison of the costs developed for proposal and the revised costs for promulgation is presented in Table XII-2 (Page 4010). These costs were used in assessing economic achievability.

### NSPS OPTION SELECTION - PROPOSAL

EPA proposed that NSPS for the secondary nickel subcategory be based on Option C, chemical precipitation, sedimentation, and multimedia filtration. Filtration was proposed for acid reclaim leaching filtrate and acid reclaim leaching belt filter backwash, but not for slag reclaim tailings. Filtration was not proposed for slag reclaim tailings wastewater because it was not found to be cost effective.

The wastewater flow rates for NSPS were equivalent to the proposed PSES flow rates. Flow reduction measures were not considered feasible for the waste streams generated in this subcategory.

#### NSPS OPTION SELECTION - PROMULGATION

We are promulgating NSPS for the secondary nickel subcategory based on Option A, chemical precipitation and sedimentation. The end-of-pipe treatment configuration for the NSPS option selected is presented in Figure XI-3 (Page 4011). It was determined that filtration for slag reclaim tailings and acid reclaim wastewater would not remove much additional pollutants beyond lime and settle treatment, and therefore, is not justified.

The pollutants and pollutant parameters specifically limited under NSPS are chromium, copper, nickel, total suspended solids and pH. The toxic pollutants arsenic and zinc were also considered for regulation because they are present 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 levels achievable by the model technology.

Promulgated NSPS technology and discharge rates are equivalent to promulgated PSES technology and discharge rates. Because NSPS is

equal to PSES, we believe that the promulgated NSPS will not have a detrimental impact on the entry of new plants into this subcategory.

#### WASTEWATER DISCHARGE RATES

A NSPS 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 NSPS effluent limitations. Since the discharge rate may be different for each wastewater source, separate production normalized discharge rates for each of the three wastewater sources are discussed below and summarized in Table XI - 1 (Page 4002). The discharge rates are normalized on a production basis by relating the amount of wastewater generated to the mass of the product which is produced by the process associated with the wastewater stream in question. These production normalizing parameters, or PNPs, are also listed in Table XI - 1.

Section V of this document further describes the discharge flow rates and presents water use and discharge flow rates for each plant by subdivision in Tables V-1 through V-3 (Pages 3962 - 3964).

#### SLAG RECLAIM TAILINGS

NSPS wastewater discharge allowance at proposal for slag reclaim tailings was 85,600 l/kkg (20,513 gal/ton) of slag reclaim nickel produced. The NSPS allowances were based on the discharge rate at the only plant reporting this stream. Since proposal, industry comments which included flow and production information enabled EPA to recalculate the production normalized flow. In addition, industry comments prompted EPA to reconsider the production normalizing parameter for this stream. Based on the new information submitted, EPA concluded that the generation of slag reclaim tailings wastewater is related more closely to raw material input to the reclaim process than to the quantity of nickel produced from the process.

The NSPS wastewater discharge allowance used at promulgation for slag reclaim tailings is 12,848 l/kkg (3,079 gal/ton) of slag input to the reclaim process. This rate is allocated only for those plants that reclaim nickel from slag generated in melt furnaces with a wet granulation process. The water use and wastewater discharge rates are presented in Table V - 1 (Page 3962).

#### ACID RECLAIM LEACHING FILTRATE

The NSPS wastewater discharge allowance used for both proposal and promulgation for acid reclaim leaching filtrate is 4,995 l/kkg (1,197 gal/ton) of acid reclaim nickel produced. This rate is allocated only for those plants that reclaim nickel from spent acids, pickling wastes, and wastewater treatment sludges by

precipitation or nickel carbonate, followed by roasting to produce nickel oxide and leaching with water. The water use and wastewater discharge rates are presented in Table V-2 (Page 3963).

### ACID RECLAIM LEACHING BELT FILTER BACKWASH

The NSPS wastewater discharge allowance used at both proposal and promulgation for acid reclaim leaching belt filter backwash is  $1,199\ 1/kkg$  (287 gal/ton) of acid reclaim nickel produced. This rate is allocated only for those plants that reclaim nickel from spent acids, pickling wastes, and wastewater treatment sludges as explained above, and clean the belt filter with water. The water use and wastewater discharge rates are presented in Table V - 3 (Page 3964).

### REGULATED POLLUTANT PARAMETERS

The raw wastewater concentrations form individual operations and the subcategory as a whole were examined to select certain pollutant parameters for limitation. This examination and evaluation was presented in Section VI. A total of five pollutants or pollutant parameters are selected for limitation under NSPS and are listed below:

119. chromium

120. copper

124. nickel TSS

Ηα

The Agency has chosen not to regulate all five priority pollutants selected in Section VI for further consideration.

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

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

This approach is technically justified since the treatable concentrations used for chemical precipitation and sedimentation technology are based on optimized treatment for concomitant

#### SECONDARY NICKEL SUBCATEGORY SECT - XI

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.

### NEW SOURCE PERFORMANCE STANDARDS

The pollutant concentrations achievable by application of the NSPS technology are discussed in Section VII of this supplement. These achievable concentrations (both one day maximum and monthly average values) are multiplied by the NSPS normalized discharge flows summarized in Table XI-1 (Page 4000) 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 new source performance standards and are presented in Table XI-2 (Page 4001) for each individual building block.

### TABLE XI-1

# NSPS WASTEWATER DISCHARGE RATES FOR THE SECONDARY NICKEL SUBCATEGORY

		rmalized rge Rate	Production Normalizing	
Building Block	<u>(1/kkg)</u>	(gal/ton)	Parameter	
Slag Reclaim Tailings	12,848	3,079	slag input to reclaim process	
Acid reclaim Leaching Filtrate	4,995	1,197	acid reclaim nickel produced	
Acid Reclaim Leaching Belt Filter Backwash	1,199	287	acid reclaim nickel produced	

TABLE XI-2
NSPS FOR THE SECONDARY NICKEL SUBCATEGORY

## (a) Slag Reclaim Tailings NSPS

ollutant p	property	7 -	any	one	day		mon	thly	avera	ge
		-						- 1		
mg/kg	(lb/mi	llion	lbs)	of	slag	inp	out	to r	eclaim	proces
					- 0-0					,
Arsenic					.850				11.	
*Chromium				5	653				2.	313
*Copper			İ	24	.410	٠.			12.	850
Nickel				24	.670				16.	320
Zinc			- 1		.760				-	837
TSS					800				250.	
*pH	Within	the	range	_			10.0	at		
· · · · · · · · · · · · · · · · · · ·	·		- 1		A-111		<u> </u>	<del></del>		
(b) Acid Re	eclaim I	Leach	ina F	iltr	ate	NSI	PS			•

Pollutant pollutant			um for one day		um for ly average
mg/kg	(lb/million	lbs)	of acid	reclaim ı	nickel produced
Arsenic		!	10.440		4.645
*Chromium			2.198		0.899
*Copper			9.491		4.995
*Nickel		1	9.590	**	6.344
Zinc		:	7.293		3.047
*TSS			204.800		97.400
*pH	Within the	range	of 7.5 t	o 10.0 a	·

## (c) Acid Reclaim Leaching Belt Filter Backwash NSPS

Pollutant pollutant			mum for one day	Maximu monthl	m for y average
mg/kg	(lb/million	lbs)	of acid	reclaim n	ickel produced
Arsenic			2.506	·	1.115
*Chromium		:	0.528		0.216
*Copper			2.278		1.199
*Nickel			2.302		1.523
Zinc		1	1.751	*	0.731
*TSS	i		49.160		23.380
*pH	Within the	range	of 7.5 t	o 10.0 at	all times

<sup>\*</sup>Regulated Pollutant

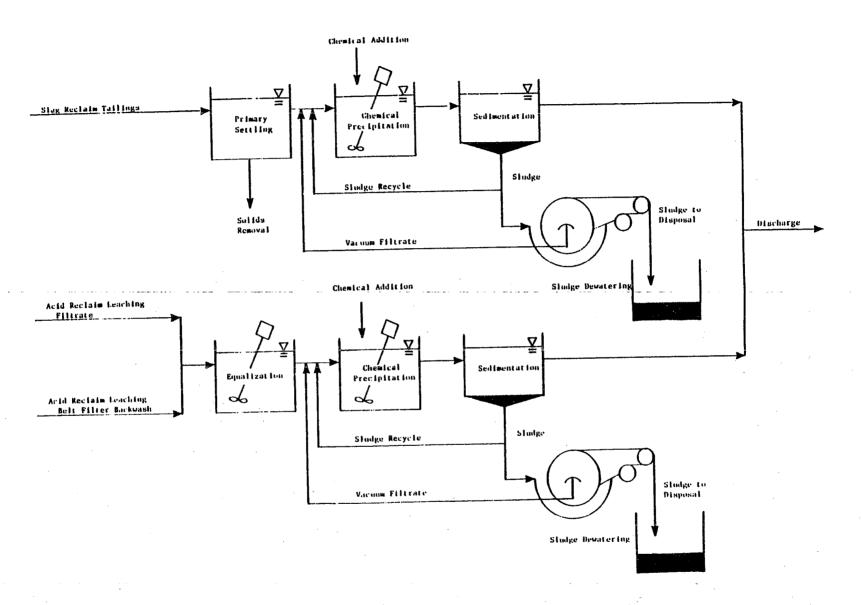


Figure XI-1

NSPS TREATMENT SCHEME FOR OPTION A

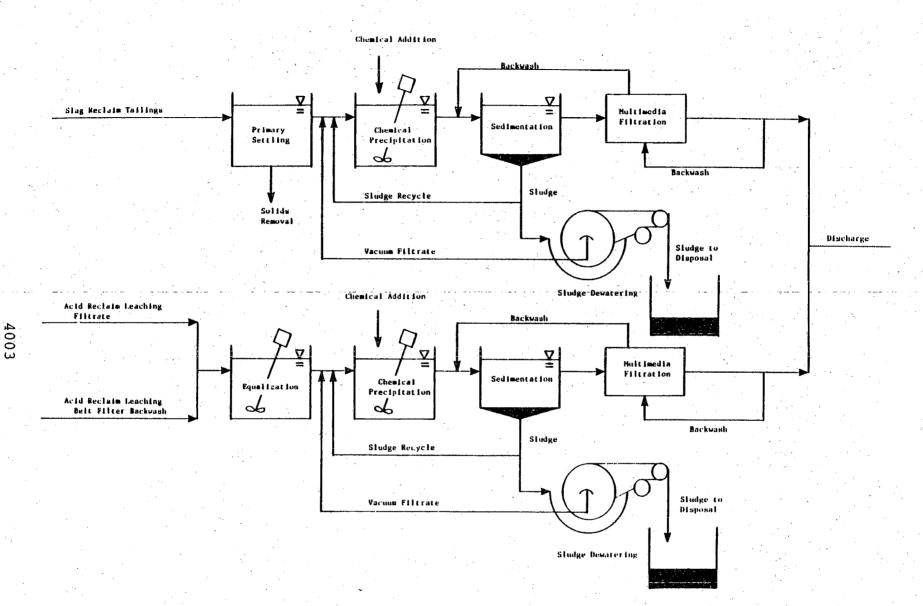


Figure XI-2
NSPS TREATMENT SCHEME FOR OPTION C

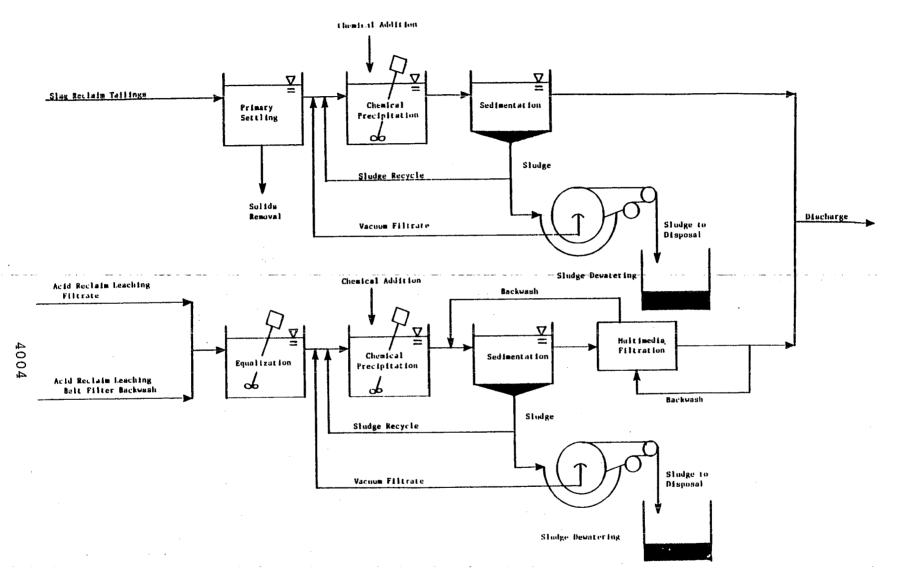


Figure XI-3

NSPS TREATMENT SCHEME FOR OPTION C WITHOUT FILTRATION FOR SLAG RECLAIM TAILINGS

#### SECTION XII

#### PRETREATMENT STANDARDS

This section describes the control and treatment technologies for pretreatment of process wastewaters from existing sources and new sources in the secondary nickel subcategory. PSES are designed prevent the discharge of pollutants which pass through, interfere with, or are otherwise incompatible with the operation publicly owned treatment works (POTW). The Clean Water requires pretreatment for pollutants, such as toxic metals, limit POTW sludge management alternatives. discharge facilities, like new direct discharge facilities, opportunity to incorporate the best available demonstrated nologies, including process changes, in-plant controls, and technologies, end-of-pipe treatment technologies, and to use plant selection to ensure adequate treatment system installation. Pretreatment standards are to be technology based, analogous to the best available or best demonstrated technology for removal of toxic pollutants.

Pretreatment standards for regulated pollutants are presented based on the selected control and treatment technology.

### TECHNICAL APPROACH TO PRETREATMENT

Before proposing or promulgating 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.

This definition of pass through satisfies two competing objectives set by Congress that standards for indirect dischargers be equivalent to standards for direct dischargers, while at the same time, 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 XI. The compliance costs and pollutant removal estimates have been recalculated since proposal based on new flow and production data for the slag reclaim tailings stream obtained through industry comments. Table XII-1 (Page 4009) shows the revised pollutant removal estimates for indirect dischargers. A comparison of proposal and promulgation compliance costs for indirect dischargers is presented in Table XII-2 (Page 4010).

### 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 Section XI. The options for PSNS and PSES, therefore, are the same as the NSPS options discussed in Section XI. A description of each option is presented in Section XI.

Treatment technologies considered for the PSES and PSNS options are:

#### OPTION A

- o Chemical precipitation and sedimentation
- o Separate treatment of slag reclaim tailings wastewater

#### OPTION C

- o Chemical precipitation and sedimentation
- o Multimedia filtration
- o Separate treatment of slag reclaim tailings wastewater

#### PSES OPTION SELECTION PROPOSAL

EPA proposed PSES for the secondary nickel subcategory based on Option C (chemical precipitation, sedimentation, and multimedia filtration). Filtration was proposed for acid reclaim leaching filtrate and acid reclaim leaching filter backwash wastewaters, but not for slag reclaim tailings wastewater. Filtration for slag reclaim tailings wastewater was not found to be cost effective.

Implementation of the proposed PSES limitations was estimated to remove 1,113 kilograms of toxic metal pollutants annually. Capital and annual costs of \$286,549 and \$119,616 (1982 dollars), respectively, were estimated in order to achieve the proposed PSES.

### PSES OPTION SELECTION - PROMULGATION

EPA is promulgating PSES for this subcategory based on Option A, chemical precipitation and sedimentation. Filtration was not to be cost effective for any subdivisions in found subcategory because it would not remove much additional pollutant beyond that removed with lime and settle treatment. pollutants specifically regulated under PSES are chromium, copper, and nickel. The toxic pollutants arsenic and zinc were also considered for regulation because they are present at treatable concentrations in the raw wastewaters from subcategory. These pollutants were not selected for specific regulation because they will be effectively controlled when the regulated toxic metals are treated to the levels achievable by the model technology. We are promulgating PSES to prevent passof chromium, copper, and nickel. These priority pollutants are removed by a well-operated POTW at an average of 32 percent while PSES technology removes approximately 84 percent.

Implementation of the promulgated PSES limitations will remove annually an estimated 1,625 kg of priority metals. We estimate a capital cost of \$320,100 and an annualized cost of \$161,200 (1982 dollars) to achieve the promulgated PSES. The promulgated PSES will not result in adverse economic impacts.

### PSNS OPTION SELECTION - PROPOSAL

EPA proposed PSNS for the secondary nickel subcategory based on Option C (chemical precipitation, sedimentation, and multimedia filtration). Filtration was not proposed for slag reclaim tailings wastewater, however, because it was not shown to be cost effective for this waste stream.

Wastewater discharge rates for PSNS were proposed equivalent to the PSES discharge rates.

## PSNS OPTION SELECTION - PROMULGATION

EPA is promulgating PSNS equivalent to promulgated NSPS and PSES. The same pollutants pass through at PSNS as at PSES, for the same reasons.

The PSES flow allowances are based on minimization of process wastewater wherever possible.

The Agency believes that the promulgated PSNS are achievable, and that they are not a barrier to entry of new plants into this subcategory.

The wastewater discharge rates for PSNS are identical to the NSPS discharge rates for each waste stream. The PSNS discharge rates are shown in Table XII-3 (Table 4012).

### PRETREATMENT STANDARDS

Pretreatment standards are based on the achievable concentrations from the selected treatment technology and the discharge rates determined in Section XI for NSPS and shown in Table XII-3. A mass of pollutant per mass of product (mg/kg) allocation is given This pollutant for each subdivision within the subcategory. allocation is based on the product of the concentration achievable from the model treatment (mg/l) and the production normalized wastewater discharge rate (1/kkg). The achievable treatment concentrations for NSPS are identical to those for PSES and PSNS. PSES and PSNS are presented in Table XII-4 and XII-5, respectively (pages 4012 - 4013).

Table XII-1

POLLUTANT REMOVAL ESTIMATES FOR INDIRECT DISCHARGERS IN THE SECONDARY NICKEL SUBCATEGORY

	*				and the second second		
<u>Poilutant</u>	Total Raw Discharge (kg/yr)	Option A Discharge (kg/yr)	Option A Removed (kg/yr)	Option C Discharge (kg/yr)	Option C Removed (kg/yr)	Selected Option Discharge (kg/yr)	Selected Option Removed (kg/yr)
Antimony Arsenic Cadmium Chromium (total) Copper Cyanide (total)	0 16.90 0 12.20 1,606.38	0 16.90 0 4.95 34.18	0 0 7.25 1,572.20	0 16.90 0 4.13 22.98	0 0 0 8.07 1,583.40	0 16.90 0 4.94 34.03	0 0 0 7.26 1,572.35
Lead Mercury	0	0	0	0	0	0	0
Nickel Selenium Silver Thallium Zinc	51.68 0 0 0 0 0	0 6.41 0 0 0 0	0 45.27 0 0 0	0 6.00 0 0 0 0	0 45.68 0 0 0 0	0 6.00 0 0 0	0 45.68 0 0 0
TOTAL PRIORITY POLLUTAI	NTS 1,687.35	62.63	1,624.72	50.18	1,637.17	62.04	1,625.31
Ammonia Cobalt Fluoride	0 0 23.89	0 0 23.89	0 0 0	0 0 23.89	0 0 0	0 0 23.89	0 0 0
TOTAL NONCONVENTIONALS	23.89	23.89	0	23.89	. 0	23.89	Ú
TSS Oil & Grease	932,833.74 699.12	707.09 581.35	932,126.65 117.77	153.20 581.35	932,680.54 117.77	699.68 581.35	932,134.06 117.77
TOTAL CONVENTIONALS	933,532.86	1,288.44	932,244.42	734.55	932,798.31	1,281.03	932,251.83
TOTAL POLILUTANTS	935,244.10	1,374.96	933,869.14	808.62	934,435.48	1,366.96	933,877.14

Option A = Chemical precipitation and sedimentation

Option C = Chemical precipitation, sedimentation, and filtration

Table XII-2

# COST OF COMPLIANCE FOR THE SECONDARY NICKEL SUBCATEGORY INDIRECT DISCHARGERS

(March, 1982 Dollars)

	Proposa	l Costs	Promulgation Costs		
Option	Capital Cost	Annual Cost	Capital Cost	Annual Cost	
A	286,137	119,339	320,100	161,200	
С	341,274	147,750	387,300	196,200	
<u></u>	(286,549)*	(119,616)*	(320,500)*	(161,500)*	

4010

<sup>\*</sup>These costs represent Option C without filtration for slag reclaim tailings.

## TABLE XII-3

## PSES AND PSNS WASTEWATER DISCHARGE RATES FOR THE SECONDARY NICKEL SUBCATEGORY

Wastewater Stream	Norr	and PSNS malized arge Rate (gal/ton)	Production Normalizing Parameter
Slag Reclaim Tailings	12,848	3.079	slag input to reclaim process
Acid reclaim Leaching Filtrate	4,995	1,197	acid reclaim nickel produced
Acid Reclaim Leaching Belt Filter Backwash	1,199	287	acid reclaim nickel produced

### TABLE XII-4

## PSES FOR THE SECONDARY NICKEL SUBCATEGORY

## (a) Slag Reclaim Tailings PSES

Pollutant or pollutant property	Maximum for any one day	Maximum for monthly average
mg/kg (lb/million	lbs) of slag	input to reclaim process
Arsenic *Chromium *Copper *Nickel Zinc	26.850 5.653 24.410 24.670 18.760	11.950 2.313 12.850 16.320 7.837

## (b) Acid Reclaim Leaching Filtrate PSES

Pollutant or pollutant propert	Maximum for cy any one day	Maximum for monthly average
mg/kg (lb/m	illion lbs) of acid	reclaim nickel produced
Arsenic *Chromium *Copper *Nickel Zinc	10.440 2.198 9.491 9.590 7.293	4.645 0.899 4.995 6.344 3.047

## (c) Acid Reclaim Leaching Belt Filter Backwash PSES

Pollutant or pollutant proper	Maximum for ty any one day	Maximum for monthly average
mg/kg (lb/m	illion lbs) of acid	reclaim nickel produced
Arsenic *Chromium *Copper *Nickel Zinc	2.506 0.528 2.278 2.302 1.751	1.115 0.216 1.199 1.523 0.731

<sup>\*</sup>Regulated Pollutant

TABLE XII-5

### PSNS FOR THE SECONDARY NICKEL SUBCATEGORY

## (a) Slag Reclaim Tailings PSNS

Pollutant of pollutant p			mum for one day		um for ly average
mg/kg	(lb/million	lbs)	of slag	input t	o reclaim process
Arsenic *Chromium *Copper *Nickel Zinc			26.850 5.653 24.410 24.670 18.760		11.950 2.313 12.850 16.320 7.837

## (b) Acid Reclaim Leaching Filtrate PSNS

Pollutant or pollutant pr			num for one day	Maximum for monthly average
mg/kg (	lb/million	lbs)	of acid	reclaim nickel produced
Arsenic			10.440	4.645
*Chromium			2.198	0.899
*Copper		į	9.491	4.995
*Nickel		- ;	9.590	6.344
Zinc		!	7.293	3.047

## (c) Acid Reclaim Leaching Belt Filter Backwash PSNS

Pollutant or pollutant property	Maximum for any one day	Maximum for monthly average
mg/kg (lb/millic	on lbs) of acid	reclaim nickel produced
Arsenic	2.506	1.115
*Chromium	0.528	0.216
*Copper	2.278	1.199
*Nickel	2.302	1.523
Zinc	1.751	0.731

<sup>\*</sup>Regulated Pollutant

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### SECTION XIII

## BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY

EPA is not promulgating best conventional pollutant control for the secondary nickel subcategory at this time.

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Pages 4017 and 4018 are omitted.

### NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY

### DEVELOPMENT DOCUMENT SUPPLEMENT

for the

Secondary Tin Subcategory

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May 1989

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## TABLE OF CONTENTS

Section		Page
		•
<b>I</b> .	SUMMARY	4029
II	CONCLUSIONS	4031
III	SUBCATEGORY PROFILE	4045
	Description of Secondary Tin Production	4045
	Raw Materials	4045
	Tin Smelting	4046
	Alkaline Detinning	4046
	Electrowinning	4047
	Precipitation of Tin Hydroxide	4047
	Reduction to Tin Metal	4047
	Process Wastewater Sources	4948
	Other Wastewater Sources	4048
	Age, Production, and Process Profile	4048
IV	SUBCATEGORIZATION	4055
	Factors Considered in Subdividing the Secondary Tin Subcategory	4055
	Other Factors	4057
	Production Normalizing Parameters	4057
V	WATER AND WASTEWATER CHARACTERISTICS	4059
	Wastewater Flow Rates	4060
	Wastewater Characteristics Data	4061
	Data Collection Portfolios	4061
	Field Sampling Data	4062
	Wastewater Characteristics and Flows by	4063
	Subdivision	
	Tin Smelter SO <sub>2</sub> Scrubber	4063
*	Dealuminizing Rinse	4063
	Tin Mud Acid Neutralization Filtrate	4064
	Tin Hydroxide Wash	4064
	Spent Electrowinning Solution From New Scrap	4064
	Spent Electrowinning Solution From Municipal Solid Waste	4065
	Tin Hydroxide Supernatant From Scrap	4065
	Tin Hydroxide Supernatant From Plating Solutions and Sludges	4066
· · · · · · · · · · · · · · · · · · ·	Tin Hydroxide Filtrate	4066

# TABLE OF CONTENTS (Continued)

Section		<u>Page</u>
VI	SELECTION OF POLLUTANT PARAMETERS	4215
	Conventional and Nonconventional Pollutant Parameters Selected	4215
•	Toxic Priority Pollutants	4217
	Toxic Pollutants Never Detected	4217
	Toxic Politicants Never Found Above Their Analytical Quantification Concentration	4217
	Toxic Pollutants Present Below Concentrations Achievable by Treatment	4218
	Toxic Pollutants Detected in a Small Number of Sources	4218
	Toxic Pollutants Selected for Further Consideration in Establishing Limitations and	4220
	Standards	
VII	CONTROL AND TREATMENT TECHNOLOGIES	4229
	Current Control and Treatment Practices	4229
	Tin Smelter SO <sub>2</sub> Scrubber	4229
	Dealuminizing Rinse	4229
	Tin Mud Acid Neutralization Filtrate	4230
	Tin Mud Acid Neutralization lifetato	4230
	Tin Hydroxide Wash Spent Electrowinning Solution From New Scrap	4230
	Spent Electrowinning Solution From Municipal Solid Waste	4230
	Tin Hydroxide Supernatant From Scrap	4231
	Tin Hydroxide Supernatant From Plating Solutions and Sludges	4231
	Tin Hydroxide Filtrate	4231
	Control and Treatment Options	4231
	Option A	4231
	Option C	4232
VIII	COST OF WASTEWATER TREATMENT AND CONTROL	4233
	Treatment Options for Existing Sources	4233
	Treatment Options for dailering boarder	4233
	Option A	4233
	Option C	4234
	Cost Methodology	4234
	Nonwater Quality Aspects	4235
	Energy Requirements	4235
	Solid Waste	4236
	Air Pollution	4430

## TABLE OF CONTENTS (Continued)

Section		Page
IX	BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE	4239
	Technical Approach to BPT	4239
· · · · · · · · · · · · · · · · · · ·	Industry Cost and Pollutant Removal Estimates BPT Option Selection	4241
	Wastewater Discharge Rates	4241 4242
•	Tin Smelter SO <sub>2</sub> Scrubber 424	
- 1	Dealuminizing Rinse	4243
	Tin Mud Acid Neutralization Filtrate	4243
	Tin Hydroxide Wash	4243
	Spent Electrowinning Solution From New Scrap Spent Electrowinning Solution From Municipal	4243
	Solid Waste	2444
	Tin Hydroxide Supernatant From Scrap	4244
	Tin Hydroxide Supernatant From Plating Solutions	4244
	and Studges	
	Tin Hydroxide Filtrate	4245
	Regulated Pollutant Parameters Effluent Limitations	4245
•	Differe Dimitations	4245
X	BEST AVAILABLE TECHNOLOGY ECONOMICALLY	4259
, · ·	ACHIEVABLE	
	Technical Approach to BAT	
· · · · · · · · · · · · · · · · · · ·	Option A	4259
	Option C	4260 4260
:. •	Industry Cost and Pollutant Removal Estimates	4260
	POLLUTANT Removal Estimates	4260
(	Compliance Costs	4261
. <u>.</u> .	BAT Option Selection - Proposal	4261
. 1	Noghanakan Disahi	4262
F	11	4263 4263
I	Effluent Limitations	4263
XI N	NEW SOURCE PERFORMANCE STANDARDS	
•	SOOKOD I DKI OKUKNCE SIANDARDS	4281
Ţ	Technical Approach to NSPS	4281
N	NSPS Option Selection - Proposal	4282
7		4282
· · · · · · · · · · · · · · · · · · ·	lore Course Dan-Early me a s	4282
	The state of the s	4282

## TABLE OF CONTENTS (Continued)

Section		Page
XII	PRETREATMENT STANDARDS	4293
	Technical Approach to Pretreatment Industry Cost and Pollutant Removal Estimates Pretreatment Standards for Existing and New Sources PSES and PSNS Option Selection	4293 4293 4294 4294
	Regulated Pollutant Parameters Pretreatment Standards	4295 4295
XIII	BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY	4317

## LIST OF TABLES

<u>Table</u>	<u>Title</u>	Page
III-1	Initial Operating Year (Range) Summary of Plants in the Secondary Tin Subcategory By Discharge Type	4049
III-2	Production Ranges for Secondary Tin Plants for 1982	4050
III-3	Summary of Secondary Tin Subcategory Processes and Associated Waste Streams	4051
V-1	Water Use and Discharge Rates Tin Smelter SO <sub>2</sub> Scrubber	4068
V-2	Water Use and Discharge Rates Dealuminizing Rinse	4068
V-3	Water Use and Discharge Rates Tin Mud Acid Neutralization Filtrate	4068
V-4	Use and Discharge Rates Tin Hydroxide Wash	4069
V-5	Water Use and Discharge Rates Spent Electrowinning Solution From New Scrap	4069
V-6	Water Use and Discharge Rates Spent Electrowinning Solution From Municipal Solid Waste	4069
V-7	Water Use and Discharge Rates Tin Hydroxide Supernatant From Scrap	4070
V-8	Water Use and Discharge Rates Tin Hydroxide Supernatant From Plating Solutions and Sludges	4070
V-9	Water Use and Discharge Rates Tin Hydroxide Filtrate	4071
V-10	Scrubber Blowdown Raw Wastewater Sampling Data	4071
V-11	Spent Electrowinning Solution Raw Wastewater Sampling Data	4082
V-12	Tin Hydroxide Precipitation Supernatant (From Scrap) Raw Wastewater Sampling Data	4102

## LIST OF TABLES (Continued)

<u>Table</u>	<u>Title</u>	Page
V-13	Tin Hydroxide Precipitation Supernatant (From Spent Plating Solution and Sludges) Raw Wastewater Sampling Data	4113
V-14	Tin Hydroxide Filtrate Raw Wastewater Sampling Data	4129
V-15	Mud Pond Supernatant Raw Wastewater Sampling Data	4140
V-16	Electrowinning Solution After Chlorination - Plant C Treated Wastewater Sampling Data	4151
V-17	Electrowinning Solution After Chlorination and Neutralization - Plant C Treated Wastewater Sampling Data	4161
V-18	Electrowinning Solution After Chlorination, Neutralization, and Sedimentation - Plant C Treated Wastewater Sampling Data	4181
V-19	Final Effluent - Plant C Treated Wastewater Sampling Data	4181
V-20	Electrowinning Solution After Carbonation - Plant D Treated Wastewater Sampling Data	4191
V-21	Influent to Treatment - Plant E Raw Wastewater Sampling Data	4201
V-22	Treated Effluent - Plant E Treated Wastewater Sampling Data	4205
V-23	Secondary Tin Sampling Data, Raw Wastewater from Self Sampling Data	4209
VI-1	Frequency of Occurrence of Priority Pollutants Secondary Tin Subcategory Raw Wastewater	4223
VI-2	Toxic Pollutants Never Detected	4227
VIII-1	Cost of Compliance for the Secondary Tin Subcategory Direct Dischargers	4237
VIII-2	Cost of Compliance for the Secondary Tin Subcategory Indirect Dischargers	4237

## LIST OF TABLES (Continued)

<u>Table</u>	<u>Title</u>	Page
IX-1	BPT Wastewater Discharge Rates for the Secondary Tin Subcategory	4247
IX-2	BPT Mass Limitations for the Secondary Tin Subcategory	4248
x-1	Secondary Tin Subcategory Pollutant Removal Estimates Direct Dischargers	4266
X-2	Cost of Compliance for the Secondary Tin Subcategory Direct Dischargers	4268
X-3	BAT Wastewater Discharge Rates for the Secondary Tin Subcategory	4269
X-4	BAT Mass Limitations for the Secondary Tin Subcategory	4270
XI-1	NSPS Wastewater Discharge Rates for the Secondary Tin Subcategory	4283
XI-2	NSPS for the Secondary Tin Subcategory	4284
XII-1	Secondary Tin Subcategory Pollutant Removal Estimates Indirect Dischargers	4296
XII-2	Cost of Compliance for the Secondary Tin Subcategory Indirect Dischargers	4297
XII-3	PSES and PSNS Wastewater Discharge Rates for the Secondary Tin Subcategory	4298
XII-4	PSES for the Secondary Tin Subcategory	4299
XII-5	PSNS for the Secondary Tin Subcategory	4308

## LIST OF FIGURES

Figure	<u>Title</u>	Page
III-l	Tin Smelting Production Process	4052
III-2	Other Tin Production Processes	4053
III-3	Geographic Locations of the Secondary Tin Subcategory Plants	4054
V-1	Sampling Sites at Secondary Tin Plant A	4210
V-2	Sampling Sites at Secondary Tin Plant B	4211
V-3	Sampling Sites at Secondary Tin Plant C	4212
V-4	Sampling Sites at Secondary Tin Plant D	4213
V-4 V-5	Sampling Sites at Secondary Tin Plant E	4214
v-3 xI-1	BPT Treatment Scheme for Option A	4257
	BAT Treatment Scheme for Option A	4279
X-1	BAT Treatment Scheme for Option C	4280

#### SECTION I

#### SUMMARY

This document provides the technical basis for promulgating 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 secondary tin subcategory consists of twelve plants. Of the twelve plants, three discharge directly to rivers, lakes, or streams; one discharges to a publicly owned treatment works (POTW); and eight achieve zero discharge of process wastewater.

EPA first studied the 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 the sources and volume of water used, the processes used, the sources of pollutants and wastewaters in the plant, and the constituents of wastewaters, including toxic priority pollutants. As a result, nine subdivisions or building blocks have been identified for this subcategory that warrant separate effluent limitations. These include:

- (a) Tin smelter SO2 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 plating solutions and sludges, and
- (i) Tin hydroxide filtrate.

EPA also identified several distinct control and treatment technologies (both in-plant and end-of-pipe) applicable to the 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 Effluent Limitations and Standards for the Nonferrous Metals Manufacturing 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. Cyanide precipitation was selected as the basis for cyanide limitations. To meet the BPT effluent limitations based on this technology, the 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 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 secondary tin subcategory is estimated to incur a capital cost of \$160,187 and an annual cost of \$50,044. 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.

#### SECTION II

#### CONCLUSIONS

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

(a) Tin smelter SO2 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 plating solutions and sludges, and

(i) Tin hydroxide filtrate.

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

## (a) <u>Tin Smelter</u> SO<sub>2</sub> Scrubber BPT

Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/mill	ion lbs) of cr	ude tapped tin produced
Arsenic	19.220	8.554
Lead	3.863	1.840
Iron	11.040	5.611
Tin	3.495	2.024
TSS	377.100	179.400
pH Within	the range of	7.5 to 10.0 at all times

## SECONDARY TIN SUBCATEGORY SECT - II

## (b) Dealuminizing Rinse BPT

		•
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/mil	lion lbs) of de	aluminized scrap produced
Lead	0.015	0.007
Cyanide (total)	0,010	0.004
Fluoride	1,225	0.700
Tin	0.013	0.008
TSS	1,435	0.683
pH With	in the range of	7.5 to 10.0 at all times
(c) Tin Mud Acid N	eutralization F	iltrate BPT
Pollutant or	Maximum for	Maximum for
Pollutant Property		
corracant froperty	Any One Day	Monthly Average
mg/kg (lb/million l	bs) of neutrali	zed dewatered tin mud pro
Lead	2.120	1.009
Cyanide (total)	1.464	0.606
Fluoride	176.600	100.400
Tin	1.918	1.110
rss	206.900	98.420
oH Within	n the range of	7.5 to 10.0 at all times
(d) Tin Hydroxide	Wash BPT	
(d) <u>Tin Hydroxide</u>	Masii BP1	
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (1b/i	million lbs) of	tin hydroxide washed
Lead	5.020	2.391
Cyanide (total)	3.466	1.434
Fluoride	418.400	237.900
Fin	4.542	2.630
rss	490.100	233.100
		7.5 to 10.0 at all times
		, to to roto at are times

# (e) Spent Electrowinning Solution from New Scrap BPT

Pollutant or	Maximum for	Maximum for	<del></del>
Pollutant Property			re .
	!		
mg/kg (lb/mi	llion lbs) of	cathode tin pro	oduced
,,	,	, , , , , , , , , , , , , , , , , , ,	<del>-</del>
Lead	7.056	3.360	e a fill of the property of
Cyanide (total)	4.872	2.016	
Fluoride	588.000	334.300	
Tin	6.384	3.696	
TSS	688.800	327.600	\$ · *
		7.5 to 10.0 at	all timos
pH Within	the range or	7.5 to 10.0 at a	arr crmes
· · · · · · · · · · · · · · · · · · ·		<del>-i</del>	<del>-,</del>
(6) Onesh Electronia	متمانيا المتان متانيا	from Worldings	0-1:3
(f) Spent Electrowin	ning Solution	rrom Municipal	<u>80110</u>
Waste BPT			
			<del></del> -
Pollutant or	Maximum for		
Pollutant Property	Any One Day	Monthly Avera	ge
mg/kg (lb/million	lbs) of MSW	scrap used as ra	aw material
Lead	0.050	0.024	
Cyanide (total)	0.035	0.014	
Fluoride	4.165	2.368	
Tin	0.045	0.026	
TSS	4.879	2.321	
pH Within	the range of	7.5 to 10.0 at	all times
			*
(g) Tin Hydroxide Su	pernatant fro	m Scrap BPT	
	The second second	. ,	
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	ge
		· · · · · · · · · · · · · · · · · · ·	
mg/kg (lb/million	lbs) of tin	metal recovered	from scrap
			•
Lead	23.370	11.130	
Cyanide (total)	16.140	6.677	
Fluoride	1,947,000	1,107.000	
Tin	21.140	12.240	t <sub>e</sub>
TSS		1,085.000	
		7.5 to 10.0 at	all times
Dir MTCIITII	the range or	,.5 co 10.0 ac	GII CIMCD

# (h) <u>Tin Hydroxide</u> <u>Supernatant from Plating</u> <u>Solutions and Sludges</u> BPT

Pollutant or	Maximum for	Maximum for	
Pollutant Proper	ty Any One Day	Monthly Average	* .
	<u>'</u>		
mg/kg (lh	o/million lbs) of ti		from
	plating solutions	s and sludges	•
_	1		
Lead	48.300	23.000	
Cyanide (total)	33.350	13.800	1
Fluoride	4,025.000	2,289.000	
Tin	43.700	25.300	
TSS	4,715.000	2,243.000	
pH Wi	thin the range of 7	7.5 to 10.0 at all	times
<del>-</del>	•		

## (i) Tin Hydroxide Filtrate BPT

Pollutant or Pollutant Pro	operty	Maximum for Any One Day	Maximum for Monthly Average	
mg	/kg (lb/m	illion lbs) of	tin metal produce	đ
Lead Cyanide (tota Fluoride Tin TSS pH	·	10.520 7.263 876.500 9.517 1,027.000 the range of 7	5.009 3.005 498.400 5.510 488.400 .5 to 10.0 at all	times

BAT is promulgated 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 cyanide precipitation for selected waste streams. The following BAT effluent limitations are promulgated:

## (a) Tin Smelter SO2 Scrubber BAT

Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/mill	ion lbs) of cr	ude tapped tin produced
Arsenic	12.790	5.703
Lead	2.575	1.196
Iron	11.040	5.611
Tin	3.495	2.024

# (b) Dealuminizing Rinse BAT

• • • •			
Pollutant or	Maximum for	Maximum for	
Pollutant Property	• .		
rottacane rropercy	ming one bay	nonchity hverage	*
mg/kg (lb/milli	on lbs) of de	aluminized scrap prod	duced
Lead	0.010	0.005	
Cyanide (total)	0.007	0.0028	
Fluoride	. 1.225	0.697	
Tin	0.013	0.008	
1111	0.013	0.000	
(c) Tin Mud Acid Neu	tralization F	iltrate BAT	
Pollutant or	Maximum for	Maximum for	
Pollutant Property		Monthly Average	
mg/kg (lb/mill	ion lbs) of n mud prod	eutralized dewatered uced	tin
Lead	1.413	0.656	
Cyanide (total)	1.009	0.404	
Fluoride	176.600	100.400	
Tin	1.918	1.110	
1111	1.910	1.110	
(d) <u>Tin Hydroxide War</u>	sh BAT  Maximum for	Maximum for	· · · · · · · · · · · · · · · · · · ·
(d) <u>Tin Hydroxide War</u> Pollutant or Pollutant Property	Maximum for	Maximum for Monthly Average	<u> </u>
Pollutant or Pollutant Property	Maximum for Any One Day		1
Pollutant or Pollutant Property mg/kg (lb/mi	Maximum for Any One Day llion lbs) of	Monthly Average	1
Pollutant or Pollutant Property  mg/kg (lb/mi	Maximum for Any One Day  llion lbs) of  3.347	Monthly Average	1
Pollutant or Pollutant Property  mg/kg (lb/mi  Lead Cyanide (total)	Maximum for Any One Day  llion 1bs) of  3.347 2.391	Monthly Average tin hydroxide washed 1.554 0.956	1
Pollutant or Pollutant Property  mg/kg (lb/mi  Lead Cyanide (total) Fluoride	Maximum for Any One Day llion 1bs) of 3.347 2.391 418.400	Monthly Average tin hydroxide washed 1.554 0.956 237.900	1
Pollutant or Pollutant Property  mg/kg (lb/mi  Lead Cyanide (total)	Maximum for Any One Day  llion 1bs) of  3.347 2.391	Monthly Average tin hydroxide washed 1.554 0.956	1
Pollutant or Pollutant Property  mg/kg (lb/mi  Lead Cyanide (total) Fluoride	Maximum for Any One Day 11ion 1bs) of 3.347 2.391 418.400 4.542	Monthly Average tin hydroxide washed 1.554 0.956 237.900 2.630	ī
Pollutant or Pollutant Property  mg/kg (lb/mi  Lead Cyanide (total) Fluoride Tin	Maximum for Any One Day  llion lbs) of  3.347 2.391 418.400 4.542	Monthly Average tin hydroxide washed 1.554 0.956 237.900 2.630	1
Pollutant or Pollutant Property  mg/kg (lb/mi  Lead Cyanide (total) Fluoride Tin  (e) Spent Electrowin	Maximum for Any One Day 11ion 1bs) of 3.347 2.391 418.400 4.542	Monthly Average  tin hydroxide washed  1.554 0.956 237.900 2.630  from New Scrap BAT	1
Pollutant or Pollutant Property  mg/kg (lb/mi  Lead Cyanide (total) Fluoride Tin  (e) Spent Electrowin  Pollutant or Pollutant Property	Maximum for Any One Day  llion lbs) of  3.347 2.391 418.400 4.542  ning Solution  Maximum for Any One Day	Monthly Average  tin hydroxide washed  1.554 0.956 237.900 2.630  from New Scrap BAT  Maximum for	
Pollutant or Pollutant Property  mg/kg (lb/mi  Lead Cyanide (total) Fluoride Tin  (e) Spent Electrowin  Pollutant or Pollutant Property	Maximum for Any One Day  llion lbs) of  3.347 2.391 418.400 4.542  ning Solution  Maximum for Any One Day  llion lbs) of	Monthly Average  tin hydroxide washed  1.554 0.956 237.900 2.630  from New Scrap BAT  Maximum for Monthly Average  cathode tin produced	
Pollutant or Pollutant Property  mg/kg (lb/mi)  Lead Cyanide (total) Fluoride Tin  (e) Spent Electrowin Pollutant or Pollutant Property  mg/kg (lb/mi)  Lead	Maximum for Any One Day  llion lbs) of  3.347 2.391 418.400 4.542  ning Solution  Maximum for Any One Day  llion lbs) of  4.704	Monthly Average  tin hydroxide washed  1.554 0.956 237.900 2.630  from New Scrap BAT  Maximum for Monthly Average  cathode tin produced  2.184	
Pollutant or Pollutant Property  mg/kg (lb/mi  Lead Cyanide (total) Fluoride Tin  (e) Spent Electrowin  Pollutant or Pollutant Property  mg/kg (lb/mi  Lead Cyanide (total)	Maximum for Any One Day  llion lbs) of  3.347 2.391 418.400 4.542  ning Solution  Maximum for Any One Day  llion lbs) of  4.704 3.360	Monthly Average  tin hydroxide washed  1.554 0.956 237.900 2.630  from New Scrap BAT  Maximum for Monthly Average  cathode tin produced  2.184 1.344	
Pollutant or Pollutant Property  mg/kg (lb/mi)  Lead Cyanide (total) Fluoride Tin  (e) Spent Electrowin  Pollutant or Pollutant Property  mg/kg (lb/mi)  Lead	Maximum for Any One Day  llion lbs) of  3.347 2.391 418.400 4.542  ning Solution  Maximum for Any One Day  llion lbs) of  4.704	Monthly Average  tin hydroxide washed  1.554 0.956 237.900 2.630  from New Scrap BAT  Maximum for Monthly Average  cathode tin produced  2.184	

# (f) $\frac{\text{Spent}}{\text{Waste}} \stackrel{\text{Electrowinning}}{\text{BAT}} \stackrel{\text{Solution}}{\text{Solution}} \stackrel{\text{from Municipal Solid}}{\text{Municipal Solid}}$

Waste BAT		$\mathbf{e}_{i} = \mathbf{e}_{i}$	
Pollutant or	Maximum fo	or Maximum fo	
Pollutant Property	Any One Da		
FOILUCANC FLOPELCY	Any One De	y Monthly Aver	age
mg/kg (lb/million	lbs) of MS	W scrap used as	raw material
Lead	0.033	0.01	5
Cyanide (total)	0.024	0.01	
Fluoride	4.165	2.36	8
Tin	, 0.045	0.02	6
(g) <u>Tin Hydroxide</u> <u>Su</u>	pernatant f	rom Scrap BAT	
Pollutant or	Maximum fo	or Maximum fo	r
Pollutant Property	1		•
mg/kg (lb/million	lbs) of ti	n metal recovere	d from scrap
Lead	15.580	7.23	3
Cyanide (total)	11.130	4.45	
Fluoride	1,947.000	1,107.00	0
Tin	21.140	12.24	0
	· · · · · · · · · · · · · · · · · · ·		
(h) Tin Hydroxide Sur Solutions and Sl		rom Plating	
Pollutant or	Maximum fo	or Maximum fo	· · · · · · · · · · · · · · · · · · ·
Pollutant Property	Any One Da		
mg/lsg /1b/mill	ion lbcl of	tin metal recov	orod from
		ons and sludges	ered from
Lead	32.200	14.95	
Cyanide (total)	23.000	9.20	
Fluoride	4,025.000	2,289.00	
Tin	43.700	25.30	0
		· · · · · · · · · · · · · · · · · · ·	
(i) <u>Tin Hydroxide</u> <u>Fi</u>	ltrate BAT	·	· .
Pollutant or	Maximum fo	or Maximum fo	r
Pollutant Property	Any One Da	y Monthly Aver	age
mg/kg (lb/m	illion lbs)	of tin metal pr	oduced
Lead	7.012	3.25	6
Cyanide (total)	5.009	2.00	and the second s
Fluoride	876.500	498.40	
Tin	9.517	5.51	· · · · · · · · · · · · · · · · · · ·
<del></del>	, , , ,	3.31	-

### SECONDARY TIN SUBCATEGORY SECT - II

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 cyanide precipitation for selected waste streams. The following effluent standards are promulgated for new sources:

## (a) Tin Smelter SO<sub>2</sub> Scrubber NSPS

Pollutant or	Maximum for Maximum for
Pollutant Property	Any One Day Monthly Average
ma/ka (lb/mill	ion lbs) of crude tapped tin produced
mg/ng (15/m111	Ton 1907 of crade capped tin produced
Arsenic	12.790 5.703
Lead	2.575 1.196
Iron	11.040 5.611
Tin	3.495 2.024
TSS	138.000 110.400
pH Within	the range of 7.5 to 10.0 at all times
(b) Dealuminizing Ri	nge NGDG
(b) <u>beatuminizing</u> <u>ki</u>	inse institution
Pollutant or	Maximum for Maximum for
· ·	
Pollutant Property	Any One Day Monthly Average
mg/kg (lb/milli	on lbs) of dealuminized scrap produced
Lead	0.010 0.005
Cyanide (total)	0.007 0.003
Fluoride	1.225 0.697
Tin	0.013 0.008
TSS	0.525 0.420
	the range of 7.5 to 10.0 at all times
pii	the range of 7.3 to 10.0 at all times
(a) Tin Mud Acid Neu	tralization Filtrate NSPS
(C) IIII Mud ACIO Neu	craffzactom filtrace NSPS
Pollutant or	Maximum for Maximum for
Pollutant Property	Any One Day Monthly Average
mg/kg (lb/mill.	ion lbs) of neutralized dewatered tin
	mud produced
Lead	1.413 0.656
Cyanide (total)	1.009 0.404
Fluoride	176.600 100.400
Tin	1.918 1.110
TSS	75.710 60.560
pH Within	the range of 7.5 to 10.0 at all times

# SECONDARY TIN SUBCATEGORY SECT - II

# (d) <u>Tin Hydroxide Wash</u> NSPS

Pollutant or	Maximun	for	Maximum fo	r
Pollutant Property			onthly Aver	
				5 -
mg/kg (lb/m	illion l	s) of ti	n hydroxide	washed
_		_		_
Lead	3.3		1.55	
Cyanide (total)	2.3		0.95	
Fluoride	418.4		237.90	
Tin	and the second s	42	2.63	
TSS	179.3		143.40	
pH Within	n the rar	ige of 7.	5 to 10.0 a	t all times
(e) Spent Electrowin	nning Sol	ution fro	om New Scra	o NSPS
Pollutant or	Maximun	for	Maximum fo	r
Pollutant Property			onthly Avera	
I O I I O P O P O P O P O P O P O P O P		. 201		
mg/kg (lb/m	illion lk	s) of ca	thode tin p	roduced
Lead	4.7	04	2.18	4
Cyanide (total)		160	1.34	
Fluoride	588.0		334.30	
Tin		884	3.69	
TSS	252.0		201.60	
pH Within	the rang	e of 7.5	to 10.0 at	
(f) Spent Electrowin	ning Col	ution fr	om Municipo	l Colid
(f) Spent Electrowing Waste NSPS	mind 201	ucion iii	om Municipa.	50114
Masec Nors				
Pollutant or	Maximum	for	Maximum for	<u> </u>
Pollutant Property	Any One	Day Mo	onthly Avera	age
	· -			
mg/kg (lb/million	lbs) of	MSW scra	ap used as	raw material
T			0 01	<b>-</b> :
Lead	0.0		0.019	
Cyanide (total)	0.0		0.00	
Fluoride	4.1		2.368	
Tin TSS	1.7	45	0.026 1.428	
			1.426 5 to 10.0 at	
pH Within	r iciie ran	ye UL / .	, LU 10.0 a	arr cimes

# (g) Tin Hydroxide Supernatant from Scrap NSPS

Pollutant or	Maximum for Maximum for
Pollutant Property	Any One Day Monthly Average
mg/kg (lb/million	lbs) of tin metal recovered from scrap
Lead	15.580 7.233
Cyanide (total)	11.130 4.451
Fluoride	1,947.000 1,107.000
Tin	21.140 12.240
TSS	834.600 667.700
pH Within	the range of 7.5 to 10.0 at all times

# (h) Tin Hydroxide Supernatant from Plating Solutions and Sludges NSPS

Pollutant or	Maximum for		
Pollutant Property	Any One Day	Monthly Average	-
		tin metal recovered from	n
pla	ating solutio	ns and sludges	•
· -			

Lead	32.200	14.950
Cyanide (total)	23.000	9.200
Fluoride	4,025.000	2,289.000
Tin	43.700	25.300
TSS	1,725.000	1,380.000
pH Wi	thin the range of 7.	5 to 10.0 at all times

## (i) Tin Hydroxide Filtrate NSPS

Pollutant o		Maximum for Any One Day	Maximum for Monthly Average	
m	g/kg (lb/m	illion lbs) of	tin metal produced	1
Lead Cyanide (to Fluoride Tin TSS pH		7.012 5.009 876.500 9.517 375.700 the range of	3.256 2.004 498.400 5.510 300.500 7.5 to 10.0 at all	times

PSES are promulgated 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 cyanide precipitation for selected waste streams. The following pretreatment standards are promulgated for existing sources:

# (a) <u>Tin Smelter SO<sub>2</sub> Scrubber PSES</u>

		•
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
<b>-</b>		
mg/kg (lb/mil:	lion lbs) of c	rude tapped tin produce
3. 3		
Arsenic	12.790	5.703
Lead	2.575	1.196
Iron	11.040	5,611
Tin	3.495	2.024
± ± ± ±		2.024
(b) Dealuminizing Ri	inse PSES	
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/mill:	ion lbs) of dea	aluminized scrap produce
Lead	0.010	0.005
Cyanide (total)	0.007	0.003
Fluoride	1.225	0.697
Tin	0.013	0.008
TIN	0.013	0.008
Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/mil]		eutralized dewatered tim
	mud produ	uced
Lead	1.413	0.656
		0.404
Cyanide (total)	1.009	
Fluoride	176.600	100.400
Tin	1.918	1.110
(d) <u>Tin Hydroxide</u> Wa	ash PSES	
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/mi	illion lbs) of	tin hydroxide washed
P.c. J	2 247	1 554
Lead		
O	3.347	1.554
	2.391	0.956
Fluoride	2.391 418.400	0.956 <b>237.9</b> 00
Cyanide (total) Fluoride Tin	2.391	0.956

# (e) Spent Electrowinning Solution from New Scrap PSES

Waste         PSES           ollutant or ollutant Property         Maximum for Maximum for Maximum for Maximum for Monthly Average           mg/kg (lb/million lbs) of MSW scrap used as raw material maximum for Max	(0) <u>DD0110</u> <u>===00010W=11</u>				<u> </u>	
Monthly Average   mg/kg (lb/million lbs) of cathode tin produced   dead   4.704   2.184   3.360   1.344   1.	Pollutant or	Maximum	for	Maxim	um for	<del></del>
mg/kg (lb/million lbs) of cathode tin produced   4.704						
Spent   Electrowinning   Solution   From   Municipal   Solid	round rroperty	imy one	Day	noncinzy	merage	•
Yanide (total)   3.360   1.344     luoride   588.000   334.300     in   6.384   3.696     Spent   Electrowinning   Solution   from   Municipal   Solid     Waste   PSES     Ollutant or   Maximum   for   Maximum   for     Ollutant   Property   Any   One   Day   Monthly   Average     mg/kg (lb/million   lbs)   of   MSW   scrap   used   as   raw   materical     ead   0.033   0.015     yanide (total)   0.024   0.010     luoride   4.165   2.368     in   0.045   0.026     G)   Tin   Hydroxide   Supernatant   from   Scrap   PSES     Ollutant   Or   Maximum   for   Maximum   for     ollutant   Property   Any   One   Day   Monthly   Average     mg/kg (lb/million   lbs)   of   tin   metal   recovered   from   scr.     ead   15.580   7.233     yanide (total)   1.130   4.451     luoride   1,947.000   1,107.000     in   21.140   12.240     h)   Tin   Hydroxide   Supernatant   from   Plating     Solutions   and   Sludges   PSES     Ollutant   Or   Maximum   for   Maximum   for     ollutant   Or   Plating   Solutions   and   sludges     mg/kg (lb/million   lbs)   of   tin   metal   recovered   from     plating   solutions   and   sludges     ead   32.200   14.950     yanide   (total)   23.000   9.200     duoride   4,025.000   2,289.000	mg/kg (lb/mi	llion lbs	s) of	cathode	tin produ	ıced
Yanide (total)   3.360   1.344     luoride   588.000   334.300     in   6.384   3.696     Spent   Electrowinning   Solution   from   Municipal   Solid     Waste   PSES     Ollutant or   Maximum   for   Maximum   for     Ollutant   Property   Any   One   Day   Monthly   Average     mg/kg (lb/million   lbs)   of   MSW   scrap   used   as   raw   materical     ead   0.033   0.015     yanide (total)   0.024   0.010     luoride   4.165   2.368     in   0.045   0.026     G)   Tin   Hydroxide   Supernatant   from   Scrap   PSES     Ollutant   Or   Maximum   for   Maximum   for     ollutant   Property   Any   One   Day   Monthly   Average     mg/kg (lb/million   lbs)   of   tin   metal   recovered   from   scr.     ead   15.580   7.233     yanide (total)   1.130   4.451     luoride   1,947.000   1,107.000     in   21.140   12.240     h)   Tin   Hydroxide   Supernatant   from   Plating     Solutions   and   Sludges   PSES     Ollutant   Or   Maximum   for   Maximum   for     ollutant   Or   Plating   Solutions   and   sludges     mg/kg (lb/million   lbs)   of   tin   metal   recovered   from     plating   solutions   and   sludges     ead   32.200   14.950     yanide   (total)   23.000   9.200     duoride   4,025.000   2,289.000	T J	4 70	n 4		2 70/	
Spent   Electrowinning   Solution   from   Municipal   Solid						
f) Spent Electrowinning Solution from Municipal Solid  Waste PSES  ollutant or Maximum for Monthly Average  mg/kg (lb/million lbs) of MSW scrap used as raw materice ead 0.033 0.015 yanide (total) 0.024 0.010 luoride 4.165 2.368 in 0.045 0.026  g) Tin Hydroxide Supernatant from Scrap PSES  ollutant or Maximum for Maximum for ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from scraped (total) 1.130 4.451 luoride 1.947.000 1.107.000 in 21.140 12.240  h) Tin Hydroxide Supernatant from Plating Solutions and Sludges PSES  ollutant or Maximum for Ma						
f) Spent Electrowinning Solution from Municipal Solid  Waste PSES  collutant or Maximum for Maximum for ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of MSW scrap used as raw matericated 0.033 0.015  ead 0.024 0.010  luoride 4.165 2.368  in 0.045 0.026  g) Tin Hydroxide Supernatant from Scrap PSES  collutant or Maximum for Maximum for ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from scr.ead  yanide (total) 1.130 7.233  yanide (total) 1.130 4.451  luoride 1,947.000 1,107.000  in 21.140 12.240  h) Tin Hydroxide Supernatant from Plating  Solutions and Sludges PSES  collutant or Maximum for Maximum for ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from plating solutions and sludges  mg/kg (lb/million lbs) of tin metal recovered from plating solutions and sludges  ead  yanide (total) 23.000 14.950  yanide (total) 23.000 9.200  luoride 4,025.000 2,289.000				3		
Waste   PSES	rin	6.38	34		3.696	
Waste   PSES	<del></del>				<del></del>	
Waste   PSES	(f) Spent Electrowin	ning Solu	ution	from Mun	icipal So	olid
mg/kg (lb/million lbs) of MSW scrap used as raw material ead	Waste PSES					<del></del>
mg/kg (lb/million lbs) of MSW scrap used as raw material ead					×,	
mg/kg (lb/million lbs) of MSW scrap used as raw material ead	Pollutant or	Maximum	for	Maxim	um for	- <del> </del>
mg/kg (lb/million lbs) of MSW scrap used as raw material ead		Any One	Dav	Monthly	Average	
ead		;	7			
yanide (total)         0.024         0.010           luoride         4.165         2.368           in         0.045         0.026           g)         Tin Hydroxide Supernatant from Scrap PSES           ollutant or ollutant or ollutant Property Any One Day Monthly Average           mg/kg (lb/million lbs) of tin metal recovered from scrapanide (total)         15.580         7.233           yanide (total)         11.130         4.451           luoride         1,947.000         1,107.000           in         21.140         12.240    (b)  Tin Hydroxide Supernatant from Plating Solutions and Sludges PSES  (ollutant or Maximum for Maximum for Ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from plating solutions and sludges  ead  yanide (total)         32.200         14.950           yanide (total)         23.000         9.200           luoride         4,025.000         2,289.000	mg/kg (lb/million	1bs) of	MSW s	crap use	d as raw	materia
yanide (total)         0.024         0.010           luoride         4.165         2.368           in         0.045         0.026           g)         Tin Hydroxide Supernatant from Scrap PSES           ollutant or ollutant or ollutant Property Any One Day Monthly Average           mg/kg (lb/million lbs) of tin metal recovered from scrapanide (total)         15.580         7.233           yanide (total)         11.130         4.451           luoride         1,947.000         1,107.000           in         21.140         12.240    (b)  Tin Hydroxide Supernatant from Plating Solutions and Sludges PSES  (ollutant or Maximum for Maximum for Ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from plating solutions and sludges  ead  yanide (total)         32.200         14.950           yanide (total)         23.000         9.200           luoride         4,025.000         2,289.000	- A-A	0.0		**	0.015	
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in 0.045 0.026  g) Tin Hydroxide Supernatant from Scrap PSES  ollutant or Maximum for Maximum for ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from scratead 15.580 7.233 yanide (total) 11.130 4.451 luoride 1,947.000 1,107.000 in 21.140 12.240  h) Tin Hydroxide Supernatant from Plating Solutions and Sludges PSES  ollutant or Maximum for Maximum for ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from plating solutions and sludges  ead 32.200 14.950 yanide (total) 23.000 9.200 luoride 4,025.000 2,289.000						
g) Tin Hydroxide Supernatant from Scrap PSES  ollutant or Maximum for Maximum for ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from scrape dead 15.580 7.233 yanide (total) 11.130 4.451 luoride 1,947.000 1,107.000 in 21.140 12.240  h) Tin Hydroxide Supernatant from Plating Solutions and Sludges PSES  ollutant or Maximum for Maximum for ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from plating solutions and sludges  ead 32.200 14.950 yanide (total) 23.000 9.200 luoride 4,025.000 2,289.000						
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ollutant or ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from scratead ead 15.580 7.233 yanide (total) 11.130 4.451 luoride 1,947.000 1,107.000 in 21.140 12.240  h) Tin Hydroxide Supernatant from Plating Solutions and Sludges PSES  ollutant or Maximum for Maximum for ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from plating solutions and sludges  ead 32.200 14.950 yanide (total) 23.000 9.200 luoride 4,025.000 2,289.000	a) Tin Hydroxide Su	pernatant	fron	Scrap	PSES	
mg/kg (lb/million lbs) of tin metal recovered from scratead ead yanide (total) luoride in  Tin Hydroxide Supernatant from Plating Solutions and Sludges PSES  ollutant or Maximum for Maximum for ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from plating solutions and sludges  ead yanide (total)	(9) <u>1111 mydronido</u> <u>Dd</u>	JCI II GCGIII	= ====	<u> </u>		
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ead	Pollutant Property	Any One	Day	Monthly	Average	
yanide (total) 11.130 4.451 luoride 1,947.000 1,107.000 in 21.140 12.240  h) Tin Hydroxide Supernatant from Plating Solutions and Sludges PSES  ollutant or Maximum for Maximum for ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from plating solutions and sludges  ead 32.200 14.950 yanide (total) 23.000 9.200 luoride 4,025.000 2,289.000	mg/kg (lb/million	lbs) of	tin m	netal rec	overed fi	om scra
yanide (total) 11.130 4.451 luoride 1,947.000 1,107.000 in 21.140 12.240  h) Tin Hydroxide Supernatant from Plating Solutions and Sludges PSES  ollutant or Maximum for Maximum for ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from plating solutions and sludges  ead 32.200 14.950 yanide (total) 23.000 9.200 luoride 4,025.000 2,289.000	ead	15.58	30		7.233	
luoride in  1,947.000 21.140  12.240  h) Tin Hydroxide Supernatant from Plating Solutions and Sludges PSES  ollutant or Maximum for Maximum for ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from plating solutions and sludges  ead yanide (total) 1,947.000 1,107.000 12.240  Maximum for Maximum fo	<del>-</del>	1.1				•
in 21.140 12.240  h) Tin Hydroxide Supernatant from Plating Solutions and Sludges PSES  ollutant or Maximum for Maximum for ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from plating solutions and sludges  ead 32.200 14.950 yanide (total) 23.000 9.200 luoride 4,025.000 2,289.000				7 1		
h) Tin Hydroxide Supernatant from Plating Solutions and Sludges PSES  ollutant or Maximum for Maximum for ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from plating solutions and sludges  ead 32.200 14.950 yanide (total) 23.000 9.200 luoride 4,025.000 2,289.000				•		
Solutions and Sludges PSES  ollutant or Maximum for Maximum for ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from plating solutions and sludges  ead 32.200 14.950 yanide (total) 23.000 9.200 luoride 4,025.000 2,289.000	:1n	74 · 14	ł O		12.240	
Solutions and Sludges PSES  ollutant or Maximum for Maximum for ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from plating solutions and sludges  ead 32.200 14.950 yanide (total) 23.000 9.200 luoride 4,025.000 2,289.000				<u> </u>		
Solutions and Sludges PSES  ollutant or Maximum for Maximum for ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from plating solutions and sludges  ead 32.200 14.950 yanide (total) 23.000 9.200 luoride 4,025.000 2,289.000	(h) Tin Hydroxide Su	pernatant	from	n Plating	•	
ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from plating solutions and sludges  ead 32.200 14.950 4.950 9.200 14.025.000 2,289.000					•	
ollutant Property Any One Day Monthly Average  mg/kg (lb/million lbs) of tin metal recovered from plating solutions and sludges  ead 32.200 14.950 4.950 9.200 14.025.000 2,289.000						
mg/kg (lb/million lbs) of tin metal recovered from plating solutions and sludges  ead 32.200 14.950 yanide (total) 23.000 9.200 luoride 4,025.000 2,289.000	Pollutant or	Maximum	for	Maxim	um for	-
plating solutions and sludges  ead 32.200 14.950 yanide (total) 23.000 9.200 luoride 4,025.000 2,289.000	Pollutant Property	Any One	Day	Monthly	Average	
plating solutions and sludges  ead 32.200 14.950 yanide (total) 23.000 9.200 luoride 4,025.000 2,289.000	mg/kg (1b/mill	ion lhel	of ti	n metal	recovered	from
yanide (total)23.0009.200luoride4,025.0002,289.000						
yanide (total)23.0009.200luoride4,025.0002,289.000					14 050	
luoride 4,025.000 2,289.000	· ·	and the second second		;		
luoride 4,025.000 2,289.000	Cyanide (total)					
	Pluoride	4,025.00	0 0	2,2	89.000	
	n:					
	L'T U	43.70	0 (		25.300	

# (i) Tin Hydroxide Filtrate PSES

Pollutant or	Maximum for	Maximum for	<del></del> .
Pollutant Property	Any One Day	Monthly Average	
mg/kg (lb/million lbs	) of tin metal	produced	
Lead	7.012	3.256	· ·
Cyanide (total)	5.009	2.004	
Fluoride	876.500	498.400	
Tin	9.517	5.510	

PSNS are promulgated 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 cyanide precipitation for selected waste streams. The following pretreatment standards are promulgated for new sources.

# (a) Tin Smelter SO2 Scrubber PSNS

Pollutant or Pollutant Prope	•	Maximum for onthly Average
mg/kg (:	lb/million lbs) of crude	tapped tin produced
Arsenic Lead Iron Tin	12.790 2.575 11.040 3.495	5.703 1.196 5.611 2.024

## (b) Dealuminizing Rinse PSNS

Pollutant or

Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/millio	on lbs) of dea	aluminized scrap produced
Lead Cyanide (total) Fluoride Tin	0.010 0.007 1.225 0.013	0.005 0.003 0.697 0.008

Maximum for

Maximum for

# (c) <u>Tin Mud Acid Neutralization Filtrate</u> PSNS

. ,			
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
ma/ka (1b/m;11	ion lbal of n	eutralized dewatered t	• -
mg/kg (ID/mIII	mud produ		ın
	mud produ	iceu	
Lead	1.413	0.656	
Cyanide (total)	1.009	0.404	
Fluoride	176.600	100.400	
Tin	1.918	1.110	
1 1	1		
d) <u>Tin Hydroxide Was</u>	<u>h</u> PSNS		
Pollutant or	Maximum for	Maximum for	
Pollutant Property		Monthly Average	
Torracant Property	miy one bay	Honenry Average	
mg/kg (lb/mi	llion lbs) of	tin hydroxide washed	<del></del>
Lead	3.347	1.554	
Cyanide (total)	2.391	0.956	
Fluoride	418.400	237.900	
Tin	4.542	2.630	
·	<u> </u>		
e) Spent Electrowinn	ing Solution f	rom New Scrap PSNS	
c) bent hitetiowing	ing borderon i	TOM NEW BETAD IBNB	
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
mg/kg (lb/mi	llion lbs) of	cathode tin produced	
Lead	4 704	2.184	
— <del></del>	4.704 3.360		
Cyanide (total) Fluoride	588.000	1.344 334.300	
Tin	6.384	3.696	-
1111	0.304	3.000	
		· · · · · · · · · · · · · · · · · · ·	
f) Spent Electrowinn	ing Solution f	rom Municipal Solid	
Waste PSNS			٠.
	, i		
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
ma/ka /1h/	million lbc\ c	of MSW scrap used as	<del></del>
mg/kg (ID/	raw mater		
• • • • • • • • • • • • • • • • • • •	TOW MOLET		
Lead	0.033	0.015	
Cyanide (total)	0.024	0.010	
Fluoride	4.165	2.368	
Tin	0.045	0.026	

# (g) Tin Hydroxide Supernatant from Scrap PSNS

	1					
Pollutant or	Maximum	for	Ma	aximum f	or	
Pollutant Property	Any One	Day	Mont	thly Ave	erage	
	· .					
mg/kg (lb/million	lbs) of	tin	metal	recover	ed from	scrag
	1					
Lead	15.58	0		7.2	233	
Cyanide (total)	11,.13				51	
Fluoride	1,947.00	0		1,107.0	00	
Tin	21.14	0		12.2	40	
	;					
(h) Tin Hydroxide Sup	pernatant	fro	m Plat	ting		
Solutions and Slu	udges   PSI	NS				
	i					
Pollutant or	Maximum	for	Ma	aximum f	or	
Pollutant Property	Any One	Day	Mont	chly Ave	rage	+ 1
mg/kg (lb/mill:						rom
plat	ting solu	tion	s and	sludges	}	
_	1				·	
Lead	32.20	0		14.9	50	
Cyanide (total)	23.00	0		9.2	00	
Fluoride	4,025.00	0		2,289.0	00	
Tin	43.70			25.3		
	1					
(i) Tin Hydroxide Fil	ltrate P	SNS			* * *	*
Pollutant or	Maximum :	for	Má	aximum f	or	
Pollutant Property	Any One	Dav	Mont	hly Ave	rade	
1	<b>-</b> i	_		-	J	
mg/kg (lb/m	illion lb	s) o	f tin	metal r	roduced	
37 4 5 1 7	1	•				
Lead	7.01	2		3.2	56	
Cyanide (total)	5.00			2.0		i
Fluoride	876.50			498.4		
Tin	9.51			5.5		
4.4.16	7.71	• .	•	J • u		

EPA is not promulgating BCT for the secondary tin subcategory at this time.

#### SECTION III

### SUBCATEGORY PROFILE

This section of the secondary tin supplement describes the raw materials and processes used in the production of secondary tin and presents a profile of the secondary tin plants identified in this study.

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 such as brass, bronze, and white metal alloys including babbitt. 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 SECONDARY TIN PRODUCTION

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 (page 4052).

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. These secondary tin production operations 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 (page 4053).

### RAW MATERIALS

Tin concentrates used in tin production are imported from South America and Malaysia. EPA considers these tin concentrates to be secondary raw materials for the purpose of establishing effluent limitations. There are no tin producing facilities in the United States that manufacture tin from concentrates alone.

The other 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. residues (and sometimes concentrates) are smelted in a kaldo furnace with limestone, magnesium oxide, and coke at 2,000 to 2,400°F. When the tin content of the residual slag reaches 5 to 7 percent, pyrite is added to liberate additional tin as volatile tin sulfide. The tin sulfide is contacted with atmospheric oxygen which results in the generation of sulfur dioxide and tin which are captured in a baghouse and later oxide particles recycled to the furnace. Sulfur dioxide emissions from the smelting furnace are controlled with a scrubber employing a slurry of finely ground aragonite and water as the scrubbing solution. Crude molten tin is periodically tapped 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<sub>2</sub>SnO<sub>3</sub>. The chemical reaction is as follows:

9Sn + 6NaNO<sub>3</sub> + 12NaOH + 9H<sub>2</sub>O ---->

 $9Na_2SnO_3 \cdot H_2O + 2NH_3 + 2N_2 + 3H_2O$ 

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<sub>2</sub>S 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. The one plant which uses this process precipitates tin from a solution which is a mixture of alkaline detinning solution, spent plating solution, and a solution generated by dissolving tin electroplating sludge in water.

#### REDUCTION TO TIN METAL

The tin hydroxide is dried and calcined in a furnace to produce

## SECONDARY TIN SUBCATEGORY SECT - III

tin dioxide, SnO2. 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 secondary tin production, the process wastewater sources can be subdivided as follows:

- (a) Tin smelter SO2 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 plating solutions and sludges, and
- (i) Tin hydroxide filtrate.

### OTHER WASTEWATER SOURCES

may be other waste streams associated with secondary tin subcategory. These streams may include noncontact cooling water, stormwater runoff, and maintenance and cleanup These wastewater streams are not considered water. EPA believes that the flows and of this rulemaking. part these streams with loadings assoc'iated pollutant insignificant relative to the wastewater streams selected are best handled by the appropriate permit authority on case-by-case basis under authority of Section 403 of Clean Water Act.

### AGE, PRODUCTION, AND PROCESS PROFILE

Table III-1 (page 4049) shows the relative age and discharge status of the 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 (page 4050) shows the 1982 production for secondary tin. Eleven of the 12 secondary tin plants have production levels less than 1,000 kkg/yr. One tin producer has a production level between 1,000 and 5,000 kkg/yr.

Table III-3 (page 4051) provides a summary of the number of plants with the various production processes and the number of plants which generate wastewater from each process. Alkaline detinning is practiced by 10 of the 12 secondary tin plants. Of these 10 plants, eight also practice electrowinning. Figure III-3 (page 4054) shows the geographic locations of the secondary tin facilities in the United States by discharge status.

Discharge Type	Initial Operating 1982- 1972- 1973 1968 (0-10) (11-15)	Year (Range) 1967- 1958 (16-25)	(Plant Age : 1957- 1948 (26-35)	in Years) 1947- 1938 (36-45)	Total
Direct	0	1.	1	1	3
Indirect	0 0	1	0	0	1
Zero	<u> </u>	3	ing and the second seco	· · · · · · · · · · · · · · · · · · ·	<u> </u>
TOTAL	2 1	5	2	2	12

TABLE III-2
PRODUCTION RANGES FOR SECONDARY TIN PLANTS FOR 1982

Discharge Type	Produc <u>0-100</u>	tion Range 100-1000	kkg/yr 1000-5000	Total
Direct	*	*	*	3
Indirect	1	0	0	1
Zero	4	<u>4</u>	<u>o</u>	<u>8</u>
Total	*	*	*	12

<sup>\*</sup> Direct discharge production data have been withheld because the information on which they are based has been claimed to be confidential.

Table III-3
SUMMARY OF 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 <sub>2</sub> scrubber	1	1
Alkaline Detinning	10	
<ul><li>Dealuminizing rinse</li><li>Tin mud acid neutralization filtrate</li></ul>	1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Electrowinning	8	
<ul> <li>Tin hydroxide wash</li> <li>Spent electrowinning solution from new scrap</li> <li>Spent electrowinning solution from municipal solid waste</li> </ul>	1 8 1	1 7 1
Tin Hydroxide Precipitation	2	
<ul> <li>Supernatant from scrap</li> <li>Supernatant from plating solutions and sludges</li> <li>Tin hydroxide filtrate</li> </ul>	1 2 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Reduction to Tin Metal	1	

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

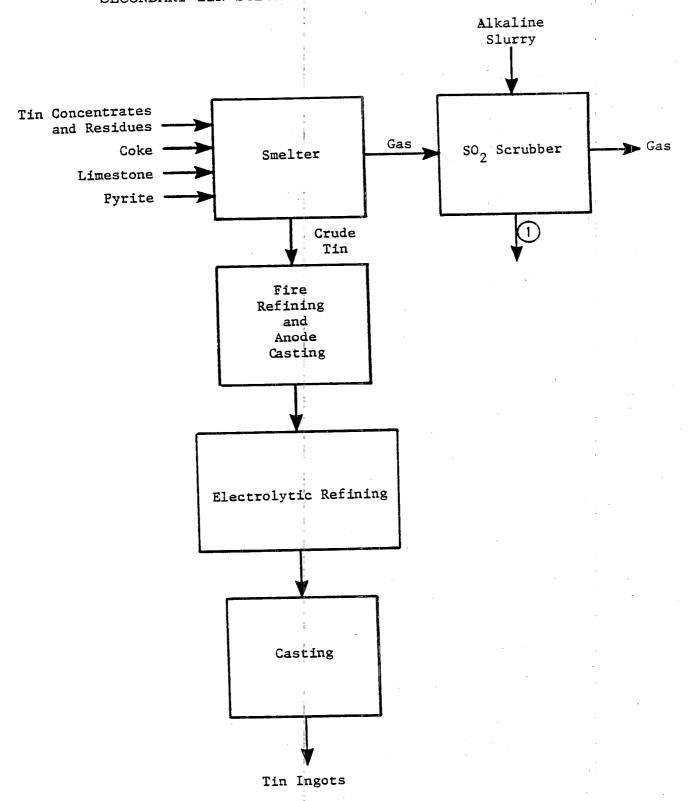


Figure III-1

TIN SMELTING PRODUCTION PROCESS

4053

Figure III-2

SECONDARY TIN SUBCATEGORY

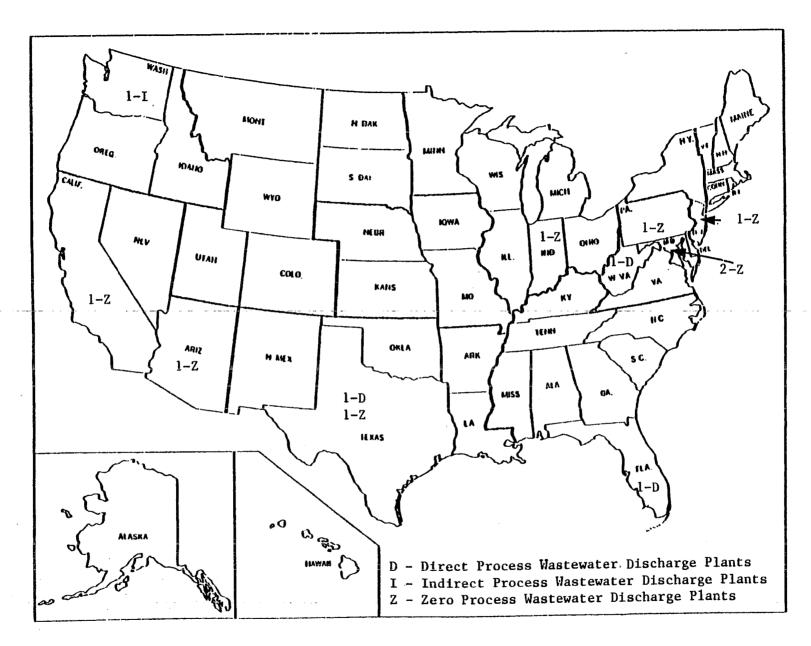


Figure III-3
GEOGRAPHIC LOCATIONS OF THE PRIMARY-AND SECONDARY TIN SUBCATEGORY PLANTS

### SECTION IV

### SUBCATEGORIZATION

section summarizes the factors considered during the designation of related subdivisions or building blocks the of the secondary tin subcategory. Following proposal, the Agency decided to revise the name of this subcategory to Secondary Tin, instead of Primary and Secondary Tin, to more accurately reflect the nature of the raw materials used in this subcategory. The same plants and operations that were included proposal included this Subcategory at are promulgation.

FACTORS CONSIDERED IN SUBDIVIDING THE SECONDARY TIN SUBCATEGORY

The factors listed for general subcategorization were each evaluated when considering subdivision of the secondary tin subcategory. In the discussion that follows, the factors will be described as they pertain to this particular subcategory.

The rationale for. considering segmentation ο£ 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. is still considered While secondary tin 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:

- (a) Tin smelter SO2 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 plating solutions and sludges, and
- (i) Tin hydroxide filtrate.

These subdivisions follow directly from differences within the five production processes which may be used in the production of 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 alkaline scrubbing system. Blowdown of 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 stream associated with electrowinning is 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, 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 two types of raw materials: tin plated steel scrap, and plating solutions and sludges. Tin hydroxide filtrate from dewatering the precipitated tin hydroxide is also designated as a separate subdivision.

Following proposal, the Agency decided to combine tin hydroxide supernatant from spent plating solutions and tin plating sludge solids into one subdivision because there is only one plant discharging these streams, as discussed in Section V.

# OTHER FACTORS

The other factors considered in this evaluation were be inappropriate bases for subdivision. Air methods, treatment total costs, and : requirements are functions of the selected subcategorization factors--metal product, raw materials, and production processes. Therefore, they are not independent do not affect the subcategorization which has developed. As discussed in Section IV of the Development Document, certain other factors, such as plant plant size, and the number of employees, were also evaluated and determined to be inappropriate for use as bases 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 nine subdivisions are as follows:

# Building Block

PNP

1. Tin smelter SO<sub>2</sub> scrubber produced

kkg of crude tapped tin

Dealuminizing rinse produced

kkg of dealuminized scrap

### SECT - IV

## SECONDARY TIN SUBCATEGORY

- 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 plating solutions and sludges
- 9. Tin hydroxide filtrate

kkg of neutralized, dewatered tin mud produced

kkg of tin hydroxide washed

kkg of cathode tin produced

kkg of MSW scrap used as raw material

kkg of tin metal recovered

kkg of tin metal recovered from plating solutions and sludges

kkg of tin metal produced

The PNP for subdivision 1, tin smelter SO<sub>2</sub> scrubber, has been changed following proposal to kkg of crude tapped tin produced. This change was made based on information obtained during a visit to a facility generating this wastewater stream.

Subdivision 8, tin hydroxide supernatant from plating solutions and sludges, is a new subdivision for promulgation, consisting of the proposed subdivisions 8 and 9. As such, the PNP for subdivision 8 is a combination of the proposed PNPs for subdivisions 8 and 9; that is, kkg of tin metal recovered from plating solutions and sludges.

#### SECTION V

#### WATER USE AND WASTEWATER CHARACTERISTICS

This section describes the characteristics of the wastewaters associated with the 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. Data collection portfolios (dcp) and field sampling results were used in the development of effluent limitations and standards for this subcategory. Data collection portfolios contain information regarding wastewater flows and production levels.

In order to quantify the pollutant discharge from secondary tin plants, a field sampling program was conducted. A complete list of the pollutants considered and a summary of 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 priority pollutants and other pollutants deemed appropriate. Because the standard for TCDD was judged to be too hazardous to be generally available, samples were never analyzed for this Samples were also not analyzed for asbestos. pollutant. There no reason to expect that TCDD or asbestos would present in wastewater in the secondary tin subcategory. samples were analyzed for cyanide and three general, the classes of pollutants: priority organic priority pollutants, pollutants, and criteria pollutants (which priority metal includes both conventional and nonconventional pollutants).

Following proposal, additional data were gathered concerning flow, production, and wastewater characteristics at one of the tin plants identified in this study. These data were obtained during a field sampling episode, and are contained in the administrative record supporting this rulemaking.

In addition, EPA collected more economic information on plants in the secondary tin subcategory, which is contained in the administrative record supporting this rulemaking. Revisions to the economics analysis are discussed in a separate document. Through the economic data gathering, EPA learned that one secondary tin plant had changed discharge status following proposal. Using an evaporation system, plant 1014 changed from being an indirect discharger to a zero discharge facility. Due to this process change, EPA decided to revise the subdivision scheme for this subcategory, by combining 2 subdivisions into 1 subdivision, namely, combining tin hydroxide supernatant from spent plating solutions and tin hydroxide supernatant from sludge solids into tin hydroxide supernatant from plating solutions and

sludges. As discussed in Section IV, the PNP for this new subdivision has also been appropriately revised. This revision is being made for regulatory simplification reasons, and will not affect the mass limitations with which any plant in this subcategory must comply. This change is discussed in more detail later in this section and also in section IX.

After proposal, EPA gathered additional wastewater sampling data for two of the subdivisions in this subcategory, tin mud acid neutralization filtrate and dealuminizing rinse. These data were acquired through a self sampling program conducted at the specific request of EPA. The data include analysis for the priority metals antimony, arsenic, cadmium, chromium, copper, lead, nickel, selenium, silver, thallium and zinc. The data also include analyses for cyanide and the nonconventional pollutant tin. The data support the assumptions which EPA had made at proposal concerning the presence and concentrations of pollutants in these subdivisions where we did not have analytical data for specific pollutants. For this reason, the selection of pollutant parameters for limitation in this subcategory (Section VI) has not been revised based on this new data.

described in Section IV of this supplement, the subcategory has been divided into 9 subdivisions wastewater sources, so that the promulgated contains mass discharge limitations and standards for unit processes discharging process wastewater. Differences wastewater characteristics associated with subdivisions are to be expected. For this reason, wastewater corresponding to each subdivision are addressed separately in the discussions that follow. These wastewater sources are:

- (a) Tin smelter SO2 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 plating solutions and sludges, and
- (i) 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

### SECONDARY TIN SUBCATEGORY SECT - V

produced. Differences between the water use and wastewater flows associated with a given stream result from recycle, evaporation, and carry-over 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<sub>2</sub> scrubber water flow is related to the production of crude tapped tin. As such, the discharge rate is expressed in liters of scrubber water per metric ton of crude tapped tin (gallons of scrubber water per ton of crude tapped tin).

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-9 (pages 4068 - 4070). appropriate, an attempt was made to identify factors Where that could account for variations in water use 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 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 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 priority pollutants in their wastewater. Three of the five discharging plants responded. The responses are summarized below:

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

#### FIELD SAMPLING DATA

In order to quantify the concentrations of pollutants present in wastewater from secondary tin plants, wastewater samples were collected at five plants, which represent more than one-third of the secondary tin plants in the United States. Diagrams indicating the sampling sites and contributing production processes are shown in Figures V-1 through V-5 (pages 4210 - 4214).

Raw wastewater data are summarized in Tables V-10 through V-15 (pages 4071-4140). Data from samples of treated and partially treated wastewater streams are presented in Tables V-16 through V-22 (pages 4151-4205). The stream numbers listed in the tables correspond to those given in the individual plant sampling site diagrams, Figures V-1 through V-5. 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. 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.

The detection limits shown on the data tables for priority 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 used were reported with the analytical data and hence are the appropriate limits to apply to the data. Detection variation can occur as a result of a number of laboratoryequipment-specific, specific, and daily operator-specific factors. These factors can include day-to-day differences machine calibration, variation in stock solutions, and variation in operators.

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

### SECONDARY TIN SUBCATEGORY SECT - V

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 secondary tin production involves 9 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 SO2 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 SO2s emissions in the smelter flue gas. The scrubber uses a recirculating alkaline solution. A portion of the solution must be discharged in order to maintain effective SO2 removal. The water use and wastewater discharge rates for this stream are shown in liters per metric ton of crude tapped tin in Table V-1 (page 4049).

Following proposal, the one facility reporting this waste stream was visited and the scrubber blowdown was sampled. It was determined that this scrubber currently operates at greater than 90 percent recycle. The blowdown is directly discharged following equalization, chemical precipitation and sedimentation. Analytical data for this stream are presented in Table V-10 (page 4071). These data show treatable concentrations of arsenic, cadmium, chromium, copper, lead, selenium, zinc, tin, and suspended solids.

### 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 (page 4068) in liters per metric ton of dealuminized scrap produced.

There was no analytical data for this stream available before proposal and it was 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. Data supplied to the Agency after proposal corroborates the assumption that a treatable level of cyanide is present.

### 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 (page 4068) in liters per metric ton of neutralized, dewatered tin mud produced.

Analytical data for this wastewater stream were collected after proposal through a self sampling program at the specific request of EPA. These data are presented in Table V-23 (page 4209) and show that this stream contains treatable concentrations of cyanide and zinc.

#### 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 washed with tin hydroxide is water to impurities, dissolved in a sodium hydroxide solution and mixed with the tin solution from the alkaline detinning operation to entering the electrowinning cell. hydroxide wash water is discharged as a waste stream. one facility reporting this stream achieves zero discharge through the use of an evaporation pond. The water use discharge rates are shown in liters per metric ton of hydroxide washed in Table V-4 (page 4069).

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 priority 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 (page 4069) in liters per metric ton of cathode tin produced.

Table V-11 (page 4082) summarizes the raw wastewater sampling data for the priority and selected conventional and nonconventional pollutants. It can be seen that there are treatable concentrations of several priority 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 (page 4069) 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 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<sub>2</sub>SnO<sub>3</sub>. 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 (page 4070) 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 (page 4102) summarizes the raw wastewater sampling data for the priority and selected conventional and nonconventional pollutants. It can be seen that treatable levels of priority 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 PLATING SOLUTIONS AND SLUDGES

Two plants reported the use of spent tin plating solutions as raw One facility recovers tin as tin hydroxide from both material. 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. hydroxide is then precipitated from the resultant solution. second facility uses only spent plating solutions. proposal, the Agency learned that the second Following facility revised their process for recovering tin from solution. Instead of precipitating tin hydroxide using ammonia, discharging the liquids, the solution is completely evaporated in an oven to produce a tin hydrate product. No process water is discharged from this operation.

The Agency revised this subdivision for promulgation by combining tin hydroxide supernatant from spent plating solutions with tin hydroxide supernatant from tin plating sludge solids to form a new subdivision, namely tin hydroxide supernatant from plating solutions and sludges. The water use and discharge rates for this subdivision are presented in Table V-8 (page 4070). This revision was made to simplify the regulation, and will not change the mass limitations with which any plant must comply.

Sampling data for tin hydroxide supernatant from tin plating and sludges is presented in Table V-13 (page 4113). solutions The samples were collected at the facility which plating solutions and tin sludge solids as raw materials to tin hydroxide precipitation operations. Ιt can be priority treatable concentrations of metals particularly antimony which was detected present, concentration of 3.1 mg/l. Cyanide is maximum maximum observed concentration of present with a 16 Very high concentrations of | fluoride are present with concentrations from 12,000 15,000 to from This fluoride originates tin fluoroborate fluoroboric acid which are used in the tin plating рН This wastewater has nearly-neutral and treatable a of suspended solids. concentrations

#### TIN HYDROXIDE FILTRATE

When tin hydroxide slurry is separated from the supernatant stream, it may be further dewatered in a filter press prior to

## SECONDARY TIN SUBCATEGORY SECT - V

drying. The resultant filtrate is discharged as a wastewater stream. Water use and discharge rates are presented in Table V-10 (page 4071) 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 (page 4129) summarizes the sampling data for this waste stream. Treatable concentrations of cyanide and priority metals are present including antimony at 2.4 mg/l. Treatable concentrations of fluoride and TSS are also present.

## SECONDARY TIN SUBCATEGORY SECT - V

### TABLE V-1

## WATER USE AND DISCHARGE RATES TIN SMELTER SO<sub>2</sub> SCRUBBER

(1/kkg of crude tapped tin produced)

Plant Code	Percent Recycle	Production Normalized <u>Water</u> <u>Use</u>	Production Normalized <u>Discharge</u> <u>Rate</u>
1118	>90	NR	9198

### TABLE V-2

# WATER USE AND DISCHARGE RATES DEALUMINIZING RINSE

(1/kkg of dealuminized scrap produced)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Rate
1046	0	35	35
			· ·

### TABLE V-3

# WATER USE AND DISCHARGE RATES TIN MUD ACID NEUTRALIZATION FILTRATE

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

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Rate
1046	0	5047	5047

### SECONDARY TIN SUBCATEGORY SECT - V

#### TABLE V-4

### WATER USE AND DISCHARGE RATES TIN HYDROXIDE WASH

### (1/kkg of tin hydroxide washed)

Plant Code	Percent Recycle	Production Normalized <u>Water</u> <u>Use</u>	Production Normalized Discharge Rate		
1049	0	11953	11953		
- Annual Control of the Control of t			<ul> <li>Solution of the second of the s</li></ul>		

#### TABLE V-5

### WATER USE AND DISCHARGE RATES SPENT ELECTROWINNING SOLUTION FROM NEW SCRAP

### (1/kkg of cathode tin produced)

Percent Plant Code Recycle	Production Normalized Water Use	Production Normalized Discharge Rate		
1047 0	NR	NR		
1049 0	24069	24069		
1048 NR	NR	21982		
1054 0	16609	16609		
1046 0	15145	15145		
1056 0	12489	12489		
1057 0	10498	10498		
1144 NR	NR	NR		

#### TABLE V-6

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

### (1/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

### SECONDARY TIN SUBCATEGORY SECT - V

#### TABLE V-7

### WATER USE AND DISCHARGE RATES TIN HYDROXIDE SUPERNATANT FROM SCRAP

(1/kkg of tin metal recovered from scrap)

Plant Code	Percent nt Code Recycle	Production Normalized <u>Water</u> <u>Use</u>	Production Normalized Discharge Rate
1036	0	55640	55640
		1	

#### TABLE V-8

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

(1/kkg of tin metal recovered from plating solutions and sludges)

Plant Code	Percent Recycle		Production Normalized Water Use	Production Normalized Discharge Rate
1036	0	1	115000	115000

### TABLE V-9

### WATER USE AND DISCHARGE RATES TIN HYDROXIDE FILTRATE

(1/kkg of tin metal produced)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Rate
1118	>90	NR	9198

Table V-10

SCRUBBER BLOWDOWN
RAW WASTEWATER SAMPLING DATA

Pollutant		Stream	Sample	Co	Concentrations (mg/1)					
	TOTTUCANE	Code	Type†	Source	Day 1	Day 2	Day 3	<u>13</u> {		
Toxi	c Pollutants							CO		
1.	acenaphthene	895	6	ND	ND ND			SECONDARY		
5.	benzidine	895	6	ND	ND ND-	•		TIN		
8.	1,2,4-trichlorobenzene	895	6	ND	ND ND			SUBCATEGORY		
9.	hexachlorobenzene	895	6	ND	ND ND			regory.		
12.	hexachloroethane	895	6	ND	ND ND					
18.	bis(2-chloroethyl)ether	895	6	ND	ND ND			SECT -		
20.	2-chloronaphthalene	895	6	ND	ND ND			⋖		
21.	2,4,6-trichlorophenol	895	6	ND	ND ND					
22.	p-chloro-m-cresol	895	6	ND	ND ND					
24.	2-chlorophenol	895	6	ND	ND ND					

SECONDARY TIN SUBCATEGORY

Table V-10 (Continued)

### SCRUBBER BLOWDOWN RAW WASTEWATER SAMPLING DATA

	Stream	Sample		centrations		Dov. 3
Pollutant	Code	<u>Type†</u>	Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
25. 1,2-dichlorobenzene	895	6	ND	ND ND		
26. 1,3-dichlorobenzene	895	6	ND	ND ND		
27. 1,4-dichlorobenzene	895	6	ND	ND ND		
28. 3,3'-dichlorobenzidine	895	6 .	ND	ND ND		
31. 2,4-dichlorophenol	895	6	ND	ND ND		
34. 2,4-dimethylphenol	895	6	ND	ND ND		
35. 2,4-dinitrotoluene	895	6	ND	ND		
36. 2,6-dinitrotoluene	895	6	ND	ND	•	
37. 1,2-diphenylhydrazine	895	6	ND	ND ND		• · · · · · · · · · · · · · · · · · · ·
39. fluoranthene	895	6	ND	ND ND	-	

4072

Table V-10 (Continued)

	Pollutant	Stream	Sample	C	oncentrations	s (mg/1)	
Toxi		_Code	Typet	Sourc	e Day 1	Day 2	Day 3
TOXI	c Pollutants (Continued)						· .
40.	4-chlorophenyl phenyl ether	895	6	ND	ND ND		
41.	4-bromophenyl phenyl ether	895	6	ND	ND:		
42.	bis(2-chloroisopropyl)ether	895	6	ND	ND ND		
43.	bis(2-chloroethoxy)methane	895	6	ND	ND ND		
52.	hexachlorobutadiene	895	6	ND	ND ND		
53.	hexachlorocyclopentadiene	895	6	ND	ND ND		
54.	isophorone	895	6	ND =	ND ND		
55.	naphthalene	895	6 · 6 · · · · · · · · · · · · · · · · ·	ND	ND ND		
56.	nitrobenzene	895	6	ND	ND ND		

### Table V-10 (Continued)

Pollutant	Stream Code	Sample Typet	Conc Source	entration Day 1	s (mg/1) Day 2	Day 3	SECONDARY
Toxic Pollutants (Continued)							DAR
57. 2-nitrophenol	895	6	ND	ND T			NIL A
58. 4-nitrophenol	895	6	ND	ND ND			
59. 2,4-dinitrophenol	895	6	ND	ND ND			SUBCATEGORY
60. 4,6-dinitro-o-cresol	895	6	ND	ND ND			ORY
61. N-nitrosodimethylamine	895	6	ND	ND ND			SECT
62. N-nitrosodiphenylamine	895	6	ND	ND ND			ا ا
63. N-nitrosodi-n-propylamine	895	6	ND	ND ND			
64. pentachlorophenol	895	6	ND	ND ND			·· ma
65. phenol	895	6	ND	ND ND			

Table V-10 (Continued)

Pollutant Pollutant	Stream Code	Sample Typet	Cor Source	ncentration		
Toxic Pollutants (Continued)		<u> </u>	<u> </u>	Day 1	Day 2	Day 3
66. bis(2-ethylhexyl) phthalate	895	6	ND	ND ND		
67. butyl benzyl phthalate	895	6	ND	ND ND		
68. di-n-butyl phthalate	895	6	ND	ND ND		
69. di-n-octyl phthalate	895	6	ND	ND ND	- -	es de la companya de la companya de la companya de la companya de la companya de la companya de la companya de
70. diethyl phthalate	895	6	ND	ND ND		. •
71. dimethyl phthalate	895	6	ND	ND ND	•	
72. benzo(a)anthracene	895	6	ND	ND ND		
73. benzo(a)pyrene	895	6	ND	ND ND	•	
74. benzo(b)fluoranthene	895	6	ND	ND ND		ı

### Table V-10 (Continued)

Pollutant	Stream Code	Sample Typet	Conc Source	centrations (	mg/1) Day 2	Day 3	SECONDARY
Toxic Pollutants (Continued)							DARS
75. benzo(k)fluoranthane	895	6	ND	ND ND			NIT 7
76. chrysene	895	6	ND	ND ND	· · ·		
77. acenaphthylene	895	6	ND	ND ND			SUBCATEGORY
78. anthracene (a)	895	6	ND	ND ND			RY
79. benzo(ghi)perylene	895	6	ND	ND ND			SECT
80. fluorene	895	6	ND	ND ND		·	1
81. phenanthrene (a)	895	6	ND	ND ND			
82. dibenzo(a,h)anthracene	895	6	ND	ND ND			
83. indeno (1,2,3-c,d)pyrene	895	6	ND	ND ND			1

Table V-10 (Continued)

. :	Pollutant	Stream	Sample	Cor	ncentrati		
Touris		Code	<u>Type†</u>	Source	Day 1	Day 2	Day 3
	Pollutants (Continued)		, **				
84.	pyrene	895	6	ND	ND ND		
114.	antimony	895	6	0.0013	0.047	0.078	0.048
115	arsenic	**************************************	6	0.007	3.20 4.50	4.50	2.10
17.	beryllium	895	6	<0.010	<0.010 <0.010	<0.010	<0.010
18.	cadmium	895	6	<0.030	0.30 0.30	0.30	0.30
19.	chromium	895	6	<0.030	0.10 0.084	0.12	0.99
20.	copper	895	6	<0.030	0.35 0.37	0.28	0.60
21.	cyanide (total)	895	1 2	<0.01	<0.01 <0.01	<0.01	<0.01
22.	lead	895	6	0.054	3.00 3.70	3.70	2.80
23.	mercury	895	6	0.0149	0.0129 0.005	0.013	0.0094

Table V-10 (Continued)

Pollutant	Stream Code	Sample Type†	Con Source	centration Day 1	ns (mg/1) Day 2	Day 3 [5]
Toxic Pollutants (Continued)						Day 3 ECONDARY
124. nickel	895	6	0.052	<0.25 0.15	0.18	0.16 RY
125. selenium	895	6	<0.001	0.33 0.44	0.55	0 / 0
126. silver	895	6	0.0014	0.0045 0.0133	0.0042	SUBCATEGORY 0.0059 0.0030
127. thallium	895	6	<0.001	0.0026 0.0037	0.0031	0.0030 X
128. zinc	895	6	0.030	0.14 2.30	2.20	2.10 s
Nonconventional Pollutants				1	ı	1
Acidity	895	6	10	60 180	50	61
Alkalinity	895	6	160	<1	. 99	80
Aluminum	895	6	2.80	5.50 6.00	7.80	7.50

Table V-10 (Continued)

	Stream		Co	Concentrations (mg/l)					
Pollutant	Code	Typet	Source	Day 1	Day	Day 3			
Nonconventional Pollutants (Continued)						Day 3 POND			
Ammonia Nitrogen	895	6	0.04	2.2 2.4	1.9	1.8 Y			
Barium	895	6	0.12	0.18 0.43	0.21	0.27 SU			
Boron	895	6	0.17	26.00 40.00	36.00	SUBCATEGORY 5.90 3.00			
Calcium	895	6	0.067	3.40 ,700	4.20	3.00 RY			
Chloride	895	6		,000 ,000	780	380 SECH			
Cobalt	895	6	<0.030	0.081 0.11	0.13	0.60 i			
Fluoride	895	6	0.40	9.3 7.5	7.4	7.0			
Iron	895	6	2.80	140 190	250	250			
Magnesium	895	6	0.018	0.069 58	0.078	0.070			
Manganese	895	6	0.11	0.45 0.25	0.47	0.49			

### Table V-10 (Continued)

Pollutant	Stream Code	Sample Typet	Source	oncentrat Day			8ECO
Nonconventional Pollutants (Continued)							ONDARY
Molybdenum	895	6	<0.030	<0.030 <0.030		0.40	NIT A
Germanium	895	6	<.0.5.0	<0.50 <0.50	<0.50	<0.50	
Indium	895	6	<0.50	<0.50 <0.50	<0.50	<0.50	SUBCATEGORY
Sodium	895	6	0.12	0.19 80	0.20	0.19	ORY
Sulfate	895	6		1,200 1,100	1,100	1,100	SECT
Tin	895	6	<0.25	3.30 1.10	0.89	0.92	., ., .<
Titanium	895	6	<0.25	<0.25 <0.25	<0.25	0.36	
Total Dissolved Solids (TDS)	895	6		4,000 3,900	4,600	4,200	
Total Organic Carbon (TOC)	895	6	13	16 13	22	45	

Table V-10 (Continued)

<u>Pollutant</u>	1		Stream Code	Sample Type†	
Total Solids (TS)			895	6	650 6,400 35,000 1,800 9,300
Vanadium			895	6	<0.030
Yttrium			895		<0.25 <0.25 <0.25 <0.25 <0.25 <
Conventional Pollutant	<u>s</u>	•,			
Oil and Grease			895	1	<1 <1 1 4 50 €60 €60 €60 €60 €60 €60 €60 €60 €60 €6
Total Suspended Solids	(TSS)		895	6	5 5,400 26,000 10,000 g,900
pH (standard units)			895		7.20 6.25 6.20 6.60 6.25

†Sample Type Code: 1 - One-time grab

1 - One-time grab6 - 24-hour automatic composite

Table V-11

SPENT ELECTROWINNING SOLUTION RAW WASTEWATER SAMPLING DATA

		Stream	Sample	Conc		70		
	Pollutant	_Code_	Typet	Source	Day 1	Day 2	Day 3	EC
m i o	Pollutants							SECONDARY
10x10	Pollucancs							ĕ
1	acenaphthene	455	1	- ND	. ND		14	RX
1.	acenaphenene	843	i	ND	ND			
		856	1	ND	ND			TIN
9	acrolein	455	1	ND	ND			US
2	actorem	843		- N·D ·-	- ND ·			- 🛱
		856	ĺ	ND	· ND	:		SUBCATEGORY
								Ë
3.	acrylonitrile	455	1	ND	ИD			Ö
	<b>,</b>	843	1	ND	ND			₽Z
		856	1	ND	ND			•
4.	benzene	455	1	0.013	0.051			(0
→•	belizene	843	1	ND	0.047			SECT
		856	· <b>1</b>	ND	0.003			诌
		, , , ,	1	ND	ND			ı
5.	benzidine	455	1	ND	ND		ž.	<
		843	. I	ND ND	ND		,	
		856	ı.	ND	ND			-
6.	carbon tetrachloride	455	1	ND	ND	-		
0.	Carbon Lettachiolide	843	1	ND	ND			
		856	1	ND	ND			
		,		ND	ND			
7.	chlorobenzene	455	l 1	ND ND	ND			
		843	1 1	ND ND	ND			
		856	l '	מא	ND			

Table V-11 (Continued)

	Pollutant	Stream Code	Sample Typet	Con Source	centrations Day 1	(mg/1) Day 2	Day 3	SEC
Toxic Poll	utants (Continued)				- <del></del>	Day 2	Day 3	ONI
8. 1,2,	4-trichlorobenzene	455	1	ALD				SECONDARY
		843	1	ND ND	N D N D			
		856	1	ND	ND	4 - 4		TIN
9. acena	aphthene	455	1	- ND	ND			S
		843	1	ND	ND			ВС
· · · · · · · · · · · · · · · · · · ·	en de la companya de la companya de la companya de la companya de la companya de la companya de la companya de Mangana de la companya de la companya de la companya de la companya de la companya de la companya de la company	856	1 -	ND	ND			ΑŢ
10. acrol	lein	455	1	ND	ND			SUBCATEGORY
		843	1	ND	ND		* F	RY
		856	1	ND	ND		-	
11. acryl	onitrile	455	1	ND	0.066			CO
		843	1	ND	ND			SECT
		856	1	ND	ND			H
12. benze	ne	455	, '					1
•		843	1	ND ND	ND			۷,
		856	i	ND ND	ND ND	,		
12 1 1 2			•	ND.	ND	•		
13. 1,1-d	ichloroethane	455	1	ND	ND	· .		٠,
		843	1	ND	ND			
		856	1	ND	ND			
14. 1,1,2	-trichloroethane	455	5 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	ND	ИD			
	•	843	1	ND	ND			
		856	1	ND	ND	•		•

Table V-11 (Continued)

	<u>Pollutant</u>	Stream Code	Sample Typet	Conce Source	entrations Day 1	(mg/l) Day 2	Day 3	C ELCONID
Toxic P	ollutants (Continued)						AKI	ל ל
15. 1	,1,2,2-tetrachloroethane	455 843 856	1 1 1	ND ND ND	ND ND ND		H.	T L
16c	hloroethane	455 843	1	ND ND	ND ND		SUBCATEGORY	יקטעזי
	·	856	1	ND	ND		E G	びびず
17. b	is(chloromethyl)ether	455 843 856	1 1 1	ND ND ND	ND ND ND		ž *	ģ
18. b	ois(2-chloroethyl)ether	455 843 856	1 1 1	ND ND ND	ND ND ND		В С	
19. 2	2-chloroethyl vinyl ether	455 843 856	1 1 1	ND ND ND	ND ND		<	⋖
20. 2	2-chloronaphthalene	455 843 856	, 1 1	ND ND ND	ND ND ND	· • -		
21. 2	2,4,6-trichlorophenol	455 843 856	1 1 1	ND ND ND	ND ND ND	•		1

Table V-11 (Continued)

		Stream	Sample	Conc	entrations	(ma/1)		
<u>Pollutant</u>		Code	<b>Type†</b>	Source	Day 1		Day 3 C	
Toxic Pollutants (Continued)							OND	
22. p-chloro-m-cresol		455	1	ND	ND		Day 3	
		843 856	1	ND ND	ND		TIN	
23. chloroform		455	4	:	ND			
		843	. Tr	0.038 ND	ND ND		SUBCATEGORY	
		856	1	0.037	ND		ÄTE	
24. 2-chlorophenol		455 843	1	ND	ND		ĘOĐ	
		856	i	ND ND	ND ND		ĸ	
25. 1,2-dichlorobenzene		455	1	ND	ND-		ro.	
		843 856	1 1	ND ND	ND ND	-	SECT	
26. 1,3-dichlorobenzene		455	1		`` 		.)	
	7	843	1	ND ND	ND ND		⋖	
0.7	are to the second of the secon	856	1	ND	ND	en en en en en en en en en en en en en e	•	
27. 1,4-dichlorobenzene		455 843	· · · 1 .	ND ND	ND			
		856	1	ND ND	ND ND			
28. 3,3'-dichlorobenzidine		455	1 ,	ND	ND			
		843 856	1	ND ND	ND ND			

Table V-11 (Continued)

Pollutant	Stre Cod	•	Source	entrations Day 1	mg/1) Day 2	Day 3	SECONDARY
Toxic Pollutants (Continu	ued)		٠				NDAF
29. 1,1-dichloroethyle	ne 455 843 856	1	ND ND ND	ND ND			NIT
30. 1,2- <u>trans</u> -dichloro	ethylene 455 843 856	1	ND ND ND	ND ND ND			SUBCATEGORY
31. 2,4-dichlorophenol	455 843 856	1	ND ND ND	ND ND ND			GORY
32. 1,2-dichloropropan	e 455 843 856	1	ND ND ND	ND ND ND			SECT
33. 1,3-dichloropropen	e 455 843 856	3 1	ND ND ND	ND ND ND			 
34. 2,4-dimethylphenol	455 842 856	3 ' 1	ND ND ND	0.009 ND ND			
35. 2,4-dinitrotoluene	455 84 856	3 1	ND ND ND	ND ND ND			

Table V-11 (Continued)

Stream	Sample	0			
Code		Source			1) - 0
		<u> </u>	Day 1	Day Z	Day 3
			*	•	•
455	1	MD	ND		
843	· i			•	
856	. 1.	ND	•		-
455	1	A 12 Pm	**		
	1				
030	•	עא	ND		
455	1	ND	MD	•	
843	1			.*	
856	. 1	ND .			:
/. E. E.			٠		,
	1				
	; I				,
050	- <b>1</b>	ND	ND		
455	- 1	NID.	N.O.		
843	1				
856	1	ND			
				•	• 10
			ND	$\mathcal{J}_{i} = \mathcal{J}_{i}$	
	1		ND		
000	1	ND	ND	*	
455	1	MD			
	1				*
	i				
	455 843 856 455 843 856 455 843 856 455 843 856	Code         Typet           455         1           843         1           856         1           455         1           843         1           856         1           455         1           843         1           856         1           455         1           843         1           856         1           455         1           843         1           856         1           455         1           843         1           856         1           455         1           843         1           856         1           455         1           843         1           856         1	Code         Typet         Source           455         1         ND           843         1         ND           856         1         ND           455         1         ND           843         1         ND           856         1         ND           455         1         ND           856         1         ND           455         1         ND           843         1         ND           856         1         ND           455         1         ND           843         1         ND           856         1         ND           455         1         ND           843         1         ND           856         1         ND           455         1         ND           856         1         ND           455         1         ND           455         1         ND           455         1         ND           843         1         ND	Code         Typet         Source         Day 1           455         1         ND         ND           843         1         ND         ND           856         1         ND         ND           843         1         ND         ND           856         1         ND         ND           856         1         ND         ND           856         1         ND         ND           843         1         ND         ND           856         1         ND         ND           856         1         ND         ND           856         1         ND         ND           843         1         ND         ND           856         1         ND         ND           856         1	Code         Typef         Source         Day 1         Day 2           455         1         ND         ND         ND           843         1         ND         ND         ND           856         1         ND         ND         ND           843         1         ND         ND         ND           856         1         ND         ND         ND           843         1         ND         ND         ND           856         1         ND         ND         ND           856         1         ND         ND         ND           843         1         ND         ND         ND           856         1         ND         ND         ND           455         1         ND         ND         ND           455         1         ND         ND         ND           455         1         ND         ND         ND           843         1         ND         ND         ND           455         1         ND         ND         ND           455         1         ND         ND         ND <t< td=""></t<>

Table V-11 (Continued)

Pollutant	Stream Code	Sample Typet	Conc Source	entrations Day 1	mg/1) Day 2	Day 3	SECONDARY
							NDA
Toxic Pollutants (Continued)							RY
(a 1: (a shlare athory) mothana	455	1	ND	ND			
43. bis(2-chloroethoxy)methane	843	1	ND	ND			TIN
	856	1	ND	ND			
	455	1	0.019	0.031			SUBCATEGORY
44. methylene chloride	843	· · · · · · · · · · · · · · · · · · ·	ND.	ND			<mark>∑</mark>
	843 856	1	0.021	0.025			H
	0.50	•	;				Ġ.
	455	1	ND	ND			됬
45. methyl chloride (chloromethane)	843	i	ND	ND			ĸ
	856	i	ND	ND			
							70
46. methyl bromide (bromomethane)	455	1	ND	ND			SECT
46. methyl bromide (bromomethane)	843	1	ND	ND			H
	856	1	ND	ND			1
							<
47. bromoform (tribromomethane)	455	1	ND	ND			٦.
47. Diomotorm (82252 memory)	843	1	ND	ND			
	856	1	ND .	ND	. *.*		
				ND			
48. dichlorobromomethane	455	1	ND	ND			
40. 0101122222	843	1	ND	ND			
	856	1	ND	ND			
		4	ND	ND			
49. trichlorofluoromethane	455	l 1	ND	ND		-	
	843	1		ND			
	856	1	ND	MD			

Table V-11 (Continued)

D-11	Stream	Sample	Concentrations (mg/l)				
<u>Pollutant</u>	<u>Code</u>	Typet	Source	Day 1	Day 2	Day 3	
Toxic Pollutants (Continued)				1.14 54			
50. dichlorodifluoromethane	455						
30. drenforddrifdoromethane	843	1 1	ND ND	ND		and the second	
	856	1	ND	ND ND			
			ND	ND	**************************************		
51. chlorodibromomethane	455	:	0.002	ND -	نا شابهدیدید		
	843	1:	ND	ND		*	
	856	1	ND	ND			
52. hexachlorobutadiene	455	1	ND	ND			
	843	1	ND.	ND ND			
	856	1	ND	ND	: · · · ·	•	
53. hexachlorocyclopentadiene				4	* * * * * * * * * * * * * * * * * * *		
53. hexachlorocyclopentadiene	455	1	ND	ND			
	843	]	ND	ND			
	856	. 1	ND	ND	*		
54. isophorone	455	1	ND	ND			
	843	1	ND	ND	. •		
	856	1	ND	ND			
55. naphthalene	/ 5 5	grande de la companya					
naphenatene	455 843	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ND	ND			
	856	1	ND ND	ND ND		**************************************	
		•	ND	מאז		4	
56. nitrobenzene	455	1	ND	ND			
	843	1	ND	ND	-		
	856	1	- ND	ND			

Table V-11 (Continued)

	Stream	Sample	Conc	entration	s (mg/l)		ស
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	S
rollutant			• .				N
Toxic Pollutants (Continued)			·				SECONDARY
57. 2-nitrophenol	455	1	ND	ND			K
57. 2-nitrophenol	843	1	ND	0.060			TIN
	856	1	ND	ND			
			MD	ND			SUBCATEGORY
58. 4-nitrophenol	455	l i	ND	ND.			ВС
	843		ND				A
	856	1	ND	ND			Œ
	455	1	ND	ND			ĬĢ.
59. 2,4-dinitrophenol	843	1	ND	ND			ΣX
	856	i	ND	ND			
	0.70	•	4.	-1			
co / C listers a amagal	455	1 .	ND	ND			SECT
60. 4,6-dinitro-o-cresol	843	i	ND	ND			Ğ
	856	i	ND	ND			Н
	050	·		· · · · · · · · · · · · · · · · · · ·			Ţ
61. N-nitrosodimethylamine	455	1	ND	ND			<
61. N-nitrosodimethylamine	843	1	ND	ND			
	856	1	ND	ND			
			•				
62. N-nitrosodiphenylamine	455	1	ND	ND			
62. N-nitrosodiphenylamine	843	1	ND	ND			
	856	1	ND	ND			
				M F			•
63. N-nitrosodi-n-propylamine	455	1 :	ND	ND			
000 11 11 11	843	1	ND	ND			
	856	1	ND	ND			

Table V-11 (Continued)

	Dollar	Stream	Sample	Conce	entrations	s (mg/1)	S	
	Pollutant	Code	<u>Typet</u>	Source	Day 1	Day 2	Day 3	
Toxic	Pollutants (Continued)				ar .	· ·	Day 3	
61.		<u></u>		• •		90 × 1	AR	
64.	pentachlorophenol	455	1	ND	ND			
		843	1	ND	ND		TIN	
•		856	1	ND	NĎ.		Z	
65.	phenol	455	. 1	e NIN e e	0.047		2	
. T. T. T		843		- ND	0.017		<u> </u>	
		856	1	ND ND	0.130	•	CA	
,	the state of the s		•	ND	0.020		担	
66.	bis(2-ethylhexyl) phthalate	455	1	0.006	ND		SUBCATEGORY	
		843	i	0.054	ND		R	
		856	· 1	0.004	ND			
<b>7</b> 7		· ·			,			
67.	butyl benzyl phthalate	455	1 :	ND	ND		മ	
		843	1	ND	ND.		SECT	
		856	1	ND	ND		H	
68	di-n-butyl phthalate	/ 5 5					1.59	
	di-n-bucyi phenarace	455 843	l 1	ND	ND		< `	
		856 ·	 	ND	ND		* 2	
	65 (F.) 1	0.70		ND	ND			
69.	di-n-octyl phthalate	455	1	ND	ND			
		843	. 1	ND ND	ND			
		856	i	ND	ND.			
<u></u>					HD.	•		
70.	diethyl phthalate	455	1 · · · · ·	ND	ND			
	(x,y) = (x,y) + (x,y	843	1	ND	ND		•	
		856	1	ND	ND			

Table V-11 (Continued)

Pollutant	<u>:</u>	Stream Code	Sample Typet	Conc Source	entration Day 1	s (mg/1) Day 2	Day 3	SEC
Toxic Pollutants (Co								SECONDARY
71. dimethyl phtha	ılate	455	1	ND	ND			
, it dimedically in process		843 856	1 1	ND ND	ND ND			TIN
70 1 ( )		455	1	ND	ND			
72. benzo(a)anthra	icene	843	· · · - i · · ·	THE THE THE	ND-			ВС
	<u>.</u>	856	1	ND	ND			SUBCATEGORY
73. benzo(a)pyrene	· .	455	1	ND	ND			GOF
, 5. Denie (u, p) - ene	843 856	1 1	ND ND	ND ND		•	R	
7/ 1 /1 \	th on o	455	1	ND	ND			řo.
74. benzo(b)fluora	inthene	843	i	ND	ND			SECT
		856	1	ND	ND			H
75. benzo(k)fluora	anthene	455	1	ND	ND			<
		843 856	1 1	ND ND	ND ND			
								٠.
76. chrysene		455 843	1	ND ND	ND ND	• •		
		856	i	ND	ND			
77. acenaphthylene	i.	455	1	·ND	ND			
//. acenaphenyrene		843	1	ND	ND			
		856	, I.	ND	ND	*		

Table V-11 (Continued)

		Stream	Sample	Conc	entration	ns (mg/l)	
	<u>Pollutant</u>	Code	Typet	Source	Day 1	Day 2	Day 3
Toxic	Pollutants (Continued)		, N				
70							•
78.	anthracene (a)	455	1	ND	ND		
		843	1	ND	ND		
		856	1	ND	ND		
79.	benzo(ghi)perylene	455-		ND	ND	<u></u>	
	(8 71 - 3 - 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5	843	i	ND	ND ND		
		856	i	ND	ND		
				ND	ND		
80.	fluorene	455	1	ND	ND		•
4		843	1	ND	ND	•	
		856	1	ND	ND		•
81.	phenanthrene (a)	455	1	ND	ND		
	(2)	843	i	ND	ND		
		856	i	ND ND	ND		
		030		ND	ND		
82.	dibenzo(a,h)anthracene	455	1	ND	ND		
		843	1	ND	ND		
		856	1.	ND	ND		w ng n
υn	4-4 (1 0 0 1)						- 7
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	NĐ		
		843	1	ND	0.003	·	•
		856	i	ND	0.063		

	<u>Pollutant</u>	Stream Code	Sample Typet	Conc Source	entration Day 1	s (mg/l) Day 2	Day 3	SECONDARY
Toxic	Pollutants (Continued)							DAI
85.	tetrachloroethylene	455 843 856	1 1 1	ND ND ND	ND ND 0.399		•	TIN
8.6.	toluene	455 843 856	1 1	0.001 0.093 0.005	0.018 0.017 0.005	<u>-</u>		SUBCATEGORY
87.	trichloroethylene	455 843 856	1 1 1	ND ND 0.007	ND ND 0:009			EGORY
88.	vinyl chloride (chloroethylene)	455 843 856	1 1 1	ND ND ND	ND ND ND			SECT
89.	aldrin	455 843 856	1 1 1	ND ND ND	ND ND ND			۲
90.	dieldrin	455 843 856	1 1 1	ND ND ND	ND ND ND		ne e	
91.	chlordane	455 843 856	1 1 1	ND ND ND	ND ND ND			

Table V-11 (Continued)

			4.			
Pollutant	Stream	Sample	Conc	entrations	(mg/1)	Ø
<u> </u>	Code	<u>Typet</u>	Source	Day 1	Day 2	Day 3 C
Toxic Pollutants (Continued)	N. Vi					Day 3
92. 4,4'-DDT	, i					). IA
72. 4,4 -DDI	455	1	ND	ND		XX
	843	1	ND	ND		H
	856	1	ND	ND	,	TIN
93. 4,4'-DDE	455				1	
e sang kanang menghabi di dibanggan di Tambanggan di Kanang menggan di kanang menggan di kanang menggan di kan Penggan di kanang menggan di kanang me	843	1	ND	ND		ğ
	856	1	ND	ND		· č
	0.70		ND	ND		SUBCATEGORY
94. 4,4'-DDD	455	1	ND	ATIN		E G
	843	1	ND	ND		g,
	856	i	ND .	ND ND		ĸ
95. alpha-endosulfan		•	N.D	ND		
95. alpha-endosulfan	455	1	ND .	ND		70
	843	1	ND	ND		SECT
	856	1	ND	ND	•	日
96. beta-endosulfan	/ 5 5		* H			1
on doubt Half	455 843	]	ND	ND		<
	856	1	ND	ND		
	0.70		ND	ND		· ·
97. endosulfan sulfate	455	1	ND	AT ID	at -	•
	843	i	ND	ND	· · · · ·	
	856	i	ND	ND ND		
98. endrin	1 41			иD		
98. endrin	455	1	ND	ND		
	843	1	ND	ND		
	856	1	ND	ND	•	

Table V-11 (Continued)

Pollutant	Stream Code	Sample Typet	Conc Source	entration Day 1	s (mg/1) Day 2	Day 3	SECONDARY
Toxic Pollutants (Continued)		4		·			NDA:
Toxic Pollutants (continues)				MD			RY
99. endrin aldehyde	455	1	ND	ND ND			
99. endrin aromy	843	]	ND	ND ND			HIN
	856	ı	ND	N·D			
	455	1	ND	ND			SUBCATEGORY
100. heptachlor	843		ND-	- ND			8
	856	i	ND	ND			Ä
	050	•				-	O.
	455	1	ND	ND			မ္အ
101. heptachlor epoxide	843	1	ND	ND			Ŕ
	856	1	ND	ND		-	
		_	MD	ND			70
102. alpha-BHC	455	1	ND ND	ND			SECT
102. d.2p	843	1	ND ND	ND			H
	856	•	ND				ı
•	. c 5	1	ND	ND			⋖
103. beta-BHC	455 973	1	ND	ND			•
٠	843 856	1	ND	ND			
	٥٥٥	•			•		-
·	455	1	ND	ND	٠		
104. gamma-BHC	843	1	ND	ND			
	856	1	ND	ND	ar .		
					· · · ·		
105 Joleo RUC	455	1 1 1	ND	ИD			
105. delta-BHC	843	1	ND	ND			
	856	. 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ND	ND	-		

Table V-11 (Continued)

	<u>Pollu</u>	tant		Stream	Sample	Conc	entration	s (mg/l)	
	10114	canc		Code	<u>Type†</u>	Source	Day 1	Day 2	Day 3
Toxio	Pollutants	(Continued)		*	100 m 100 m	s e e e e e e e e e e e e e e e e e e e			
106.	PCB-1242	(b)		455 843	1 1	ND ND	N D N D		
		•		856	1	ND	ND		
107.	PCB-1254	(b)		455		ND	ND -		
				843 856	1	ND ND	ND ND		
108.	PCB-1221	(b)		455 843 856	1 1	ND ND ND	ND ND ND		
109.	PCB-1232	(c)		455	1	ND	ND		
				843 856	ी भी	ND ND	ND ND	ž V	
110.	PCB-1248	(c)		455 843	1 1	ND ND	ND ND		
		•	· ·	856	1	ND	ND		
11.	PCB-1260	(c)		455 843	1	ND ND	ND ND		
1.0	PGD 4044			856	1	ND	ND		
1.2.	PCB-1016	(c)		455 843	# <b>1</b> ************************************	ND ND	ND ND		
			£	856	1	ND	:ND		

Table V-11 (Continued)

	Stream	Sample	Conc	entration	s (mg/1)			
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	SECONDARY	
							Ä	
Toxic Pollutants (Continued)							R	
110	455	1	ND	ND			7	
113. toxaphene	843	1	ND	ND			TIN	
	856	1	ND	ND				
				5 0	•		SUBCATEGORY	
114. antimony	455	1	0.001	5.0			ВС	
and zimenty	843	1	<0.001	0.9			Ŋ	
	856	1	<0.001	0.41			E	
	. / 5 5	1	0.002	2.0			Ğ	
115. arsenic	455	1 ,	0.002	1.9			R	
	843	1	0.007	6.6				
	856	i	0.007	0.0				
447	455	1	<0.001	0.08			SECT	
117. beryllium	843	ì	<0.001	0.005			G	
	856	1	<0.001	0.20			, <u></u>	
							'	
118. cadmium	455	1	0.020	0.42			7	
110. Cadmiram	843	1	<0.001	0.34			:	
	856	1	0.001	0.29				
	, , , ,	4	0.003	0.94	í			
119. chromium (total)	455	l 1	0.003	0.30				
	843	l 1	0.004	0.56				
			0.004	0.50				
	455	1	0.008	0.50	•			
120. copper	843	1	0.14	0.30				
	856	i		0.41				
	<b>U J U</b>	•	-					

Table V-11 (Continued)

Pollutant	Stream	Sample	Con	centratio	ons (mg/l)		ស
rorrucant	_Code_	<u>Type†</u>	Source	Day 1	Day 2	Day	구 H
Toxic Pollutants (Continued)						<u>= - /</u>	J KO
121. cyanide (total)	455 843 856	1 1 1	0.002 ND 0.004	3.6 ND 24			SECONDARY TIN
122. lead	455	1	0.019	2.6			
	843 856	1	0.001	1.0 9.0			BCAI
123. mercury	455 843 856	1 1 1	<0.002 <0.002 0.007	<0.002 <0.002 0.026			SUBCATEGORY
124. nickel	455 843 856	1. 1 1	<0.001 0.001 0.003	2.5 4.1 3.7			SECT
125. selenium	455 843 856	1 1	0.033 3.1 <0.005	0.040 32 <0.005			- - -
126. silver	455 843 856	1 1	<0.001 0.02 <0.001	0.40 0.35 0.30		i ,	
127. thallium	455 843 856	1 1 1	0.14 <0.001 0.005	3.1 2.0 2.0			·

Table V-11 (Continued)

	Stream	Sample	Con	centrations	(mg/l)	)		
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	CON	
Toxic Pollutants (Continued)			•				SECONDARY	
128. zinc	455 843	1 1	0.08 0.06	29 1.1			NIL A	
	856	1	0.24	0.24				
Nonconventional Pollutants				٠.			SUBC:	
alkalinity	455	1	60	220,000			ATE	
aluminum	455	1	1.90	13,000			SUBCATEGORY	
ammonia nitrogen	843 856	1 1	1.5	20 92		٠.	70	
calcium	455	1	11	<0.1			SECT	
chemical oxygen demand (COD)	455°	1	4.0	3,600			I <b>&lt;</b> -	
fluoride	455	1	1.2	0.5			7	
magnesium	455		5.5	0.04	•	-		
phenolics	455 843 856	1 · 1 · 1 · 1	0.011 0.002 0.001	1.4 0.00 0.11				

Table V-11 (Continued)

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

<sup>†</sup>Sample Type Code: 1 - One-time grab

<sup>(</sup>a), (b), (c) Reported together.

Table V-12

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

	Pollutant	Stream Code	Sample Typet	Conc Source	entration Day 1	s (mg/1) Day 2	Day 3	SECONDARY
Toxic	Pollutants							VDAR
1.	acenaphthene	395	1	ND	ND			
2.	acrolein	395	1	ND	ND			TIN S
3.	acrylonitrile	395	1	ND	ND .			SUBCATEGORY
4.	benzene	395	1	ND	ND			ATEC
5.	benzidine	395	1	ND	ND			30RY
6.	carbon tetrachloride	395	. 1	ND	ND			
7.	chlorobenzene	395	. 1	ND ·	ND			SECT
8.	1,2,4-trichlorobenzene	395	1	ND	ND			百
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	• <b>1</b>	ND	ND			
14.	1,1,2-trichloroethane	395	1 .	ND	ND			

Table V-12 (Continued)
ROXIDE PRECIPITATION SUPERNATANT (FROM SCRAN

TIN	HYDROXIDE	PRECIPITATIO	N SUPERNAT	ΓANΤ	(FROM	SCRAP)
	RA	AW WASTEWATER	SAMPLING	DATA		

	•		*	• "				
, s	<u>Pollutant</u>	Stream Code	Sample Typet	<u>Conc</u>	entration Day 1	s (mg/1) Day 2	Day 3	SEC
Toxic	Pollutants (Continued)	• .		V 200		<u> </u>	bay 5	CON
15.	1,1,2,2-tetrachloroethane	395	1	ND	ND			ONDARY
16.	chloroethane	395	1	ND	ND			NIT ?
17.	bis(chloromethyl)ether	395	<u>1</u>	ND	'ND			
18.	bis(2-chloroethyl)ether	395	1	ND	ND			SUBCATEGORY
19.	2-chloroethyl vinyl ether	395	1	ND	ND			TEG
20.	2-chloronaphthalene	395	1	ND	ND			ORY
21.	2,4,6-trichlorophenol	395	1	ND	ND		. •	¥
22.	p-chloro-m-cresol	395	1	ND	ND			SECT
23.	chloroform	395	1	ND	ND	-		l,
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 <u>Code</u>	Sample Typet	Source	entrations Day 1	(mg/1) Day 2	Day 3
Toxic Pollutants (Continued)						DAS
29. 1,1-dichloroethylene	395	1	<0.01	<0.01		is Th
30. 1,2-trans-dichloroethylene	395	1	ND	ND		5
31. 2,4-dichlorophenol	395	1	ND	ND		<u>.</u> . 6
32. 1,2-dichloropropane	395	1	ND	N-D		`\$ H .U
33. 1,3-dichloropropene	395	1	ND	ND		G S
34. 2,4-dimethylphenol	395	1	ND	ND		
35. 2,4-dinitrotoluene	395	1	ND	ND		ຫຼື ຫຼື
36. 2,6-dinitrotoluene	395	1	:ND	ND		<b>(</b>
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		
	395	1	ND	ND		•
41. 4-bromophenyl phenyl ether 42. bis(2-chloroisopropyl)ether	395	1	ND	ND		

Table V-12 (Continued)

									*
		Pollutant	Stream _Code	Sample Typet	Con Source	centration Day 1	ns (mg/1) Day 2	Day 3	SEC
	Toxic	e Pollutants (Continued)					<u> </u>	<u>Day 5</u>	SECONDARY
	43.	bis(2-choroethoxy)methane	395	1	ND	ND			ARY
	44.	methylene chloride	395	1	<0.01	<0.01			TIN
	45.	methyl chloride (chloromethane)	395		ND	ND_		compression of the second	SUE
	46.	methyl bromide (bromomethane)	395	1	ND	ND			SUBCATEGORY
	47.	bromoform (tribromomethane)	395	1	ND	ND			EGOI
	48.	dichlorobromomethane	395	1	ND	ND			75
	49.	trichlorofluoromethane	395	1.	ND	ND			ន
	50.	dichlorodifluoromethane	395	1	ND	ND			SECT
	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 Typet	Conc Source	entrations Day 1	mg/1) Day 2	Day 3	SECONDARY
Toxic	Pollutants (Continued)							NDAF
57.	2-nitrophenol	395	1	ND	0.031			•
58.	4-nitrophenol	395	1	<0.01	0.026			NIL
- 59 <b>.</b>	2,4-dinitrophenol	39.5	1	ND	0.086			SUBO
60.	4,6-dinitro-o-cresol	395	1	ND	ND			CATE
61.	N-nitrosodimethylamine	395	1	ND	ND			SUBCATEGORY
62.	N-nitrosodiphenylamine	395	1	ND	ND			ĸ
63.	N-nitrosodi-n-propylamine	395	1	ND	ND			S
64.	pentachlorophenol	395	1	ND	<0.01			SECT
65.	phenol	395	1	ND	ND			ı <
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			
		395	1	ND	ND			
69.	di-n-octyl phthalate	395	1	ND	ND			
70.	diethyl phthalate	377			212	-		

Table V-12 (Continued)

				•		
<u>Pollutant</u>	Stream <u>Code</u>	Sample Typet	Conc Source	entration Day 1	s (mg/l) Day 2	Day 3 C
Toxic Pollutants (Continued)			•			Day 3 CONDARY
71. dimethyl phthalate	395	1	ND	ND		
72. benzo(a)anthracene	395	1 .	ND	ND		TIN
73. benzo(a)pyrene	395	11	ND	ND	<u></u> <u></u>	SUB
74. benzo(b)fluoranthene	395	1.	ND	ND		SUBCATEGORY
75. benzo(k)fluoranthane	395	1	ND	ND		IGOR
76. chrysene	395	1	ND	ND		K
77. acenaphthylene	395	1	ND	ND		N H
78. anthracene (a)	395	1.	ND	ND		SECT
79. benzo(ghi)perylene	395	1 4	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

		Stream	Sample	Conc	entration	s (mg/l)		SE
	Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	CON
Toxic	Pollutants (Continued)							SECONDARY
85.	tetrachloroethylene	395	1	ND	ND			NIT. A
86.	toluene	395	. 1	ND	ND			
87.	trichloroethylene	395	1	ND	<0.01			UBC
88.	vinyl chloride (chloroethylene)	395	1	ND	0.036			SUBCATEGORY
89.	aldrin	395	. 1	ND	ND			ORY
90.	dieldrin	395	1	ND	ND			
91.	chlordane	395	1	ND	ND			SECT
92.	4,4'-DDT	395	1	ND	ND			i i
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)

	Pollutant		Stream _Code	Sample	Conce	entrations			S
Toxio	Pollutants (Continued)			Typet	Source	Day 1	Day 2	Day 3	SECONDARY
99.	endrin aldehyde		395	. 1	ND	ND			ARY
100.	heptachlor		395	1	ND .	ND			TIN
101.	heptachlor epoxide		. 395	1,	ND	ND			
102.	alpha-BHC		395	1	ND	ND		•	SUBCATEGORY
103.	beta-BHC		395	1	ND	ND			EGO]
104.	gamma-BHC		395	1	ND	ND			RY
. 105.	delta-BHC		395	1	ND	ND			Ø
106.	PCB-1242 (b)		395	1 ,	ND	ND		e e	SECT
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)

	Pollutant	Stream Code	Sample Typet	Source	entrations Day 1	(mg/l) Day 2	Day 3	SECONDARY
Toxic	Pollutants (Continued)							DAR'
113.	toxaphene	395	1	ND	ND			
114.	antimony	395	1	0.006	4.4			TINS
	arsenic	395	1	<0.001	0.135			SUBC
117.	beryllium	395	1	<0.0005	0.001			SUBCATEGORY
118.	cadmium	395	1 .	<0.001	0.140			GORY
119.	chromium (total)	395	1	0.032	0.068			7
120.	copper	395	1	0.031	0.11			SECT
121.	cyanide (total)	395	1	0.040	0.48			CH .
	·	395	1	0.12	0.30	-		۱ <
122.	lead	395	1	<0.0002	<0.0002			
123.	mercury	395	1	<0.025	0.540			
124.	nickel		•					
125.	selenium-	395	1	<0.008	<0.008			
126.	silver	395	. 1	0.001	0.065			
127.	thallium	395	1	<0.001	0.590	ī		

Doll. bank	Stream	Sample	Con	ncentrations (mg	/1)
<u>Pollutant</u>	Code	Typet	Source	Day 1 Day	2 Day 3
Toxic Pollutants (Continued)					
128. zinc	395	1	0.05	0.210	
Nonconventional Pollutants					
alkalinity	395	<b>-1</b>	77-	-2,200	· · · · · · · · · · · · · · · · · · ·
ammonia nitrogen	395	1	2	1.1	
calcium	395	1	17	0.16	
chemical oxygen demand (COD)	395	1	<1	170	. 1
fluoride	395	1	0.94	320	
magnesium	395	1	7.2	0.80	·
phenolics	395	1	0.026	0.002	•
sulfate	395	1 1	29	2,000	<del>-</del>
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	

SECONDARY TIN SUBCATEGORY

Table V-12 (Continued)

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

Pollutant	Stream Code	Sample Typet	Conc Source	$\frac{\text{entrations } (\text{mg/1})}{\text{Day 1}}  \frac{\text{Day 2}}{\text{Day 2}}$	Day 3
Conventional Pollutants (Continued)					
total suspended solids (TSS)	395	1	9	25	
pH (standard units)	395	1	7.3	8.3	

tSample Type Code: 1 - One-time grab

<sup>(</sup>a), (b), (c) Reported together.

Table V-13
TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)
RAW WASTEWATER SAMPLING DATA

					*		
n . i a ·	Stream	Sample	Conc	entration	s (mg/l)		E S
<u>Pollutant</u>	_Code_	<b>Typet</b>	Source	Day 1	Day 2	Day 3	်င်
Toxic Pollutants	*						SECONDARY
1. acenaphthene	396 399	. 1 1	ND ND	ND ND	N D ND		RY TIN
2. acrolein	 396 399	· 1	ND ND	ND - ND	ND ND		
3. acrylonitrile	396 399	1 1	ND ND	ND ND	N D ND		SUBCATEGORY
4. benzene	396 399	1 1	ND ND	ND ND	ND ND		ORY
5. benzidine	396 399	1 1	ND ND	ND ND	ND ND		SECT
6. carbon tetrachloride	396 399	1 1	ND ND	ND ND	ND ND		- 4
7. chlorobenzene	396 399	1	ND ND	ND ND	N D ND		
8. 1,2,4-trichlorobenzene	396 399	1	ND ND	ND ND	ND ND		
9. hexachlorobenzene	396 399	1 1	ND ND	ND ND	N D ND		

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)

RAW WASTEWATER SAMPLING DATA

Pollu <u>tant</u>	Stream Code	Sample Typet	Conce Source	entration Day 1	s (mg/l) Day 2	Day 3	SECONDARY
Toxic Pollutants (Continued)							NDAF
10. 1,2-dichloroethane	396 399	1	ND ND	ND ·	ND ND		NIT Y
11. 1,1,1-trichloroethane	396 399	1 1	ND ND	ND ND	ND ND		
12. hexachloroethane	396 399	1 1	ND ND	ND ND	N D N D		SUBCATEGORY
13. 1,1-dichloroethane	396 399	1 1	ND ND	ND ND	ND ND		ORY
14. 1,1,2-trichloroethane	396 399	1 1	ND ND	ND ND	ND ND		SECT
15. 1,1,2,2-tetrachloroethane	396 399	1	ND ND	ND ND	ND ND		
16. chloroethane	396 399	1	ND ND	ND ND	ND ND		
17. bis(chloromethyl)ether	396 399	· · · · · · · · 1	ND ND	ND ND	ND ND		
18. bis(2-chloroethyl)ether	396 399	1 1	ND ND	ND ND	ND ND		

Table V-13 (Continued)

Pollutant   Stream   Code   Typet   Source   Day 1   Day 2   Day 3   Day 3   Day 2   Day 3   Day 2   Day 3   Day 3   Day 4   Day 4   Day 5   Day 5   Day 6   Day 1   Day 2   Day 3   Day 5   Day 6   Day 1   Day 2   Day 3   Day 5   Day 6   Day 6   Day 6   Day 1   Day 2   Day 3   Day 6   Day 6   Day 6   Day 6   Day 7   Day 9							
19. 2-chloroethyl Vinyl ether   396   1   ND   ND   ND   ND   ND   ND   ND		Pollutant	•	Conce Source		Day 3	SECC
19. 2-chloroethyl Vinyl ether   396   1   ND   ND   ND   ND   ND   ND   ND	Toxi	c Pollutants (Continued)					NDA
20. 2-chloronaphthalene   396   1	19.	2-chloroethyl vinyl ether	1 1				
399 1 ND ND ND ND ND ND ND ND ND ND ND ND ND	20.		1			e a como la Caramana e la	
399 1 ND ND ND ND ND ND ND ND ND ND ND ND ND	21.	2,4,6-trichlorophenol	1 1	•			ATEGO
399   1 ND ND ND ND ND ND ND ND ND ND ND ND ND	22.	p-chloro-m-cresol	1				RY
24. 2-chlorophenol 396 1 ND ND ND ND ND ND ND ND ND ND ND ND ND	23.	chloroform	1 1.				SECT
399 1 ND ND ND  26. 1,3-dichlorobenzene 396 1 ND ND ND ND  27. 1,4-dichlorobenzene 396 1 ND ND ND	24.	2-chlorophenol	, 1				ı
399 1 ND ND ND ND 27. 1,4-dichlorobenzene 396 1 ND ND ND	25.	1,2-dichlorobenzene	1				
ND ND ND	26.	1,3-dichlorobenzene	1 1				
	27.	1,4-dichlorobenzene	1				

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)

RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Conc Source	entration Day 1	s (mg/1) Day 2	Day 3	SECONDARY
Toxic Pollutants (Continued)							IDAR
28. 3,3'-dichlorobenzidine	396 399	1 1	ND ND	ND ND	ND ND		Y TIN
29. 1,1-dichloroethylene	396 399	1	<0.01 <0.01	ND ND	ND ND		
30. 1,2- <u>trans</u> -dichloroethylene	396 3 <b>9</b> 9	1 1	ND ND	ND ND	N D ND		SUBCATEGORY
31. 2,4-dichlorophenol	396 399	. 1 1	ND ND	ND ND	ND ND		RY
32. 1,2-dichloropropane	396 399	. 1	ND ND	ND ND	N D N D		SECT
33. 1,3-dichloropropene	396 399	1	ND ND	ND ND	ND ND		- V
34. 2,4-dimethylphenol	396 399	' 	ND ND	ND ND	ND ND		
35. 2,4-dinitrotoluene	396	1	ND ND	ND ND	ND ND		-
36. 2,6-dinitrotoluene	399 396 399	1 1	ND ND	ND ND	N D N D		

Table V-13 (Continued)

Pollutant	Stream _Code	Sample Typet	Conc Source	centration Day 1	ns (mg/1) Day 2	Day 3
Toxic Pollutants (Continued)				<u> </u>	Day 2	Day 3
37. 1,2-diphenylhydrazine	396 399	1 1	ND ND	ND <0.01	ND ND	
38. ethylbenzene	396 399	1	ND ND	ND - ND -	ND ND	N TEN
39. fluoranthene	396 399	1	ND	ND ND	ND ND	SUBCATEGORY
40. 4-chlorophenyl phenyl ether	396 399	1 1	ND ND	ND ND	ND ND	ÖRY
41. 4-bromophenyl phenyl ether	396 399	. 1	ND ND	ND ND	N D ND	SECT
42. bis(2-chloroisopropyl)ether	396 399	1	ND ND	ND ND	ND ND	
43. bis(2-choroethoxy)methane	396 399	. 1	ND ND	ND ND	N D ND	7
44. methylene chloride	396 399	1 .	<0.01 <0.01	1.724 <0.01	ND ND	
45. methyl chloride (chloromethane)	396 399	1	ND ND	ND ND	N D N D	
46. methyl bromide (bromomethane)	396 399	1 1	ND ND	ND ND	ND ND	
					110	

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)

RAW WASTEWATER SAMPLING DATA

D 11 hand	Stream Code	Sample Type†	Conc Source	entration Day 1	s (mg/l) Day 2	Day 3	ひせつつ
Pollutant		<u></u>				Ĭ	Ź
Toxic Pollutants (Continued)					-	)AA.	ן מיעי
47. bromoform (tribromomethane)	396 399	1 1	ND ND	ND.	ND ND		7 TN TN
48. dichlorobromomethane	396 399	1 1:	ND ND	ND ND	ND ND		CITRO
49. trichlorofluoromethane	396 399	1	ND ND	ND ND	ND ND	)  -  - 	SUBCATEGORY
50. dichlorodifluoromethane	396 399	1 · 1	ND ND	ND ND	ND ND	i.	) P V
51. chlorodibromomethane	396 399	1	ND ND	ND ND	ND ND	( 	SECT
52. hexachlorobutadiene	396 399	1 1	ND ND	ND ND	ND ND		ı <
53. hexachlorocyclopentadiene	396 399	1 1	ND ND	ND ND	N D N D		
54isophorone	396 399	<u> </u>	ND ND	ND ND	ND ND		
55. naphthalene	396 399	1 1	ND ND	<0.01 <0.01	<0.01 <0.01		

Table V-13 (Continued)

	<u>Pollutant</u>	Stream Code	Sample Typet	Con Source	centration Day 1	s (mg/1) Day 2	Day 3	SE
<u>Toxi</u>	c Pollutants (Continued)					<u> </u>	<u>Day 3</u>	SECONDARY
56.	nitrobenzene	396 399	1	ND ND	ND ND	ND ND		
57.	2-nitrophenol	396 399	.1	ND ND	<0.01 ND	ND ND		TIN SU
58.	4-nitrophenol	396 399	1 1	<0.01 <0.01	<0.01 ND	ND ND		SUBCATEGORY
59.	2,4-dinitrophenol	-396 -399	1 1	ND ND	ND ND	ND ND	,	Adou
60.	4,6-dinitro-o-cresol	396 399	1	ND ND	ND ND	N D N D	OHC T	ā U
61.	N-nitrosodimethylamine	396 399	1	ND ND	ND ND	ND ND	; 	I.
62.	N-nitrosodiphenylamine	396 399	1	ND ND	<0.01 <0.01	<0.01 <0.01		
63.	N-nitrosodi-n-propylamine	396 399	1	ND ND	ND ND	ND ND		
64.	pentachlorophenol	396 399	1 1 · · · · · · · · · · · · · · · · · ·	ND ND	ND ND	N D N D		

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)

RAW WASTEWATER SAMPLING DATA

	Stream	Sample	Conc	entration	s (mg/l)		SEC
Pollutant	Code	Type†	Source	Day 1	Day 2	Day 3	INOC
Toxic Pollutants (Continued)							SECONDARY
65. phenol	396	1	ND	<0.01	ND		HIN
os. phenor	399	1	ND	<0.01	ND		
66. bis(2-ethylhexyl) phthalate	396	1	<0.01 <0.01	0.268 - <0.01	<0.01 <0.01		SUBCATEGORY
, , ,	399	. •	(0.01	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			CAI
67. butyl benzyl phthalate	396	1	ND	0.025	0.011 <0.01		편 Q
over part course i	399	1	ND	0.012	\U•U1		OR.S
68. di-n-butyl phthalate	396	1	ND	<0.01	<0.01	1	. 4
oo. di n babyi publika	399	1	ND	<0.01	<0.01		ζΩ
69. di-n-octyl phthalate	396	1	ND	ND	ND		SECT
dy, dien decyl phonococ	399	1	ND	ND	ND		H
70. diethyl phthalate	396	1	ND	ND	ND		<
70. diethy' phenarass	399	1	ND	ND	ND		
71. dimethyl phthalate	396	1	ND	ND	N D N D		
//. dimeenyl phenalass	399	1	ND	ND	ND		
72. benzo(a)anthracene	396	1	ND	ND	ND		
72. Delibo (a) and	399	1	ND	ND	ND		
73. benzo(a)pyrene	396	1	ND	ND	N D		
/J. Delizo(u/p/zene	399	1	ND	ND	NĐ		

Table V-13 (Continued)

					•		
	Pollutant	Stream Code	Sample Typet	Con Source	centration		
			27901	bource	Day 1	Day 2	Day 3
Toxic	Pollutants (Continued)				-		
74.	benzo(b)fluoranthene	396 399	1	ND ND	ND ND	N D N D	
75.	benzo(k)fluoranthane	396 399	1 1	ND ND	ND ND	ND ND	
76.	chrysene	396 399	1	ND ND	ND ND	N D ND	
77.	acenaphthylene	396 399	1 1	ND ND	ND ND	ND ND	
78.	anthracene (a)	396 399	1 1	ND ND	ND <0.01	ND ND	
79.	benzo(ghi)perylene	396 399	1 1 - 1 - 1	ND ND	ND ND	ND ND	
80.	fluorene	396 399	1	ND ND	ND ND	ND ND	
81.	phenanthrene (a)	396 399	1 1	ND ND	ND <0.01	ND ND	
82.	dibenzo(a,h)anthracene	396 399	1 1	ND ND	ND ND	ND ND	

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)

RAW WASTEWATER SAMPLING DATA

	Stream	Sample	Concentrations (mg/l)				
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	Ğ
Toxic Pollutants (Continued)							SECONDARY
83. indeno (1,2,3-c,d)pyrene	396 399	1 1	ND ND	ND ND	ND ND		HIN
84. pyrene	396 399		ND ND	ND ND	ND ND		
85. tetrachloroethylene	396 399	1	ND ND	ND ND	ND ND		SUBCATEGORY
86. toluene	396 399	1	ND ND	ND ND	ND ND		RY
87. trichloroethylene	396 399	1	ND ND	ND ND	N D ND		SECT
88. vinyl chloride (chloroethylene)	396 399	1	ND ND	ND ND	ND ND		ا <
89. aldrin	396 399	1	ND ND	ND ND	N D ND		
90. dieldrin	396 399	1 1	ND ND	ND ND	ND ND		
91. chlordane	396 399	1 .	ND ND	ND ND	N D N D		

Table V-13 (Continued)

D-11	Stream	Sample	Conce	entration	s (mg/l)	<b>v</b>
<u>Pollutant</u>	<u>Code</u>	<u>Typet</u>	Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						Day 3 CONDARY
92. 4,4'-DDT	396 399	1 1	ND ND	ND ND	N D ND	ARY TIN
93. 4,4'-DDE	396 399	. 1. <b>.1</b>	ND ND	ND ND	ND ND	
94. 4,4'-DDD	396 399	1 1	ND ND	ND ND	N D ND	SUBCATEGORY
95. alpha-endosulfan	396 399	1	ND ND	ND ND	ND ND	ORY
96. beta-endosulfan	396 399	1 1	ND ND	ND ND	ND ND	SECT
97. endosulfan sulfate	396 399	1 1	ND ND	ND ND	ND ND	T - V
98. endrin	396 399	1	ND ND	ND ND	N D N D	
99. endrin aldehyde	396 399	1	ND ND	ND ND	ND ND	
100. heptachlor	396 399	1	ND ND	ND ND	N D ND	

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)

RAW WASTEWATER SAMPLING DATA

	Stream	Sample	Concentrations (mg/l)				
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	
Toxic Pollutants (Continued)						Day 3	
101. heptachlor epoxide	396	1	ND	ND ND	ND ND		
	399	ı	ND			HU	
102. alpha-BHC	396 399	<u> </u>	ND ND	ND ND	ND ND	SUBC	
103. beta-BHC	396 399	1 1	ND ND	ND ND	N D ND	SUBCATEGORY	
104. gamma-BHC	396 399	1	ND ND	ND ND	ND ND	RY	
105. delta-BHC	396 399	1 1	ND ND	ND ND	N D ND	SECT	
106. PCB-1242 (b)	396 399	1 1	ND ND	ND ND	ND ND	ı <	
107. PCB-1254 (b)	396 399	1 1	ND ND	ND ND	N D ND		
108. PCB-1221 (b)	396 399	1	ND ND	ND ND	ND ND		
109. PCB-1232 (c)	396 399	1 1	ND ND	ND ND	N D N D	·	

	*		•			•		
	<u>Pollutant</u>	Stream Code	Sample Typet	Cone Source	centration Day 1	ns (mg/l) Day 2	Day 3	SEC.
Toxio	c Pollutants (Continued)						-	ECONDARY
110.	PCB-1248 (c)	396 399	1	ND ND	ND ND	N D N D	•	ARY TIN
111.	PCB-1260 (c)	396 399	1 	ND ND	ND ND	ND ND		
112.	PCB-1016 (c)	396 399	1 1	ND ND	ND ND	ND ND		SUBCATEGORY
113.	toxaphene	396 399	1 1	ND ND	ND ND	ND ND	; .	DRY
114.	antimony	396 399	1 1	0.006 0.006	0.40 0.75	3.1 2.2		SECT
115.	arsenic	396 399	1	<0.001 <0.001	0.12 0.13	0.34 0.30		- V
117.	beryllium	396 399	1	<0.0005 <0.0005	<0.0005 0.02	0.001 <0.0005		
118.	cadmium	396 399	1 1	<0.001 <0.001	0.03 0.10	0.08 0.08		
119.	chromium (total)	 396 399	1.	0.032 0.032	0.020 0.031	0.032 0.028		

Table V-13 (Continued)

TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)

RAW WASTEWATER SAMPLING DATA

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

SECONDARY TIN SUBCATEGORY

SECT

Table V-13 (Continued)
TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SPENT PLATING SOLUTION AND SLUDGES)
RAW WASTEWATER SAMPLING DATA

<u>Pollutant</u>	Stream Code	Sample Typet	Conc Source	entrations (mg/l) Day 1 Day 2	Day 3 O
Nonconventional Pollutants					TWO
alkalinity	396 399	1 1	77 77	38,200 30,000 39,000 31,000	SECONDARY TIN
ammonia nitrogen	396 399	1	2	0.8 <0.01	
calcium	396 399	1	17 17	1.1 <0.01 0.27 0.59 0.57 0.64	3CAT
chemical oxygen demand (COD)	396 399	1	<1 <1	34 110 39 120	ORY
fluoride	396 399	1	0.94 0.94	15,000 12,000 15,000 12,000	SECT
magnesium	396 399	1	7.2 7.2	0.24 0.43 0.45 0.47	ı
phenolics	396 399	1	0.026 0.026		
sulfate	396 399	1	29 29	1,700 1,500 1,200 1,700	
tin	396 399	1 1	<0.025 <0.025	60 18 13 28	

SECONDARY TIN SUBCATEGORY

Table V-13 (Continued)

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

tSample Type Code: 1 - One-time grab

<sup>(</sup>a), (b), (c) Reported together.

Table V-14

TIN HYDROXIDE FILTRATE
RAW WASTEWATER SAMPLING DATA

	Pollutant	Stream Code	Sample	Conce	ntrations			SE(
Toxic	Pollutants	<u>coue</u>	<u>Typet</u>	Source	Day 1	Day 2	Day 3	SECONDARY
1.	acenaphthene	398	1	ND	ND			
2.	acrolein	398	, 1	ND	ND	•		TIN
3.	acrylonitrile	3.98		ND	ND	. نيد د ددد		aus
4.	benzene	398	1	ND	ND			SUBCATEGORY
5.	benzidine	398	1	ND	ND			EGOF
6.	carbon tetrachloride	398	1	ND	ND			<b>K</b> .
7.	chlorobenzene	398	1	ND	ND			S
8.	1,2,4-trichlorobenzene	398	1	ND	ND			SECT
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

		Stream	Sample	Conc			
	Pollutant	Code	Typet	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		
1.7	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		
	1,4-dichlorobenzene	398	1	ND	ND		
27. 28.	3,3'-dichlorobenzidine	398	1	ND	ND		
20.	J,J GLORIE GLOBOTHE THE STATE						

SECONDARY TIN SUBCATEGORY

Table V-14 (Continued)

<u>Pollutant</u>	Stream Code	Sample Typet	Con Source	centration Day 1	ns (mg/l) Day 2	Dov. 2	ב
Toxic Pollutants (Continued)				<u> </u>	Day Z	Day 3	. <u>```</u>
29. 1,1-dichloroethylene	398	1	<0.01	ND			AKI
30. 1,2-trans-dichloroethylene	398	1	ND	ND			L
31. 2,4-dichlorophenol	398	<u> 1</u>	ND	ND			SU
32. 1,2-dichloropropane	398	1	ND	ND			3CAT
33. 1,3-dichloropropene	398	1	ND	ND			TEGORY
34. 2,4-dimethylphenol	398	1	ND	ND			RY
35. 2,4-dinitrotoluene	398	1	ND	ND		,	Ω
36. 2,6-dinitrotoluene	398	1	ND	ND			SECT
37. 1,2-diphenylhydrazine	398	1	ND	ND			. <b>.</b> ∨
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)

	Pollutant	Stream Code	Sample Type†	Conc Source	entration Day 1	s (mg/1) Day 2	Day 3
Toxic	Pollutants (Continued)						RY
43.	bis(2-choroethoxy)methane	398	1	ND	ND		TIN
44.	methylene chloride	398	1	ND	ND.		
45.	methyl chloride (chloromethane)	398	1	ND	ND		BCA
46.	methyl bromide (bromomethane)	398	1	ND	ND		SUBCATEGORY
47.	bromoform (tribromomethane)	398	1	ND	ND		DRY
48.	dichlorobromomethane	398	1 .	ND	ND		
49.	trichlorofluoromethane	398	. 1	ND	ND		SECT
50.	dichlorodifluoromethane	398	1	ND	ND		1
51.	chlorodibromomethane	398	1	ND	·ND		⋖
52.	hexachlorobutadiene	398	1 .	ND	ND		·
53.	hexachlorocyclopentadiene	398	1	ND	ND		
54.	isophorone	398	1	ND	ND		
		398	1	ND	ND		
55.	naphthalene	398	1	ND	ND	-	
56.	nitrobenzene	220	ı	110	- · -		

Table V-14 (Continued)

٠.	Pollutant	Stream Code	Sample Typet	Con	ncentration			S
Toxio	Pollutants (Continued)		<u>Typet</u>	Source	Day 1	Day 2	Day 3	CON
57.	2-nitrophenol	398	1	ND	0.010	•		SECONDARY
58.	4-nitrophenol	398	1	<0.01	0.025			TIN
59.	2,4-dinitrophenol	398	· <b></b>	ND	0.033			
60.	4,6-dinitro-o-cresol	398	1	ND	ND		*	SUBCATEGORY
61.	N-nitrosodimethylamine	398	1	ND	ND			TEGO
62.	N-nitrosodiphenylamine	398	1	ND	<0.010		-	)RY
63.	N-nitrosodi-n-propylamine	398	1	ND				
64.	pentachlorophenol	398	1	ND ND	ND ND			SECT
65.	phenol	398	1 .	ND	ND			1
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				
69.	di-n-octyl phthalate	398	 1	ND	<0.010			
70.	diethyl phthalate	398	1	ND	ND ND			

#### Table V-14 (Continued)

## TIN HYDROXIDE FILTRATE RAW WASTEWATER SAMPLING DATA

<u>Pollutant</u>	Stream Code	Sample Typet	Conc Source	entrations Day 1	mg/l) Day 2	Day 3	SECONDARY
Toxic Pollutants (Continued)							ARY
71. dimethyl phthalate	398	1	ND	ND			HHN
72. benzo(a)anthracene	398	1	ND	ND			
73. benzo(a)pyrene	398	1	ND	ND			ЈВС <i>?</i>
	398	1	ND	ND			SUBCATEGORY
	398	1	ND	ND			ORY
75. benzo(k)fluoranthane	398	1	ND	ND			•
76. chrysene		1	ND	ND			SECT
77. acenaphthylene	398	1	ND	ND			G
78. anthracene 🔩 (a)	398	1			,		ı <
79. benzo(ghi)perylene	398	1	ND	ЙD			
80. fluorene	398	1	ND	ND			
81. phenanthrene (a)	398	. 1	ND	ND			
82. dibenzo(a,h)anthracene	398	1	ND	ND			
(4.0.0	398	. 1	ND	ND			
83. indeno (1,2,3-c,d)pyrene 84. pyrene	398	1	ND	ND			

413

Table V-14 (Continued)

<u>Pollutant</u>	Stream	Sample	Conc	entration	s (mg/l)	
	Code	Typet	Source	Day 1	Day 2	Day 3
<u>Toxic Pollutants</u> (Continued)						
85. tetrachloroethylene	398	1	ND	ND		
86. toluene	398	1	ND	ND		
87. trichloroethylene	398	1	ND	· Jan 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)

	Stream Sample		Concentrations (mg/l)			SEC
<u>Pollutant</u>	Code	Typet	Source	Day 1	Day 2	Day 3 ON
Toxic Pollutants (Continued)						Day 3
99. endrin aldehyde	398	1	ND	ND		TIN
100. heptachlor	398	1	ND	ND		
101. heptachlor epoxide	398	1	ND	ND		JВСА
102. alpha-BHC	398	1	ND	ND		SUBCATEGORY
103. beta-BHC	398	1	ND	ND		ORY
104. gamma-BHC	398	1	ND	ND		
105. delta-BHC	398	1	ND	ND		SECT
106. PCB-1242 (b)	398	1	ND	ND		i i
4.	398	1	ND	ND		<
(0.)	398	1	ND	ND		
	398	. 1	ND	ND		
109. PCB-1232 (c)	398	1	ND	ND		
110. PCB-1248 (c)		1	ND	ND		
111. PCB-1260 (c)	398	1		ND		
112. PCB-1016 (c)	398	1	ND	ИD		

Table V-14 (Continued)

			•					
	<u>Pollutant</u>	Stream Code	Sample Typet	Conc Source	centrations Day 1	mg/1) Day 2	Day 3	SE(
Toxio	<u>Pollutants</u> (Continued)							
113.	toxaphene	398	1	ND	ND			ONDARY
114.	antimony	398	1	0.006	2.4			TIN
115.	arsenic	398	1	<0.001	0.024			
117.	beryllium	398	1	<0.0005	0.002			SUBCATEGORY
118.	cadmium	398	1	<0.001	0.002			OĐŒ.
119.	chromium (total)	398	1	0.032	0.04			RY
120.	copper	398	1	0.031	0.280			70
121.	cyanide (total)	398	1	0.040	10.0			SECT
122.	lead	398	1	0.12	0.037			L,
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)

Pollutant	Stream Code	Sample Typet	Source	tentrations $(mg/1)$ Day 1 Day 2	Day 3
Toxic Pollutants (Continued)					
128. zinc	398	1	0.05	0.220	
Nonconventional Pollutants					
alkalinity	398	1	777	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	
	398	1	29	2,000	
sulfate	398	1	<0.025	7.8	
tin total dissolved solids (TDS)	398	.1	160	50,000	
Conventional Pollutants oil and grease	398	1	<1	56	

SECONDARY TIN SUBCATEGORY

Table V-14 (Continued)

Pollutant	Stream _Code	Sample Typet	Conc. Source	entrations Day 1	mg/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		

tSample Type Code: 1 - One-time grab

<sup>(</sup>a), (b), (c) Reported together.

Table V-15

MUD POND SUPERNATANT
RAW WASTEWATER SAMPLING DATA

	Pollutant	Stream Code	Sample Typet	Conce Source	ntrations Day 1	(mg/1) Day 2	Day 3	SECONDARY
Toxic	Pollutants							ARS
1.	acenaphthene	456	1	ND <sub>.</sub>	ND			NIT
2.	acrolein	456	1	ND	ND			
3	acrylonitrile	456	. 1	ND	ND			JBCZ
4.	benzene	456	1	0.013	0.008			SUBCATEGORY
5.	benzidine	456	1	ND	ND			ORY
6.	carbon tetrachloride	456	1	ND	ND			
7.	chlorobenzene	456	1	ND	ND			SECT
8.	1,2,4-trichlorobenzene	456	1	ND	ND			1
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 Typet	Conc Source	centration Day 1	s (mg/1) Day 2	Day 3
Toxic Pollutants (Continued)			<del>Dod! oc</del>	<u>Duy</u> 1	Day Z	Day 3
15. 1,1,2,2-tetrachloroethane	456	. 1	ND	ND		SECONDARY
16. chloroethane	456	1	ND	ND	e e	RY
17. bis(chloromethyl)ether	456	· 1 :	ND			HIN
18. bis(2-chloroethy1)ether	456	1	ND	ND		SUB
19. 2-chloroethyl vinyl ether	456	1	ND	ND,		SUBCATEGORY
20. 2-chloronaphthalene	456	1	ND	ND		∃GOR
21. 2,4,6-trichlorophenol	456	1	ND	ND		ĸ
22. p-chloro-m-cresol	456	1	ND	ND		N N
23. chloroform	456	1	0.038	0.005		SECT
24. 2-chlorophenol	456	1	ND	ND		- <
25. 1,2-dichlorobenzene	456	1	ND	ND	1. 1	
26. 1,3-dichlorobenzene	456	1	ND	ND		
27. 1,4-dichlorobenzene	456	1	ND	ND		
28. 3,3'-dichlorobenzidine	456	1	ND	ND	1.	

Table V-15 (Continued)

### MUD POND SUPERNATANT RAW WASTEWATER SAMPLING DATA

	Stream	Sample		entration		<u> </u>	SH
Pollutant	<u>Code</u>	<u>Typet</u>	Source	Day 1	Day 2	Day 3	CO
Toxic Pollutants (Continued)							SECONDARY
29. 1,1-dichloroethylene	456	1	ND	ND			
30. 1,2- <u>trans</u> -dichloroethylene	456	1	ND	ND			TIN
31. 2,4-dichlorophenol	456	1	ND	ND		# · · · · · · · · · · · · · · · · · · ·	SUBCATEGORY
32. 1,2-dichloropropane	456	1	ND	ND			CATE
33. 1,3-dichloropropene	456	1	ND	ND			GOR
34. 2,4-dimethylphenol	456	1	ND	0.004		•	ĸ
35. 2,4-dinitrotoluene	456	1	ND	ND			S
36. 2,6-dinitrotoluene	456	1	ND	ND			SECT
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

	<u>Pollutant</u>	Stream Code	Sample Typet	Conce Source	entrations (mg/1) Day 1 Day 2	Day 3 C
Toxio	Pollutants (Continued)	*				Day 3
43.	bis(2-choroethoxy)methane	456	1 1	ND	ND	ARY
44.	methylene chloride	456	1	0.190	0.005	TIN
45.	methyl chloride (chloromethane)	456	· · · · · · · · · · · · · · · · · · ·	ND		
46.	methyl bromide (bromomethane)	456	1	ND	ND	SUBCATEGORY
47.	bromoform (tribromomethane)	456	1	ND	ND	EGO]
48.	dichlorobromomethane	456	1	ND .	ND	RY Y
49.	trichlorofluoromethane	456	1	ND	ND	Ø
50.	dichlorodifluoromethane	456	. 1	ND	ND	SECT
51.	chlorodibromomethane	456	1	0.002	ND	l <
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	

#### MUD POND SUPERNATANT RAW WASTEWATER SAMPLING DATA

		Stream	Sample	Concentrations (mg/1)					
		Pollutant	Code	Typet	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			
		N-nitrosodiphenylamine	456	1	ND	ND			7
	63.	N-nitrosodi-n-propylamine	456	1	ND	ND			
i	64.	pentachlorophenol	456	1	ND	ND			
	65.	phenol	456	1	ND	0.003			
,		bis(2-ethylhexyl) phthalate	456	1	0.006	0.002			
	66.		456	1	ND	ND			
<u> </u>	67.	butyl benzyl phthalate	456	1	ND	ND			
	68.	di-n-butyl phthalate			ND	ND			
	69.	di-n-octyl phthalate	456	1		ND			
	70.	diethyl phthalate	456	1	ND	עא			

Table V-15 (Continued)

### MUD POND SUPERNATANT RAW WASTEWATER SAMPLING DATA

				*	and the second s
Pollutant	Stream Code	Sample Typet	Conce Source	entrations (mg/l Day 1 Day 2	Day 3 C
Toxic Pollutants (Continued)					Day 3
71. dimethyl phthalate	456	1	ND	ND	
72. benzo(a)anthracene	456	1	ND	ND	HIN
73. benzo(a)pyrene	456		ND.	<b>ND</b>	SUB
74. benzo(b)fluoranthene	456	1	ND	ND	CAT
75. benzo(k)fluoranthane	456	1	ND	ND	CATEGORY
76. chrysene	456	1	ND	ND	첝
77. acenaphthylene	456	1 .	ND	ND	<u>S</u>
78. anthracene (a)	456	1	ND	ND	SECT
79. benzo(ghi)perylene	456	1	ND	ND	ı <
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

		Stream	Sample		entrations			E E
	<u>Pollutant</u>	Code	Typet	Source	Day 1	Day 2	Day 3	CON
Toxic	Pollutants (Continued)							SECONDARY
85.	tetrachloroethylene	456	1	ND	ND			
86.	toluene	456	1	0.001	0.004			TINS
.87.	trichloroethylene	456	1	ND	ND	<u> </u>		SUBC
88.	vinyl chloride (chloroethylene)	456	1	ND	ND			CATEGORY
89.	aldrin	456	1	ND	ND			30RY
90.	dieldrin	456	1	ND	ND			•
91.	chlordane	456	1	ND	ND			SECT
92.	4,4'-DDT	456	1	ND	ND			Η̈́
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	4.56	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

Polling and	Stream	Sample	Conc	entrations	s (mg/l)	
<u>Pollutant</u>	<u>Code</u>	Typet	Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)		•				Day 3
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		6
104. gamma-BHC	456	1	ND	ND	under de la companya	Ā
105. delta-BHC	456	1	ND	ND		ប្
106. PCB-1242 (b)	456	1	ND	ND		T.C.T.
107. PCB-1254 (b)	456	1	ND	ND		I <
108. PCB-1221 (b)	456	1	ND	ND	A STATE OF THE STA	
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

	Stream	Sample		entrations		Day 3
<u>Pollutant</u>	<u>Code</u>	<u>Type†</u>	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		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	4.40	<del>.</del>
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

<u>Pollutant</u>	Stream Code	Sample Typet	Conc Source	entrations (mg/1) Day 1 Day 2	Day 3	SECONDARY
Toxic Pollutants (Continued)		•				NDA
128. zinc	456	1.	0.08	190		•
Nonconventional Pollutants						TIN
alkalinity	456		60	90,000	g	SUBO
aluminum	456	1	1.90	30,000	4	CATE
ammonia nitrogen	456	. 1	0.18			SUBCATEGORY
calcium	456	1 .	11	<0.1		K
chemical oxygen demand (COD)	456	1	4.0	5,700		S
fluoride	456	1 .	1.2	0.4		SECT
magnesium	456	1	5.5	0.12		<b>-</b> ✓
phenolics	456	1	0.011	0.011	: :	
tin	456	1	1.6	240	·	
Conventional Pollutants	•	•				
oil and grease	456	1	<b>&lt;1</b>			

#### Table V-15 (Continued)

### MUD POND SUPERNATANT RAW WASTEWATER SAMPLING DATA

	Stream	Sample	Concentrations (mg/1)				
Pollutant	Code	Typet	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			

tSample Type Code: 1 - One-time grab

<sup>(</sup>a), (b), (c) Reported together.

Table V-16

ELECTROWINNING SOLUTION AFTER CHLORINATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

	Pollutant	Stream	Sample	Conc	entrations (	mg/1)	· .	SE
		Code	Typet	Source	Day 1 D	ay 2	Day 3	CON
Toxio	c Pollutants							CONDARY
1.	acenaphthene	849	1	ND	0.001			
2.	acrolein	849	1	ND	ND			TIN
3	acrylonitrile	849		ND	ND			SUBCATEGORY
4.	benzene	849	1	ND	ND			ATE
5.	benzidine	849	1	ND	ND			GOR
6.	carbon tetrachloride	849	1	ND	ND			К
7.	chlorobenzene	849	1	ND	ND			SECT
8.	1,2,4-trichlorobenzene	849	1	ND	ND			CH
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	, o		
13.	1,1-dichloroethane	849	1	ND	ND		;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;	, .
14.	1,1,2-trichloroethane	849	1 :	ND	ND			

Table V-16 (Continued)

	Stream	Sample	Concentrations (mg/1)				
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	INOCI
Toxic Pollutants (Continued)							SECONDARY
15. 1,1,2,2-tetrachloroethane	849	1	ND	ND			NIT
16. chloroethane	849	1	ND	ND			
17. bis(chloromethyl)ether	849	<u> </u>	ND	ND			JBCA
18. bis(2-chloroethyl)ether	849	1	ND	ND			SUBCATEGORY
19. 2-chloroethyl vinyl ether	849	1	ND	ND			ORY
20. 2-chloronaphthalene	849	1	ND	ND			
21. 2,4,6-trichlorophenol	849	1	ND	ND			SECT
22. p-chloro-m-cresol	849	· 1	ND	ND			l L
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)

							•
	Pollutant	Stream <u>Code</u>	Sample Typet	Cone Source	centration Day 1	s (mg/1) Day 2	Day 3
Toxi	c Pollutants (Continued)					<u> </u>	Day 5
29.	1,1-dichloroethylene	849	1	ND	ND		
30.	1,2- <u>trans</u> -dichloroethylene	849	1	ND	ND		
31.	2,4-dichlorophenol	849		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)

Pollutant	Stream Code	Sample Typet	Conce Source	entrations Day 1	mg/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		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		
	849	1	ND	ND		
	849	1	ND	ND	•	
53. hexachlorocyclopentadiene	849	1	ND	ND		
54. isophorone			ND	0.002		
55. naphthalene	849	I				
56. nitrobenzene	849	1	ND	ND		

SECONDARY TIN SUBCATEGORY

Table V-16 (Continued)

·	Pollutant	Stream Code	Sample	Conc	entration	ns (mg/l)	· · · · · ·
Tovi		Code	Typet	Source	Day 1	Day 2	Day 3
TOXI	c Pollutants (Continued)						
57.	2-nitrophenol	849	1	ND	0.020		
58.	4-nitrophenol	849	1	ND	ND		
59.	2,4-dinitrophenol	849	1	ND	N D		
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		<u> </u>
64.	pentachlorophenol	849	1	ND	ND		, (
65.	phenol	849	1	ND	0.08		
66.	bis(2-ethylhexyl) phthalate	849	1	0.054	N D		
67.	butyl benzyl phthalate	849	1	ND	ND		
68.	di-n-butyl phthalate	849		ND	ND		
69.	di-n-octyl phthalate	849					
70.	diethyl phthalate	849		ND ND	ND ND		

SECONDARY TIN SUBCATEGORY

Table V-16 (Continued)

	<u>Pollutant</u>	Stream Code	Sample Typet	Conc Source	entrations Day 1	mg/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		
	fluorene	849	1	ND	ND		
80.		849	1	ND	ND		
81.	p	849	-1 -	- ND	ND		÷
82.	dibenzo(a,h)anthracene	849	1	ND	ND		
83.	indeno (1,2,3-c,d)pyrene	849	1	ND	0.003		
84.	pyrene	047	• -	112			:

Table V-16 (Continued)

Pollutant	Stream	Sample	Conc	centration		
	<u>Code</u>	<u>Typet</u>	Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)		n,				
85. tetrachloroethylene	849	1,	ND	ND		•
86. toluene	849	1	0.093	0.001		
87. trichloroethylene	849	1	ND	0.016		
88. vinyl chloride (chloroethylen	e) 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	<b>1</b>	ND	ND		
98. heptachlor	849	1	ND	ND		

Table V-16 (Continued)

ELECTROWINNING SOLUTION AFTER CHLORINATION - PLANT C
TREATED WASTEWATER SAMPLING DATA

	Stream	Sample	Conc	entration	s (mg/1)		SH
Pollutant	Code	<u>Typet</u>	Source	Day 1	Day 2	Day 3	CON
Toxic Pollutants (Continued)							SECONDARY
99. endrin aldehyde	849	1	ND	ND			
100. heptachlor	849	1	ND	ND			TIN
101. heptachlor epoxide	849	1.	ND	ND			SUBC
102. alpha-BHC	849	1	ND	ND			SUBCATEGORY
103. beta-BHC	849	1	ND	ND			GOR
104. gamma-BHC	849	1	ND	ND			ĸ
105. delta-BHC	849	1	ND	ND			N H
	849	1	ND	ND			SECT
	849	1	ND	ND			ا ح
107. PCB-1254 (b)	849	1	ND	ND			
108. PCB-1221 (b)		1	ND	ND			
109. PCB-1232 (c)	849	1		ND			
110. PCB-1248 (c)	849	1:	ND -	*			
111. PCB-1260 (c)	849	1	ND	ND	•		
112. PCB-1016 (c)	849	1	ND	ND		-	_

Table V-16 (Continued)

		Stream	Sample	Con	centrations	(ma/1)	Č L
	<u>Pollutant</u>	Code	Typet	Source	Day 1	Day 2	Day 3
Toxio	Pollutants (Continued)		•				Day 3
113.	toxaphene	849	1	ND	ND		
114.	antimony	849	1	<0.001	<0.001		-  -  -
115.	arsenic	849	<b>1</b> (	0.008	-18-		· · · · · · · · · · · · · · · · · · ·
117.	beryllium	849	1	<0.001	0.012		CALEGOXX
118.	cadmium	849	1	<0.001	0.32		۵ ک بر
119.	chromium (total)	849	1	0.003	0.31		K
120.	copper	849	.1	0.14	0.26		C.T.
121.	cyanide (total)	849	1.	0.005	4.6		<u>CI</u>
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)

<u>Pollutant</u>	Stream Code	Sample Typet	Conc Source	entrations (mg/l) Day 1 Day 2	Day 3	SECONDARY
Toxic Pollutants (Continued)			•			DAR:
128. zinc	849	1	0.06	1.1		NIL A
Nonconventional Pollutants						
ammonia nitrogen	849	1	1.5	20		SUBCATEGORY
phenolics	849	1	0.002	0.003		ATEC
tin	849	1	0.28	2,300		JORY
Conventional Pollutants				·		
oil and grease	849	1	5.6	ND		SECT
total suspended solids (TSS)	849	1	19	25,000		i <del>j</del> I
pH (standard units)	849	1	6.5	13		<

tSample Type Code: 1 - One-time grab

<sup>(</sup>a), (b), (c) Reported together.

Table V-17

ELECTROWINNING SOLUTION AFTER CHLORINATION AND NEUTRALIZATION - PLANT C

TREATED WASTEWATER SAMPLING DATA

	Pollutant	Stream	Sample	Conc	entrations	s (mg/1)	
Toxi	c Pollutants	<u>Code</u>	Typet	Source	Day 1	Day 2	Day 3
1.	acenaphthene	850	1 .	ND	ND		
2.	acrolein	850	1 -	ND	ND		
3.	acrylonitrile	850	1	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

•							
<u>Pollutant</u>	Stream Code	Sample Typet	Conc Source	entration Day 1	ns (mg/1) Day 2	Day 3	SECONDARY
Toxic Pollutants (Continued)							NDAF
15. 1,1,2,2-tetrachloroethane	850	1	ND	ND			•
16. chloroethane	850	1	ND	ND			TIN
17. bis(chloromethyl)ether	, 850 ,	1	ND	ND	• • •		SUBC
18. bis(2-chloroethyl)ether	850	1	ND	ND			CATEGORY
19. 2-chloroethyl vinyl ether	850	1	ND	ND			GOR
20. 2-chloronaphthalene	850	1	ND	ND			K,
21. 2,4,6-trichlorophenol	850	1	ND	ND			SECT
22. p-chloro-m-cresol	850	1	ND	ND			CH.
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			
70. J'A -diction opening	-		-				

Table V-17 (Continued)

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

	Stream	Sample	Conce	ntratio	nn (ma/1)		ญ
Pollutant	Code	Typet	Source	Day 1	ons (mg/1) Day 2	Day 3	ECC
Toxic Pollutants (Continued)				•			SECONDARY
29. 1,1-dichloroethylene	850	1	ND	ND			
30. 1,2- <u>trans</u> -dichloroethylene	850	1	ND	ND			TIN
31. 2,4-dichlorophenol	850	1.21	ND	ND	en de la compansión de la compansión de la compansión de la compansión de la compansión de la compansión de la		SUB
32. 1,2-dichloropropane	850	1	ND	ND			SUBCATEGORY
33. 1,3-dichloropropene	850	1	ND	ND			GOR
34. 2,4-dimethylphenol	850	1	ND	ND			K
35. 2,4-dinitrotoluene	850	1	ND	ND			H S
36. 2,6-dinitrotoluene	850	1	ND	ND			SECT
37. 1,2-diphenylhydrazine	850	1	ND	ND	· · · · · · · · · · · · · · · · · · ·		<b>-</b>
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

SECONDARY TIN SUBCATEGORY

SECT

	Pollutant	Stream Code	Sample Type†	Source	entrations Day 1	mg/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		
		850	1	ND	ND		
54.	isophorone	850	1	ND	ND		
55 <b>.</b> 56.	naphthalene nitrobenzene	850	1	ND	ND		

TREATED WASTEWATER SAMPLING DATA

Table V-17 (Continued)

	D - 1.1	Stream	Sample		entrations			
	<u>Pollutant</u>	Code	Typet	Source	Day 1	Day 2	Day 3	E S
Toxic	Pollutants (Continued)				•		e.,	ECON
57.	2-nitrophenol	850	- 1	ND	ND 🚁			NDAF
58.	4-nitrophenol	850	1	ND	ND			ž H
5.9.	2,4-dinitrophenol	8.50		· · · · · · · · · · · · · · · · · · ·	ND			TIN
60.	4,6-dinitro-o-cresol	850	. 1	ND	ND	• .		SUBCATEGORY
61.	N-nitrosodimethylamine	850	1	ND	ND	, I	¥	ATE
62.	N-nitrosodiphenylamine	850	1 .	ND	ND			GOR:
63.	N-nitrosodi-n-propylamine	850	1	ND	ND			
64.	pentachlorophenol	850	1	ND	ND			SECT
65.	phenol	850	1	ND	0.035	,		CH.
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

			Stream	Sample	Cona	entration	ns (mg/l)		
	Pollutant		<u>Code</u>	Typet	Source	Day 1	Day 2	Day 3	
Toxic	Pollutants (Continu	ied)							
71.	dimethyl phthalate		850	1	ND	ND			
72.	benzo(a)anthracene		850	1	ND	ND			
73.	benzo(a)pyrene	<b></b>	850	1.	ND	ND	-		
74.	benzo(b)fluoranthen	ie	850	1 .	ND	ND			
75.	benzo(k)fluoranthan	ie -	850	1	ND	ND			
76.	chrysene		850	1	ND	ND			
77.	acenaphthylene		850	1	ND	ND			
78.	anthracene	(a)	850	1	ND	, ND	·		ļ
79.	benzo(ghi)perylene		850	1	ND	ND .			j
80.	fluorene		850	1	ND	ND		•	
81.	phenanthrene	(a)	850	1.	ND	ND			
82.	dibenzo(a,h)anthrac	ene	850	1	ND	ND .			
83.	indeno (1,2,3-c,d)p	yrene	850	1	ND	ND	·		
84.	pyrene		850	1	ND	ND			

Table V-17 (Continued)

<u>Pollutant</u>	Stream Code	Sample Typet	Conc Source	centrations (mg/l)  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		ND	
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)

<u>Pollutant</u>	Stream Code	Sample Typet	Conce Source	entrations Day 1	mg/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)

SECONDARY TIN

· ·	Pollutant		Stream Code	Sample Typet	Conc Source	entrations Day 1		<u> </u>
Toxic	Pollutants (Continued)				<u> </u>	<u>Day 1</u>	Day 2	Day 3
113.	toxaphene		850	1 ·	ND	ND		
114.	antimony		850	1	<0.001	0.77		
115.	arsenic		850		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	<b>. 1</b>	0.02	0.08		
127.	thallium	*	850	1	<0.001	0.78		

Table V-17 (Continued)

Pollutant	Stream Code	Sample Typet	Source	Day 1 Day 2 D	<u>ay 3</u>
Toxic Pollutants (Continued) 128. zinc	850	1	0.06	0.12	
Nonconventional Pollutants ammonia nitrogen	850	<b>1</b>	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	

tSample Type Code: 1 - One-time grab

<sup>(</sup>a), (b), (c) Reported together.

Table V-18

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

		Stream	Sample	Conc	entration	ıs (mg/l)	
	<u>Pollutant</u>	<u>Code</u>	Typet	Source	Day 1	Day 2	Day 3
Toxio	Pollutants		;			*	
1.	acenaphthene	845	1	ND	ND	ND	ND
2.	acrolein	845	1	ND	ND	ND	ND
3	acrylonitrile	845		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 y	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

		Stream	Sample		entration	s (mg/1)			
	Pollutant	Code	<u>Typet</u>	Source	Day 1	Day 2	Day 3	S	
Toxio	Pollutants (Continued)							CON	
15.	1,1,2,2-tetrachloroethane	845	- 1	ND	ND	ND	ND	SECONDARY	
16.	chloroethane	845	1	ND	ND	ND	ND	NIT A	
17.	bis(chloromethyl)ether	845	1 .	ND	ND	ND	ND		
18.	bis(2-chloroethyl)ether	845	1	ND	ND	ND	ND	UBC.	
19.	2-chloroethyl vinyl ether	845	1	ND	ND	ND	ND	SUBCATEGORY	
20.	2-chloronaphthalene	845	1	ND	ND	ND	ND	ORY	
21.	2,4,6-trichlorophenol	845	1	ND	0.004	ND	ND	. 6	
22.	p-chloro-m-cresol	845	1	ND	ND	ND	ND	SECT	
23.	chloroform	845	1	ND	ND	ND	ND	H	
24.	2-chlorophenol	845	1	ND	ND	ND	ND	<	
25.	1,2-dichlorobenzene	845	1	N·D	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

			·			**		
	<u>Pollutant</u>	Stream	Sample	Con	centration			
	TOTTUCANE	Code	Typet	Source	Day 1	Day 2	Day 3	ĵ.
Toxio	Pollutants (Continued)			*				SEC
29.	1,1-dichloroethylene	845	1	ND	ND	ND	ND	ECONDARY
30.	1,2- <u>trans</u> -dichloroethylene	845	1	ND	ND	ND	ND	•
3.1.	2,4-dichlorophenol	845	<b>1</b>	N:D ·		ND		TIN
32.	1,2-dichloropropane	845	1	ND	ND	ND :	ND	SUB
33.	1,3-dichloropropene	845	1	ND	ND	ND	ND	SUBCATEGORY
34.	2,4-dimethylphenol	845	1	ND	ND	ND	ND	GOR.
35.	2,4-dinitrotoluene	845	1	ND	ND	ND	ND	K
36.	2,6-dinitrotoluene	845	1	ND	ND	ND	ND	E S
37.	1,2-diphenylhydrazine	8,45	1	ND	ND	ND	ND	SECT
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

		Stream	Sample	Concentrations (mg/l)				
	<u>Pollutant</u>	Code	Typet	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

·	<u>Pollutant</u>	Stream	Sample	Conc	entration	s (mg/l)		
	TOTIGEARE	<u>Code</u>	<u>Typet</u>	Source	Day 1	Day 2	Day 3	מז
Toxio	Pollutants (Continued)	•						ECC
57.	2-nitrophenol	845	1 ·	ND	ND	ND	ND	SECONDARY
58.	4-nitrophenol	845	1	ND	ND	ND	ND	
59.	2,4-dinitrophenol	845	1	ND	ND	ND	ND	TIN
60.	4,6-dinitro-o-cresol	845	1	ND	ND	ND	ND	SUBCATEGORY
61.	N-nitrosodimethylamine	845	1	ND	ND	ND	ND	ATI
62.	N-nitrosodiphenylamine	845	1	ND	ND	ND	ND	3GOR
63.	N-nitrosodi-n-propylamine	845	1	ND	ND	ND	ND	K
64.	pentachlorophenol	845	1	ND	ND	, ND		N S
65.	phenol	845	1	ND	ND	ND	0.007	SECT :
66.	bis(2-ethylhexyl) phthalate	845	1	0.054	ND :	ND		<
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 - 1	ND	ND	ND	ND	•

Table V-18 (Continued)

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

SECONDARY TIN

SUBCATEGORY

		entration	entrations (mg/l)				
	Pollutant	Stream <u>Code</u>	Sample <u>Typet</u>	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.	benzo(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
*		845	1	ND	ND	ND	ND
83. 84.	indeno (1,2,3-c,d)pyrene 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

<u>Pollutant</u>	Stream	Sample	Conc	entration	s (mg/l)		
	Code	<u>Typet</u>	Source	Day 1	Day 2	Day 3	
Toxic Pollutants (Continued)			•				SEC
85. tetrachloroethylene	845	1	ND	ND	ND	ND	SECONDARY
86. toluene	845	1 .	0.093	0.009	0.001	0.014	
87. trichloroethylene	845	1	ND	0.015	ND	0.025	TIN
88. vinyl chloride (chloroethylene)	845	1	ND	ND	ND	ND	SUB
89. aldrin	845	1	ND	ND	ND	ND	SUBCATEGORY
90. dieldrin	845	1 , 1 ,	ND	ND	ND	ND	EGOI
91. chlordane	845	1	ND	ND	ND	ND	×
92. 4,4'-DDT	845	1	ND	ND	ND	ND	Ŋ
93. 4,4'-DDE	845	1	ND	ND	ND	ND	SECT
94. 4,4'-DDD	845	1	ND	ND	ND	ND	' <b>♂</b>
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	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

	Stream	Sample	Conc	Concentrations (mg/1)			
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	
Toxic Pollutants (Continued)						Ċ	
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	1110	
102. alpha-BHC	845	1	ND	ND	ND	ND 6	
103. beta-BHC	845	1	ND	ND	ND	ND S	
104. gamma-BHC	845	1	ND	ND	ND	ND S	
105. delta-BHC	845	1	ND	ND	ND	ND	
106. PCB-1242 (b)	845	1	ND	ND	ND	ND S	
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	
	845	1	ND	ND	ND	ND	
111. PCB-1260 (c) 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 Typet	Con Source	centration Day 1	ns (mg/l) Day 2	Day 3
Toxio	Pollutants (Continued)		•	• •		· · · · · · · · ·	SECC.
113.	toxaphene	845	1	ND	ND		SECONDARY
114.	antimony	845	1	<0.001	<0.001	0.51	0.00
115.	arsenic	845		0.008	<b>3.3</b>	4.4	0.28 H
117.	beryllium	845	1	<0.001	0.014	0.001	0.004 CATEGORY
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 g
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 ខ្ល
1.22.	lead	845	1	0.001	0.93	0.91	0.70 G
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 Typet	Con Source	centrations Day 1	mg/1) Day 2	Day 3
Toxic Pollutants (Continued)						SECONDARY
128. zinc	845	1	0.06	0.56	1.0	0.8 R
Nonconventional Pollutants						•
ammonia nitrogen	845	1	1.5	3	1.6	1.3 H
phenolics	845	1	0.002	0.20	0.23	0.20 BC
tin	845	1	0.28	19	22	CATEGORY
Conventional Pollutants		•				ORY
oil and grease	845	1	5.6	29	21	20
total suspended solids (TSS)	845	1	19	1,600	530	1,300 EC
pH (standard units)	845	1,	6.5	8.9	8.9	拼 (1

tSample Type Code: 1 - One-time grab

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

Table V-19

FINAL EFFLUENT - PLANT C
TREATED WASTEWATER SAMPLING DATA

	<u>Pollutant</u>	Stream _Code	Sample Typet	Conc Source	entration Day 1	ons (mg/1) Day 2	Dozz	<u>5</u>
Toxi	c Pollutants	· · · · · · · · · · · · · · · · · · ·			<u> </u>	Day Z	Day (	OI DECOMPART
1.	acenaphthene	844	: 1	ND	ND	ND	ND	OTABL
2.	acrolein	844	1	ND	ND	ND	ND.	٠.
3.	acrylonitrile	844	1	ND ·	ND	· · · · · · · · · ND · · · · · · · · · ·	ND	F.
4.	benzene	844	.1	ND	ND	0.002	0.002	)     
5.	benzidine	844	1	ND	ND	ND	ND	SUBCATEGORY
6.	carbon tetrachloride	844	1	ND	ND	ND	ND	KO97
7.	chlorobenzene	844	1	ND	ND	ND	ND	3
8.	1,2,4-trichlorobenzene	844	1	ND	ND	ND	ND	: ES
9.	hexachlorobenzene	844	1	ND	ND	ND	ND	SECT
10.	1,2-dichloroethane	844	1	ND	ND	ND	ND	١
11.	1,1,1-trichloroethane	844	1	ND	ND	ND	ND	
12.	hexachloroethane	844	1	ND	ND	ND	ND	
13.	1,1-dichloroethane	844	<b>1</b> .	ND	ND	ND	ND	•
14.	1,1,2-trichloroethane	844	1.	ND	ND	ND	ND	
	the control of the co						11 1	

Table V-19 (Continued)

		Stream	Sample	Conc	entration	s (mg/l)	
	<u>Pollutant</u>	Code	Typet	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	1.1	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

SECONDARY TIN SUBCATEGORY

Table V-19 (Continued)

	•				. %		
	Pollutant	Stream Code	Sample Typet	Conc Source	entration		
<u>Toxi</u>	c Pollutants (Continued)		<u>=7PC.</u>	bource	Day 1	Day 2	Day 3
29.	1,1-dichloroethylene	844	1 -	ND	ND	ND	
30.	1,2-trans-dichloroethylene	844	1	ND	ND 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 ND
34.	2,4-dimethylphenol	844	1	ND	ND	ND	N D
35.	2,4-dinitrotoluene	844	. 1	ND	ND	ND	
36.	2,6-dinitrotoluene	844	1	ND	ND	ND	N D N D
37.	1,2-diphenylhydrazine	844	1	ND	ND	ND	ND
38.	ethylbenzene	844	1	ND	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)

Pollutant	Stream Code	Sample Typet	Conc Source	entrations Day 1	mg/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
	844	. 1	ND	ND	ND	ND
	844	1	ND	ND	ND	ND
50. dichlorodifluoromethane		1 .	ND	ND	ND	ND
51. chlorodibromomethane	844					AT Y
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	ЫĎ
56. nitrobenzene	844	1	ND	ND	ND	ND

Table V-19 (Continued)

<u>Pollutant</u>	Stream <u>Code</u>	Sample Typet	Cond Source	centration Day 1	ns (mg/1) Day 2	Day 3	
Toxic Pollutants (Continued)					·	<u> </u>	SECC
57. 2-nitrophenol	844	1	ND	ND	ND	ND	SECONDARY
58. 4-nitrophenol	844	1	ND	0.004	ND	ND	, -
59. 2,4-dinitrophenol	844	. <u> </u>	ND	0.001	ND	N.D.	TIN
60. 4,6-dinitro-o-cresol	844	1	ND	ND	ND	ND	SUB
61. N-nitrosodimethylamine	844	1	ND	ND	ND	ND	SUBCATEGORY
62. N-nitrosodiphenylamine	844	1	ND	ND	ND	ND	GOR.
63. N-nitrosodi-n-propylamine	844	1	ND	ND	ND	ND	ĸ
64. pentachlorophenol	844	1	ND	ND	ND	ND	S H
65. phenol	844	1	ND	ND	ND	ND	SECT
66. bis(2-ethylhexyl) phthalate	844	1	0.054	0.003	0.084	0.045	<b>4</b>
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)

		Stream Sample Concentrati			entration	ations (mg/l)		
	Pollutant	Code	Typet	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)

Pollutant	Stream _Code	Sample Typet	Conc Source			Day 2	
c Pollutants (Continued)			***************************************	<u> </u>	Day Z	Day 3	SEC
tetrachloroethylene	845	. 1	ND	ND	ND	ND	SECONDARY
toluene	845	1	0.093	ND			
trichloroethylene	845	11		ND -			TIN
vinyl chloride (chloroethylene)	845	. 1	ND	ND	ND		
aldrin	845	1	ND	ND	ND		CAT
dieldrin	845	1	ND		•	•	SUBCATEGORY
chlordane	845	1			•		Ϋ́
4,4'-DDT	845	1			<b>3</b>	, . ·	Ŋ
4,4'-DDE	845	1		•		. *	SECT -
4,4'-DDD	845	1	,				- -
alpha-endosulfan	845	1	- 1	. · ·			
beta-endosulfan	845	. 1					•
endosulfan sulfate	845	1					
heptachlor	845	1	ND	ND	ND		
	tetrachloroethylene toluene trichloroethylene vinyl chloride (chloroethylene) aldrin dieldrin chlordane 4,4'-DDT 4,4'-DDE 4,4'-DDD alpha-endosulfan beta-endosulfan endosulfan sulfate	Pollutant (Code c Pollutants (Continued)  tetrachloroethylene 845  toluene 845  trichloroethylene 845  vinyl chloride (chloroethylene) 845  aldrin 845  dieldrin 845  chlordane 845  4,4'-DDT 845  4,4'-DDE 845  4,4'-DDD 845  alpha-endosulfan 845  beta-endosulfan 845	Pollutant         Code         Typet           c Pollutants         (Continued)         845         1           tetrachloroethylene         845         1         1           toluene         845         1         1           trichloroethylene         845         1         1           vinyl chloride         (chloroethylene)         845         1           aldrin         845         1         1           dieldrin         845         1         1           chlordane         845         1         1           4,4'-DDT         845         1         1           4,4'-DDE         845         1         1           4,4'-DDD         845         1         1           alpha-endosulfan         845         1         1           beta-endosulfan         845         1         1           endosulfan sulfate         845         1	Code         Typet         Source           c Pollutants         (Continued)           tetrachloroethylene         845         1         ND           toluene         845         1         ND           trichloroethylene         845         1         ND           vinyl chloride (chloroethylene)         845         1         ND           aldrin         845         1         ND           dieldrin         845         1         ND           chlordane         845         1         ND           4,4'-DDT         845         1         ND           4,4'-DDE         845         1         ND           4,4'-DDD         845         1         ND           alpha-endosulfan         845         1         ND           beta-endosulfan         845         1         ND           hentachlor         845         1         ND	Pollutant         Code         Typet         Source         Day 1           c Pollutants         (Continued)         845         1         ND         ND           tetrachloroethylene         845         1         0.093         ND           trichloroethylene         845         1         ND         ND           vinyl chloride         (chloroethylene)         845         1         ND         ND           aldrin         845         1         ND         ND         ND           dieldrin         845         1         ND         ND           chlordane         845         1         ND         ND           4,4'-DDT         845         1         ND         ND           4,4'-DDE         845         1         ND         ND           4,4'-DDD         845         1         ND         ND           alpha-endosulfan         845         1         ND         ND           beta-endosulfan         845         1         ND         ND           heptachlor         845         1         ND         ND	Pollutant   Code   Typet   Source   Day 1   Day 2	Pollutant   Code   Typet   Source   Day 1   Day 2   Day 3

	<u>Polluta</u>	ant	Stream Code	Sample Typet	Source	entration: Day 1	s (mg/1) Day 2	Day 3
Toxic	Pollutants	(Continued)						
99.	endrin aldel	nyde	844	1	ND	ND	ND	ИВ
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
			844	1	ND	ND	ND	ND
104.	gamma-BHC		844	1	ND	ND	ND	ND
105.	delta-BHC	<b>(1)</b>	844	1	ND	ND	ND	ND
106.	PCB-1242	(b)				ND	ND	ŅD
107.	PCB-1254	(b)	844	1	ND	MD		
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

SECONDARY TIN SUBCATEGORY

Table V-19 (Continued)

				***		4 - 0		
	Pollutant	Stream Code	Sample		centratio		·	
		Code	<u>Typet</u>	Source	Day 1	<u>Day 2</u>	Day 3	Ø
Toxic	Pollutants (Continued)					-		ECC
113.	toxaphene	844	1	ND	N.D			SECONDARY
114.	antimony	844	1	<0.001	0.004	<0.001	<0.001	
115.	arsenic	844	<u>. 4</u>	0.008	0.068	0.021	0.061	TIN
117.	beryllium	844	1	<0.001	<0.001	<0.001	<0.001	SUBO
118.	cadmium	844	1	<0.001	<0.001	<0.001	0.02	UBCATEGORY
119.	chromium (total)	844	1	0.003	0.002	0.002	0.003	GOR
120.	copper	844	1	0.14	0.20	0.14	0.20	K
121.	cyanide (total)	844	1	0.005	0.015	0.031	0.021	SH
122.	lead	844	1	0.001	0.015	0.010	0.015	CI
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)

	Stream	Sample	Concentrations (mg/1)				
<u>Pollutant</u>	Code	<u>Typet</u>	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		

SECONDARY TIN SUBCATEGORY

SECT -

tSample Type Code: 1 - One-time grab

<sup>(</sup>a), (b), (c) Reported together.

Table V-20
ELECTROWINNING SOLUTION AFTER CARBONATION - PLANT D
TREATED WASTEWATER SAMPLING DATA

	Dollar	Stream	Sample		entration	s (mg/l)	
	<u>Pollutant</u>	Code	Typet	Source	Day 1	Day 2	Day 3
Toxi	c Pollutants						ECC
1.	acenaphthene	858	1	ND	ND		SECONDARY
2.	acrolein	858	1	ND	ND		• •
3.	acrylonitrile	858	1. 1	ND	ND .		TIN
4.	benzene	858	1	ND	ND		SUB
5.	benzidine	858	1	ND	ND	•	SUBCATEGORY
6.	carbon tetrachloride	858	1	ND	ND		GOR
7.	chlorobenzene	858	1	ND	ND		K
8.	1,2,4-trichlorobenzene	858	1	ND	ND		N E
9.	hexachlorobenzene	858	1	ND	ND	. *	SECT
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)

				_	•	, ,11	
	<u>Pollutant</u>	Stream Code	Sample Typet	Source	entration Day 1	Day 2	Day 3
Toxio	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	N∙D	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		e e
26.	1,3-dichlorobenzene	858	1	ND	ND		
27.	1,4-dichlorobenzene	858	. 1	N.D	ND		
28.	3,3'-dichlorobenzidine	858	1	ND	ND		

Table V-20 (Continued)

<u>Pollutant</u>	Stream Code	Sample Typet	Conc Source	entration Day 1	s (mg/1) Day 2	Day 3
Toxic Pollutants (Continued)	6					
29. 1,1-dichloroethylene	858	1 .	ND	ND		
30. 1,2- <u>trans</u> -dichloroethylene	858	· <b>1</b>	ND	ND	•	
31. 2,4-dichlorophenol	858	1	ND	. ND		
32. 1,2-dichloropropane	858	1	ND	ND	de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la	
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)

<u>Pollutant</u>	Stream Code	Sample <u>Typet</u>	Conc Source	entrations Day 1	mg/l) 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		
	858	1	ND	ND		
	858	1	ND	ND		
51. chlorodibromomethane	858	1	ND	ND		
52. hexachlorobutadiene		1	ND	ND		
53. hexachlorocyclopentadiene	858	1	ND	ND		
54. isophorone	858					
55. naphthalene	858	1	ND	ΝD		
56. nitrobenzene	858	1	ND	ND		

Table V-20 (Continued)

	<u>Pollutant</u>	Stream Code	Sample Typet	Conc Source	entrations (mg/l) Day 1 Day 2	Day 3
Toxio	e Pollutants (Continued)					<u></u>
57.	2-nitrophenol	858	1	ND	ND	
58.	4-nitrophenol	. 858 <sup>-</sup>	1	ND	ND	
59.	2,4-dinitrophenol	858		ND	ND = 1	in the second
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	T.
65.	phenol	858	1. 1.	ND	0.028	
66.	bis(2-ethylhexyl) phthalate	858	1	0.004	ND	ا
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)

Pollutant		Stream Code	Sample Typet	Conce Source	entrations Day 1	(mg/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		
		858	1	ND	ND		
·		858	1	ND	ND		
77. acenaphthylene	(a)	858	1	ND	ND		
78. anthracene	(a)	830	•		NIIN		
79. benzo(ghi)perylene		858	1	ND	ND		
80. fluorene		858	1	ND	ND		
	(a)	858	1	ND	ND		
82. dibenzo(a,h)anthracen	n <b>e</b>	858	. 1	ND	ND .		
83. indeno (1,2,3-c,d)py		858	1	ND	ND		
84. pyrene		858	1	ND	ND		

Table V-20 (Continued)

	•							
	Pollutant	Stream Code	Sample Typet	Conce Source	ntrations Day 1	mg/l) Day 2	Day 3	
Toxic	Pollutants (Continued)	<b>.</b>			-			) ECC
85.	tetrachloroethylene	858	1	ND	ND			SECONDARY
86.	toluene	858	1 .	0.005	0.001	. •		•
87.	trichloroethylene	858	1-1-	0.007	0.027	uunti ta ta ta		TIN
88.	vinyl chloride (chloroethylene)	858	1 .	ND	ND			SUB
89.	aldrin	858	1	ND	ND			CATE
90.	dieldrin	858	1	ND	ND			SUBCATEGORY
91.	chlordane	858	1	ND	ND			K
92.	4,4'-DDT	858	1	ND	ND			SH
93.	4,4'-DDE	858	1	ND	ND			SECT
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			

	Stream	Sample	Concentrations (mg/l)			·
Pollutant	Code	Typet	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)

	<u>Pollutant</u>	Stream Code	Sample Typet	Conce Source	entrations (mg/l) Day 1 Day 2	Day 3
Toxio	Pollutants (Continued)					
113.	toxaphene	858	1	ND	ND	SECONDARY
114.	antimony	858	1	<0.001	0.300	
115.	arsenic	858	·	0.007	2.6	LIN
117.	beryllium	858	1	<0.001	0.003	SUE
118.	cadmium	858	1	0.001	0.20	SUBCATEGORY
119.	chromium (total)	858	1	0.004	0.37	EGOI
120.	copper	858	1	0.016	0.15	Ϋ́S
121.	cyanide (total)	858	1	0.004 3	1,000	N N
122.	lead	858	1 .	0.011	0.50	ECT
123.	mercury	858	1	0.0007	<0.0002	ı <b>∀</b>
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)

Pollutant	Stream Code	Sample Type†	Conc Source	entrations (mg/1)  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	

tSample Type Code: 1 - One-time grab

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

4200

Table V-21
INFLUENT TO TREATMENT - PLANT E
RAW WASTEWATER SAMPLING DATA

	<u>Pollutant</u>	Stream Code	Sample Typet	Cor Source	ncentratio Day 1	ons (mg/l) Day 2	)
Toxio	Pollutants				<u> </u>	bay Z	Day 3
114.	antimony	896	6	0.0013	0.0008	0.0016	ECONDARY
115.	arsenic	896	6	0.007	1.60	0.069	0 11
117.	beryllium	896	6	<0.010	<0.010	<0.010	<0.010 N
118.	cadmium	896	6	<0.030	0.061	0.50	Ŋ
119.	chromium	896	6	<0.030	<0.030	0.035	0.30 UBCATEGORY 7.50 RY
120.	copper	896	6	<0.030	0.13	1.50	7.50 R
121.	cyanide (total)	896	1	<0.01	<0.01	<0.01	<0.01
122.	lead	896	6	0.054	0.11	0.18	1.10 ½
123.	mercury	896	6	0.0149	0.0073	0.0031	(0.0025
124.	nickel	896	6	0.052	0.16	1.40	6.40
125.	selenium	896	6	<0.001	0.046	0.0042	0.0011
126.	silver	896	6	0.0014	0.0010	0.0015	0.0118
127.	thallium	896	6	<0.001	0.0011	0.0035	0.0020
128.	zinc	896	6	<0.030	0.36	1.10	3.40

Table V-21 (Continued)

## INFLUENT TO TREATMENT - PLANT E RAW WASTEWATER SAMPLING DATA

	Stream	Sample		ncentrati		
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3
Nonconventional Pollutants	·					
Acidity	896	6	10	30	61	270
Alkalinity	896	6	160	200	110	<1
Aluminum	896	6	2.80	1.20	1.80	7.60
Ammonia Nitrogen	896	6	0.04	0.50	3.2	1.2
Barium	896	6	0.12	0.13	0.75	0.040
Boron	896	6	0.17	4.30	6.40	5.40
Calcium	896	6	0.067	0.26	0.37	0.51
Chloride	896	6	155	250	770	930
Cobalt	896	6	<0.030	<0.030	0.45	1.00
Fluoride	896	6.	0.40	4.7	6.4	8.8
Iron	896	6	2.80	23.00	8.80	86.00
Magnesium	896	6	0.018	0.022	0.030	0.040
- -	896	6	0.11	0.28	0.91	1.20
Manganese Molybdenum	896	6	<0.030	0.70	1.70	0.64
HOTADOGITAIII		· .				

Table V-21 (Continued)

## INFLUENT TO TREATMENT - PLANT E RAW WASTEWATER SAMPLING DATA

Stream Code	-				
)			<u>bay 1</u>	Day A	Day 3
896	6	<0.50	0.50	<0.50	<0.50
896	6	<0.50	<0.50	<0.50	<0.50
896	6 .	. 0.12	0.18	0.1-8	0.16
896	6	46	190	320	310
896	6	<0.25	<0.25	<0.25	<0.25
896	6	<0.25	<0.25	<0.25	<0.25
896	6	510	1,300 1	,900 2	,600
896	6	13	8	<20	97
896	6	640	1,300 2,	,100 3	,100
896	6	<0.030	<0.030	<0.030	<0.030
896	6	<0.25	<0.25	<0.25	<0.25
		1			
896	1	<1	<1	<1 .	18
	Code 896 896 896 896 896 896 896 896	Code       Typet         896       6         896       6         896       6         896       6         896       6         896       6         896       6         896       6         896       6         896       6         896       6         896       6         896       6         896       6         896       6         896       6         896       6         896       6	Code         Type†         Source           896         6         <0.50	Code         Type†         Source         Day 1           896         6         <0.50	Code         Type†         Source         Day 1         Day 2           896         6         <0.50

## Table V-21 (Continued)

## INFLUENT TO TREATMENT - PLANT E RAW WASTEWATER SAMPLING DATA

	Stream	Sample	Con	centratio		
Pollutant	Code	Typet	Source	<u>Day 1</u>	Day 2	Day 3
Conventional Pollutants (Continued)						
Total Suspended Solids (TSS)	896	6	5	19	43	91
pH (standard units)	896		7.20	7.30	5.70	3.90

†Sample Type Code: 1 - One-time grab

1 - One-time grab6 - 24-hour automatic composite

Table V-22

TREATED EFFLUENT - PLANT E
TREATED WASTEWATER SAMPLING DATA

		Stream	Sample	Con	centratio	ns (mg/1)		٠
	<u>Pollutant</u>	Code	Typet	Source	Day 1	Day 2	Day 3	- (X)
Toxic	Pollutants			•		,		ECO]
114.	antimony	899	6	0.0013	0.0050	0.0020	0.0013	ECONDARY
115.	arsenic	899	6	0.007	0.14	0.052	0.082	
-117.	beryllium	899	6	<0.010	<0.010	<0.010	<0.010	TIN S
118.	cadmium	899	6	<0.030	0.12	0.12	0.11	SUBCATEGORY
119.	chromium	899	. 6	<0.030	<0.030	0.032	0.030	ATE(
120.	copper	899	6	<0.030	0.28	0.12	0.10	30RY
121.	cyanide (total)	899	1	<0.01	<0.01	<0.01	<0.01	
122.	lead	899	6	0.054	0.12	0.12	0.099	SEC
123.	mercury	899	6	0.0149	<0.0025	<0.0025	0.0030	L H
124.	nickel	899	6	0.052	0.99	0.93	0.87	⋖
125.	selenium	899	6	<0.001	0.0421	0.032	0.025	
126.	silver	899	6	0.0014	0.0010	0.0013	0.0039	
127.	thallium	899	6	<0.001	0.0036	0.0050	0.0029	
128.	zinc	899	6	<0.030	0.17	0.17	0.16	

Table V-22 (Continued)

#### TREATED EFFLUENT - PLANT E TREATED WASTEWATER SAMPLING DATA

	Stream Sample Concentrations (mg/l)					_	
<u>Pollutant</u>	Code	Typet	Source	Day 1	Day 2	Day 3	- D
Nonconventional Pollutants							) DECONDART
Acidity	899	6	10	4,800	20	10	771
Alkalinity	899	6	160	56	62	68	
Aluminum	899	6	2.80	0.50	0.80	0.60	
Ammonia Nitrogen	899	6	0.04	3.1	2.9	2.5	
Barium	899	6	0.12	0.080	0.040	0.040	į
Boron	899	6	0.17	3.80	3.70	3.50	1
Calcium	899	6	0.067	0.60	0.63	0.60	
Chloride	899	6	155	48	950	880	i (
Cobalt	899	6	<0.030	0.099	0.094	0.083	i
Fluoride	899	6	0.40	. 13	61	7.8	;
Iron	899	6	2.80	0.47	0.81	0.32	
Magnesium	899	6	0.018	0.036	0.036	0.035	
Manganese	899	6	0.11	5.10	1.10	1.00	
Molybdenum	899	6	<0.030	1.30	0.47	<0.030	

Table V-22 (Continued)

## TREATED EFFLUENT - PLANT E TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Typet	<u>Co</u> Source	ncentrat			<del></del>
Nonconventional Pollutants (Continued)		27901	Bource	Day	1 Day	2 Day	SECC
Germanium	899	6	<0.50	<0.50	<0.50	<0.50	SECONDARY
Indium	899	6	<0.50	<0.50	<0.50	<0.50	-
Sodium	899.	6	0.12	0.34	0.34	0.32	TIN
Sulfate	899	. 6	46	630	600	480	SUBCATEGORY
Tin	899	6	<0.25	<0.25	<0.25	<0.25	ATE(
Titanium	899	6	<0.25	<0.25	<0.25	<0.25	30RY
Total Dissolved Solids (TDS)	899	6	510 // 3	,800	3,400	3,100	•
Total Organic Carbon (TOC)	899	6	13	11	35	190	SECT
Total Solids (TS)	899	6	640 3	,600	3,500	3,300	i i
Vanadium	899	6	<0.030	<0.030	<0.030	1.30	, <
Yttrium	899	6	<0.25	2.10	<0.25	<0.25	
Conventional Pollutants	•. •						. •
Oil and Grease	899	1	<b>∢1</b>	78	11	3	

## Table V-22 (Continued)

#### TREATED EFFLUENT - PLANT E TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Typet	Con Source	centration <u>Day 1</u>	ns (mg/1) Day 2	Day 3
Conventional Pollutants (Continued)						
Total Suspended Solids (TSS)	899	6	5	<1	4	.4
pH (standard units)	899		7.20	6.30	6.30	6.0

1 - One-time grab6 - 24-hour automatic composite

#### TABLE V-23

## SECONDARY TIN SAMPLING DATA RAW WASTEWATER FROM SELF SAMPLING DATA

<u>Pollutant</u>	<u>Concentrat</u> :	Concentration (mg/1)					
Sample Number	88176	88147					
Toxic Pollutants							
117. beryllium 118. cadmium 119. chromium	<0.050 0.050 <0.500						
120. copper 121. cyanide 122. lead	<0.500 2.000 <0.200	75.000					
124. nickel 128. zinc	0.500 0.480						
Nonconventional Pollutants							
aluminum cobalt iron	12.000 <0.500 1.500						
manganese molybdenum tin	<0.050 0.520 <5.000						
titanium vanadium	<2.000 <1.000						

Note: 88176 = Tin Mud Acid Neutralization Filtrate 88147 = De-Aluminizing Rinse

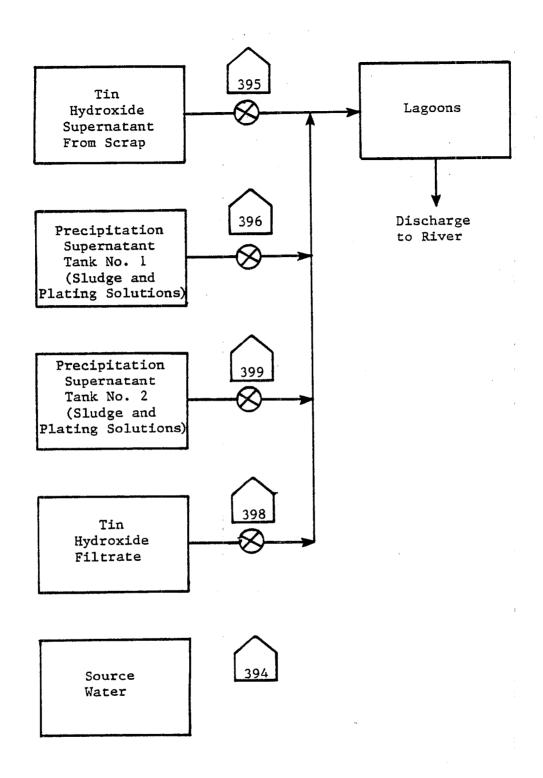


Figure V-1 SAMPLING SITES AT SECONDARY TIN PLANT A

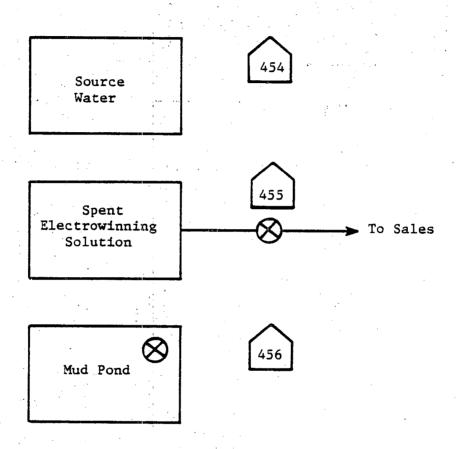


Figure V-2 SAMPLING SITES AT SECONDARY TIN PLANT B

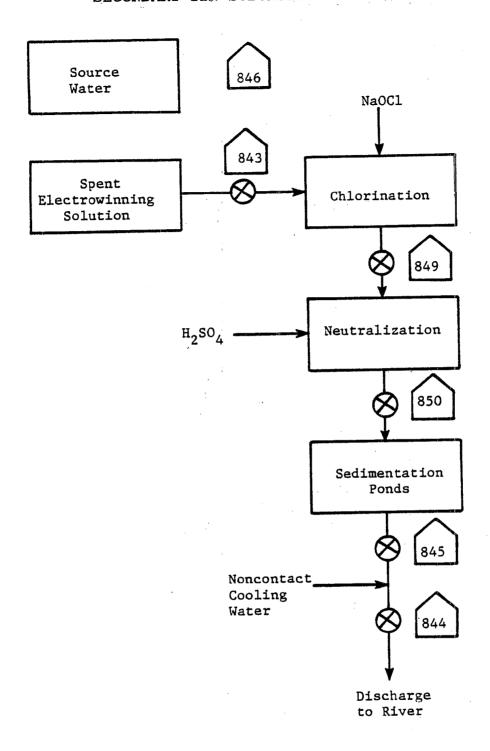


Figure V-3
SAMPLING SITES AT SECONDARY TIN PLANT C

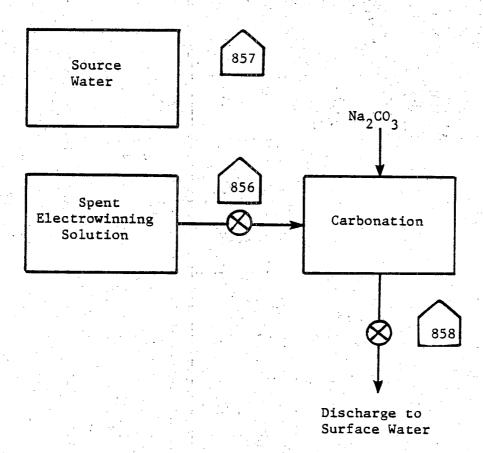


Figure V-4
SAMPLING SITES AT SECONDARY TIN PLANT D

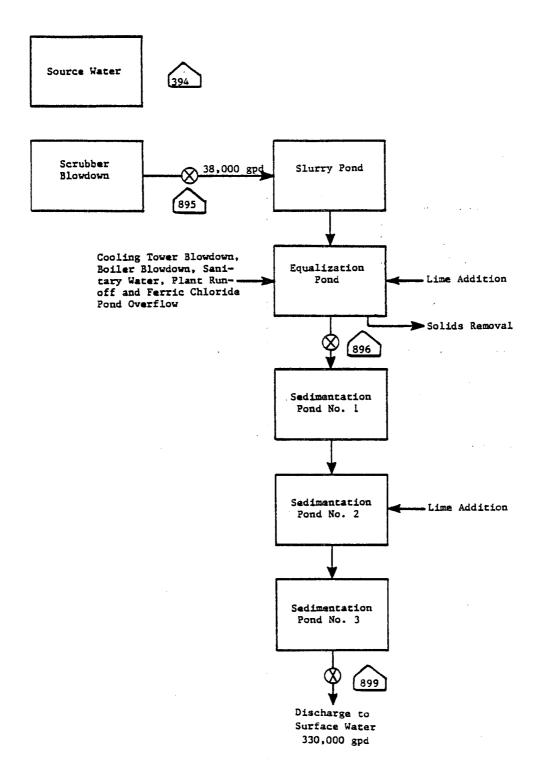


Figure V-5

SAMPLING SITES AT SECONDARY TIN PLANT E

#### SECTION VI

#### SELECTION OF POLLUTANT PARAMETERS

This section examines the chemical analysis data presented in Section V and discusses the selection or exclusion of pollutants for potential limitation. The basis for the regulation of toxic and other pollutants, along with a discussion of each pollutant selected for potential limitation is presented in Section VI of Vol. I. 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; priority 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 priority performed to select or exclude pollutants further consideration for limitations and standards. Pollutants will be considered for limitation if they are present concentrations treatable by the technologies considered in this analysis. The treatable concentrations used for the priority metals were the long-term performance values achievable by precipitation, sedimentation, and filtration. treatable concentrations used for the priority organics performance values achievable by carbon long-term adsorption. Also, conventional and nonconventional pollutants parameters are selected or and pollutant excluded from limitation.

Following proposal, additional data was collected concerning raw characteristics from tin smelter wastewater operations. This data is presented in section V of this decided document. Based on comments, the Agency has promulgate different limitations for tin smelter scrubbing operations than for other secondary tin operations. Although is still considered a single subcategory, secondary tin pollutants selected for tin smelter SO2 scrubber operations are different than for other secondary tin operations. discussed further in Section X.

#### CONVENTIONAL AND NONCONVENTIONAL POLLUTANT PARAMETERS SELECTED

As part of this study, the Agency examined samples for two conventional pollutant parameters (total suspended solids and pH) and the nonconventional pollutant parameters aluminum, barium, boron, fluoride, iron, manganese and tin. On March 18, 1985 the Agency published a notice of data availability which stated that for the tin smelter SO<sub>2</sub> scrubber building block, the Agency was considering regulating the nonconventional pollutants aluminum, barium, boron, iron, manganese and tin. For promulgation, the Agency has decided not to regulate aluminum,

barium, boron, or manganese for the tin smelter  $SO_2$  scrubber building block because these pollutants will be effectively controlled by the limitations developed for the regulated priority metal pollutants and the nonconventional pollutants iron and tin.

The conventional and nonconventional pollutants or pollutant parameters selected for limitation for the secondary tin subcategory are:

- o fluoride
- o iron
- o tin
- o total suspended solids (TSS)
- Hg o

Plants which only smelt tin concentrates and control the SO<sub>2</sub> off-gases with a wet scrubber will not be regulated for fluoride. All other tin facilities will be regulated for fluoride, but will not be regulated for iron.

Fluoride was detected in all 12 raw wastewater samples analyzed for this study. Five of the 12 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.

Iron was analyzed for in four raw wastewater samples. The observed concentrations were 140 mg/l, 190 mg/l, 250 mg/l, and 250 mg/l. All 4 concentrations are greater than the concentration considered achievable with lime, settle and filter treatment (0.28 mg/l). In addition, an iron compound is used as a raw material in the tin smelting operation. For these reasons, iron is selected for limitation in this subcategory.

Tin was analyzed for in all 14 raw waste samples, and was found in concentrations ranging from 0.89 mg/l to 8800 mg/l. All 14 values are greater than the 0.14 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 the 14 raw waste samples analyzed for this study. All 14 concentrations are well the 2.6 above mq/l treatable concentration. Furthermore, most of the specific methods used to priority metals do so by converting these metals remove precipitates, and these priority-metal-containing precipitates should not be discharged. Meeting limitation on total suspended solids helps ensure that removal

#### SECONDARY TIN SUBCATEGORY SECT - VI

of these precipitated priority metals has been effective. For these reasons, total suspended solids is selected for limitation in this subcategory.

The 12 pH values observed during this study ranged from 6.2 to 13.3. Six of the 12 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 priority 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 PRIORITY POLLUTANTS - SECONDARY TIN SUBCATEGORY

The frequency of occurrence of the priority pollutants in the raw wastewater samples is presented in Table VI-1 (page 4233). Table VI-1 is based on the raw wastewater data from streams 895, 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 in Table VI-2 (page 4223) were not detected in any raw wastewater samples in this subcategory; therefore, they are not selected for consideration in establishing limitations.

## 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 in 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 operations in 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 14 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 six out of 14 raw wastewater samples. The six observed concentrations range from 0.0004 mg/l to 0.026 mg/l, all 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 permit issuing authority to specify effluent limitations for one or more of these pollutants.

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 further consideration 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 0.01l 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 further consideration 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 further consideration for limitation.

2-Nitrophenol was detected above the concentration considered achievable by identified treatment technology (.01 mg/l) in three out of 12 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 secondary tin wastewaters. For this reason, and because it was detected in such a small number of samples, 2-nitrophenol is not selected for further consideration for limitation.

4-Nitrophenol was detected above its treatable concentration of 0.01 mg/l in two out of 12 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 12 samples and because the Agency has no reason to believe that treatable concentrations of 4-nitrophenol should be present in secondary tin wastewaters, 4-nitrophenol is not selected for further consideration for regulation.

2,4-Dinitrophenol was detected above its treatable concentration of 0.01 mg/l in two out of 12 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 12 samples, 2,4-dinitrophenol is not selected for further consideration for limitation.

Phenol was detected above the concentration considered achievable by available treatment technology (.01 mg/l) in three out of 12 raw wastewater samples. The observed treatable concentrations are 0.017, 0.02 and 0.13 mg/l. Because it was detected in only

#### SECONDARY TIN SUBCATEGORY SECT - VI

three of 12 samples, and because the Agency has no reason to believe that treatable concentrations of phenol should be present in secondary tin wastewaters, phenol is not selected for further consideration for limitation.

Bis(2-ethylhexyl) phthalate was detected above its treatability concentration of .01 mg/l in only one out of 12 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 12 raw wastewater samples, bis(2-ethylhexyl) phthalate is not selected for further consideration for limitation.

Butyl benzyl phthalate was detected above the concentration considered achievable by available treatment technology (.01 mg/l) in three out of 12 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 12 samples, butyl benzyl phthalate is not selected for further consideration for limitation.

Pyrene was detected above its treatability concentration of .01 mg/l in only one out of 12 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 secondary tin wastewaters. For this reason, and because it was detected at a treatable concentration in only one out of 12 samples, pyrene is not selected for further consideration 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 further consideration 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 further consideration for limitation.

#### SECONDARY TIN SUBCATEGORY SECT - VI

PRIORITY 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 in this subcategory. The priority 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 13 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 eight out of 14 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 13 out of 14 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 seven out of 14 raw wastewater samples. The treatable concentrations observed range from 0.084 mg/l to 0.99 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 four out of 14 raw wastewater samples. The treatable concentrations observed range from 0.41 mg/l to 0.60 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 nine out of 13 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 ten out of 14 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 14 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 seven out of 14 raw wastewater samples. The treatable concentrations observed range from 0.33 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 14 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 14 raw wastewater samples. The treatable concentrations observed range from 0.59 mg/l to 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 eight out of 14 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.

SECT -

Table VI-1

# FREQUENCY OF OCCURRENCE OF PRIORITY POLLUTANTS SECONDARY TIN SUBCATEGORY RAW WASTEWATER

	Pollutant	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentration (mg/1)(b)	Number of Streams Analyzed	Number of Samples Analyzed	ND	Detected Below Quantification Concentration	Detected Below Treat- able Concen- tration	Detected Above Treat- able Concen- tration
1.	acenaphthene	0.010	0.01	. 9	12 -	12			
2.		0.010	0.01	Ŕ	10	10			
3.	acrylonitrile	0.010	0.01	8	10	10			
4.	benzene	0.010	0.01	g g	10	6	•		
5.	benzidine	0.010	0.01	9	10	12	2		2
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	ğ,	10	12			
9.	hexachlorobenzene	0.010	0.01	ó	12	10			
10.	1,2-dichloroethane	0.010	0.01	Ŕ	10	10	2		
11.	1,1,1-trichloroethane	0.010	0.01	Ř ·	10	8	9		
12.	hexachloroethane	0.010	0.01	ğ	12	12	2		
13.	1,1-dichloroethane	0.010	0.01	Ŕ.	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			$v_{s}$
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	a	12				
19.	2-chloroethyl vinyl ether	0.010	0.01	8	10	12 10			
20.	2-chloronaphthalene	0.010	0.01	9	12	12			
21.	2,4,6-trichlorophenol	0.010	0.01	ģ	12	12		•	•
22.	parachlorometa cresol	0.010	0.01	á	12	12			
23.	chloroform	0.010	0.01	8	10	8	2 .		
24.	2-chlorophenol	0.010	0.01	ğ ·	12	12	2		-
25.	1,2-dichlorobenzene	0.010	0.01	ģ	12	12			
26.	1,3-dlchlorobenzene	0.010	0.01	á	12	12			
27.	1,4-dichlorobenzene	0.010	0.01	ó	12	12			
28.	3,3'-dichlorobenzidine	0.010	0.01	á	12	12	•		
29.	1,1-dichloroethylene	0.010	0.01	á	10	9	1		
30.	1,2-trans-dichloroethylene	0.010	0.01	. 8	10	10	•		
31.	2,4-dichlorophenol	0.010	0.01	9	12	12			
32.	1,2-dichloropropane	0.010	0.01	á	10	10			
33.	1,3-dichloropropylene	0.010	0.01	8	10	10			
34.	2,4-dimethylphenol	0.010	0.01	ğ	12	10	2		
			<b>'</b>	•	14	10	4		

### Table VI-1 (Continued)

## FREQUENCY OF OCCURRENCE OF PRIORITY POLLUTANTS SECONDARY TIN SUBCATEGORY RAW WASTEWATER

	<u>Pollutant</u>	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentra- tion (mg/l)(b)	Number of Streams Analyzed	Number of Samples Analyzed	<u>ND</u>	Detected Below Quantification Concentration	Detected Below Treat- able Concen- tration	Letected Above Treat- able Concen- tration	SECONDARY
35.	2,4-dinitrotoluene	0.010	0.01	9	11	11				λĮ
36.	2,6-dinitrotoluene	0.010	0.01	9	11	11	•			22
37.	1,2-diphenylhydrazine	0.010	0.01	9	12	10	2		1	•
38.	ethylbenzene	0.010	0.01	8	10	9	•			NIL
39.	fluoranthene	0.010	0.01	9	12	11				H
40.	4-chlorophenyl phenyl ether	0.010	0.01	9	12	12				4
41.	4-bromophenyl phenyl ether	0.010	0.01	9	12	12				ល
42.	bis(2-chloroisopropyl) ether	0.010	0.01	9	12	12				┇
43.	bis(2-chloroethoxy) methane	0.010	0.01	9	12	12	•		3	SUBCATEGORY
44.	methylene chloride	0.010	0.01	8	10	4	3		3	\(\frac{1}{2}\)
45.	methyl chloride	0.010	0.01	8	10	10				H
46.	methyl branide	0.010	0.01	8	10	10				Ħ
47.	bronoform	0.010	0.01	8	10	10				$\Xi$
48.	dichlorobromomethane	0.010	0.01	8	10	10				凝
49.	trichlorofluoromethane	0.010	0.01	8	10	10				Ř
50.	dichlorodifluoromethane	0.010	0.01	8	10	10				
51.	chlorodibromomethane	0.010	0.01	8	10.	10				
52.	hexachlorobutadiene	0.010	0.01	9	12	12				
53.	hexachlorocyclopentadiene	0.010	0.01	9	12	12				$\Omega$
54.	isophorone	0.010	0.01	9	12	12				덛
55.	naphthalene	0.010	0.01	9	12	8	4			SECT
56.	nitrobenzene	0.010	0.01	9	12	12	•		3	1.3
57.	2-nitrophenol	0.010	0.01	9	12	7	1	, I	3	1
58.	4-nitrophenol	0.010	0.01	9	12	9	1		2	
59.	2,4-dinitrophenol	0.010	0.01	9	12	10			2	Ϋ́I
60.	4.6-dinitro-o-cresol	0.010	0.01	9	. 12	12				• •
61.	N-nitrosodimethylamine	0.010	0.01	9	12	12				
62.	N-nitrosodiphenylamine	<b>0.010</b> .	0.01	9	12	9	3			
63.	N-nitrosodi-n-propylamine	0.010	0.01	9	12	12				
64.	pentachlorophenol	0.010	0.01	9	12	12	.,		9	
65.	phenol	0.010	0.01	9	12	_6	3		. j -	
66.	bis(2-ethylhexyl) phthalate	0.010	0.01	9	12	5	6		1	
67.	butyl benzyl phthalate	0.010	0.01	9.	12	7	2		. J	
68.	di-n-butyl phthalate	0.010	0.01	9	12	7	5			

# FREQUENCY OF OCCURRENCE OF PRIORITY POLLUTANTS SECONDARY TIN SUBCATEGORY RAW WASTEWATER

	<u>Pollutant</u>	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentration (mg/l)(b)	Number of Streams Analyzed	Number of Samples Analyzed	. <u>ND</u>	Detected Below Quantification Concentration	Detected Below Treat- able Concen- tration	Detected Above Treat- able Concen- tration	SECONDARY
69. 70.	di-n-octyl phthalate	0.010	0.01	9	12	12				ΆF
70.	diethyl phthalate dimethyl phthalate	0.010	0.01	9	12	12				R
72.	benzo(a)anthracene	0.010	0.01	9	12	12				
73.	benzo(a)pyrene	0.010	0.01	9	12	12		*		TIN
73. 74.	3,4-benzofluoranthene	0.010	0.01	9	12	12	•			z
75.	benzo(k) fluoranthene	0.010	0.01	· • 9	12	12	The second second second			
76.	chrysene	0.010	0.01	9	12	12				S
77.	acenaphthylene	0.010	0.01	9	12	12				UBCATEGORY
78.	anthracene (c)	0.010	0.01	9	12	12	•	*		ã
79 <b>.</b>	benzo(ghi)perylene	0.010	0.01	9	12	111	1.			≻
80.	fluorene	0.010	0.01	9	12	12		•		盓
81.	phenanthrene (c)	0.010	0.01	9	12	- 11 ,	1 %			ດີ
82.	dibenzo(a,h)anthracene	0.010	0.01	9	12	11	1			Ö
83.	indeno(1,2,3-c,d)pyrene	0.010 0.010	0.01	9	- 12	12				22
84.	pyrene	0.010	0.01	. 9	12	.12				7
85.	tetrachloroethylene	0.010	0.01	9	12	10	1		1	
86.	toluene	0.010	0.01	8 .	10	10				
87.	trichloroethylene	0.010	0.01 0.01	. 8	10	6	2 2		2	ro .
88.	vinyl chloride	0.010		8	10	8	2			E
89.	aldrin	0.005	0.01 0.01	8	10	9			1	CH
90.	dieldrin	0.005	0.01	8	10	10	•			H
91.	chlordane	0.005	0.01	8	10	10			*	
92.	4,4'-DDT	0.005	0.01	8 8	10	10				•
93.	4,4'-DDE	0.005	0.01	8	10	10			*	ΥI
94.	4,4'-DDD	0.005	0.01	8	10	10	•			H
95.	alpha-endosulfan	0.005	0.01	8	10 10	10				
96.	beta-endosul fan	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 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-BBC	. 0.005	0.01	ă	10	10				
103.	beta-BHC	0.005	0.01	8	10	10				
	9			U	10	10				

### Table VI-1 (Continued)

# FREQUENCY OF OCCURRENCE OF PRIORITY POLLUTANTS SECONDARY TIN SUBCATEGORY RAW WASTEWATER

	<u>Pollutant</u>	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentra- tion (mg/l)(b)	Number of Streams Analyzed	Number of Samples Analyzed	<u>ND</u>	Detected Below Quantification Concentration	Below Treat- able Concen- tration	Detected Above Treat- able Concen- tration	ļ
104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127.	gamma-BIKC delta-BHC PCB-1242 (d) PCB-1254 (d) PCB-1221 (d) PCB-1222 (e) PCB-1232 (e) PCB-1260 (e) PCB-1016 (e) toxaphene antimony arsenic asbestos beryllium cadmium chromium copper cyanide (f) lead mercury nickel selenium silver thallium zinc 2, 3, 7, 8-tetrachlorodibenzo-	0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.100 0.010 10 MFL 0.010 0.002 0.005 0.009 0.02 0.020 0.0001 0.005 0.010 0.005	0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01	88888888899 999999999999	10 10 10 10 10 10 10 10 10 10 11 13 14 14 14 14 14 14 14 14 14	10 10 10 10 10 10 10 10	5 6 10 1 1 4 8 1 3 9 6	4 6 10 4 6 4 4 1 3 5	8 8 8 13 7 4 9 10 9 7 4 5 8	
	p-dioxin (TCDD)									

SECONDARY TIN SUBCATEGORY

- (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.

#### TABLE VI-2

#### TOXIC POLLUTANTS NEVER DETECTED

- 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

#### TABLE VI-2 (Continued)

#### TOXIC POLLUTANTS NEVER DETECTED

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)

#### SECTION VII

#### CONTROL AND TREATMENT TECHNOLOGIES

The preceding sections of this supplement discussed the sources, flows, and characteristics of the wastewaters generated in the 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. This section also presents the control and treatment technology options which were examined by the Agency for possible application to the secondary tin subcategory.

#### CURRENT CONTROL AND TREATMENT PRACTICES

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 generating wastewater in this subcategory. Section V, wastewater associated with the secondary tin subcategory is characterized by the presence of the priority metal pollutants, cyanide, iron, fluoride, tin and suspended solids. This analysis is supported by the (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. 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 SO2 SCRUBBER

The one plant which practices tin smelting from concentrates and residues uses an alkaline scrubber to control SO<sub>2</sub> emissions from the smelting operations. The facility practices greater than 90 percent recycle of the scrubber liquor. The scrubber liquor contains treatable concentrations of priority metals and suspended solids. This stream is directly discharged after treatment consisting of lime addition and sedimentation.

#### DEALUMINIZING RINSE

The facility which reported the use of municipal solid waste as a

#### SECONDARY TIN SUBCATEGORY SECT - VII

raw material uses an alkaline leaching and rinsing process to remove aluminum from the scrap prior to detinning operations. The spent leachate and rinse water have a very alkaline pH and contain treatable concentrations of cyanide and priority 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 priority 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 to dissolving it in a caustic solution. water prior 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 treatable concentrations of priority metals contains 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 12 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 cyanide, priority metals, and suspended concentrations of solids. Of the eight plants which practice electrowinning, achieve zero discharge by contractor disposal, sales 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, 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, priority metals, and suspended solids. This stream is discharged directly after treatment consisting of cyanide oxidation with chlorine, acid addition,

#### SECONDARY TIN SUBCATEGORY SECT - VII

vacuum filtration and sedimentation.

#### TIN HYDROXIDE SUPERNATANT FROM SCRAP

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 is separated from the liquid phase by which sedimentation. The supernatant waste stream contains treatable concentrations of cyanide and priority metals. stream is reporting this waste a direct one plant discharger after treatment in sedimentation lagoons.

#### TIN HYDROXIDE SUPERNATANT FROM PLATING SOLUTIONS AND SLUDGES

Tin hydroxide may be precipitated from spent plating solutions and sludges generated from tin plated steel manufacturing operations. Sulfuric acid and sodium carbonate are 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 priority metals as well as high concentrations of fluoride. The one plant 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 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 secondary tin subcategory requires treatment technologies to reduce pollutant mass. The Option A treatment scheme consists of cyanide precipitation preliminary treatment 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 plating solutions and sludges, tin hydroxide filtrate, and tin mud acid neutralization filtrate. Preliminary

#### SECONDARY TIN SUBCATEGORY SECT - VII

treatment is followed by chemical precipitation and sedimentation applied to the combined stream of cyanide precipitation effluent, tin smelter SO<sub>2</sub> 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. It is necessary to use lime as the precipitation chemical in order to achieve effective tin removal.

#### OPTION C

Option C for the secondary tin subcategory consists of and treatment requirements of Option A (cyanide control chemical precipitation, and sedimentation) plus precipitation, multimedia filtration technology added at the end of the Option Multimedia filtration is used to remove A treatment scheme. including precipitates of metals solids, suspended beyond the concentration attainable by gravity fluoride. The filter suggested is of the gravity, mixed sedimentation. type, although other forms of filters such as rapid sand media 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.

#### SECTION VIII

#### COST OF WASTEWATER TREATMENT AND CONTROL

This section presents a summary of compliance costs for the 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 Sections 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 secondary tin subcategory.

#### TREATMENT OPTIONS FOR EXISTING SOURCES

As discussed in Section VII, two treatment options have been developed for existing secondary tin sources. The treatment schemes for each option are summarized below and schematically presented in Figures X-1 and X-2 (pages 4279 - 4280).

#### OPTION A

Option A consists of preliminary treatment consisting of 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 cyanide precipitation where required and chemical precipitation and sedimentation with the addition of multimedia filtration.

#### COST METHODOLOGY

A detailed discussion of the methodology used to develop the compliance costs is presented in Section VIII of Vol. Plant-by-plant compliance costs for the nonferrous manufacturing category revised have been as necessary proposal. These revisions calculate incremental costs, above treatment already in place, necessary to comply with the promulgated effluent limitations and standards and the administrative record presented in supporting regulation. A comparison of the costs developed for proposal and the revised costs for the final rulemaking for the subcategory are presented in Tables VIII-1 and VIII-2 (page 4237).

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

- of calcium fluoride The generation  $(CaF_2)$ during precipitation chemical was considered in cases significant amounts of fluoride were present. If the sludge resulting from chemical precipitation was mostly composed (> 50 percent), it was assumed to be suitable resale for use as a fluxing agent. Thus, annual costs for contract hauling of these sludges were not included in these instances.
- (2) 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 were costed as being disposed separately based on hazardous waste contract hauling costs.
- (3) 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

(4) Cost estimates for cyanide precipitation for plants 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 1047 was four days or 96 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.

#### NONWATER QUALITY ASPECTS

Nonwater quality impacts specific to the secondary tin subcategory, including energy requirements, solid waste and

air pollution are discussed below.

#### ENERGY REQUIREMENTS

Energy requirements for Option A are estimated 576,000 kwh/yr. Option C, which includes filtration, estimated to increase energy consumption over Option A by approximately one percent. Further, the total energy requirement 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 significant impact total on plant energy consumption.

#### SOLID WASTE

Sludge generated in the secondary tin subcategory is due to the precipitation of metals as hydroxides and carbonates using Sludges associated with the secondary tin subcategory will necessary contain quantities of priority 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 that would wastes be generated 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, 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 (5-10%) excess lime was added during treatment, and sludges subsequently generated passed the toxicity test. See CFR 8261.24. Thus, the Agency believes that the wastewater sludaes from both secondary operations will not be EP toxic if technology is applied. The one exception is that recommended produced as a result of cyanide precipitation are expected to exhibit hazardous characteristics, and have 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 disposition. EPA's generator standards would require generators of hazardous nonferrous metals manufacturing wastes to meet containerization,

labeling, recordkeeping, and reporting requirements; if plants dispose of hazardous wastes off-site, they would have to prepare a manifest which would track the movement of the wastes from the generator's premises to a permitted off60site treatment, storage, or disposal facility. See 40 CFR 262.20, 45 FR 33142 (May 19, as amended at 45 FR 86973 (December 31, 1980). 1980), 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 (May 19, 1980), as amended at 45 FR 86973 (December 31, Finally, RCRA regulations establish standards 1980). 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.

It is estimated that 2,781 metric tons per year of sludge will be generated as a result of these proposed BAT and PSES regulations for the secondary tin subcategory.

#### AIR POLLUTION

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

#### SECONDARY TIN SUBCATEGORY SECT - VIII

#### TABLE VIII-1

# COST OF COMPLIANCE FOR THE 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 SECONDARY TIN SUBCATEGORY INDIRECT DISCHARGERS

	Proposal	Promulgation Costs				
<u>Option</u>	Capital Cost	Annual Cost	Capital Cost	<u>Annual</u> <u>Cost</u>		
A	333400	112200	156612	46676		
В	341700	119900	160187	50044		

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#### 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). BPT reflects the existing performance by plants of various sizes, ages, and manufacturing processes within the 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 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 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 secondary tin subcategory has been subdivided into nine 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 nine 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 regulatory flow or BPT discharge rate) reflects the water use controls which are common practices within the category. The BPT regulatory flow is based on the average of all applicable data. Plants with normalized flows above the average may have to implement some method of flow reduction to achieve the BPT limitations.

The second requirement to calculate mass limitations is the 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 (lime settle technology). Cyanide sedimentation and precipitation applied streams 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 stream-by-stream basis, primarily because plants in subcategory may perform one or more of the operations in various combinations. The mass loadings (milligrams of pollutant per ton of production mg/kkg) were calculated multiplying the BPT regulatory flow (1/kkg) by the concentration achievable by the BPT level of treatment technology (mg/1)each pollutant parameter to be limited under BPT. These mass loadings are published in the Federal Register and in CFR Part the effluent limitations and standards 421 as for subcategory.

The mass loadings which are allowed under BPT for each plant will be the sum of the individual mass loadings for the various building blocks 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 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 (1/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 or promulgated 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. The pollutant removal estimates have been revised since proposal based on comments and on new data. Table X-1 (page 4266) shows the pollutant removal estimates for each treatment option for direct dischargers. Compliance costs for direct dischargers are presented in Table X-2 (page 4268).

#### BPT OPTION SELECTION

The technology basis for the promulgated BPT limitations Option A, chemical precipitation and sedimentation technology to remove metals, fluoride, and solids from combined wastewaters to control pH, with preliminary treatment consisting of The promulgated technology is equivalent cyanide precipitation. Chemical precipitation the proposed technology. sedimentation technology is already in-place at two of direct dischargers in the subcategory. pollutants specifically selected for regulation at BPT arsenic, cyanide, lead, iron, tin, fluoride, TSS, and pH. are discussed in Section X, plants which only smelt tin concentrates SO2 off-gases with a wet scrubber will control regulated for cyanide or fluoride. All other secondary tin plants will be regulated for cyanide and fluoride, but will regulated for arsenic and iron. The BPT treatment scheme is presented schematically in Figure IX-1 (page 4257).

Implementation of the promulgated BPT limitations will remove annually an estimated 544 kg of priority metals, 144 kg of

cyanide, 237,220 kg of fluoride, and 506,900 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.

transferring cyanide precipitation technology are performance to the secondary tin subcategory from coil plants. We believe the technology is transferable to coating 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 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 building block based average of the flows of the existing plants, determined from analysis of dcp. The discharge rate is used 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 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 or product which is produced by the associated with the waste stream in question. These production normalizing parameters, or PNPs, are also listed in Table IX-1 (page 4247).

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-9 (pages 4068 - 4070)

#### TIN SMELTER SO2 SCRUBBER

The wastewater discharge promulgated for tin smelter BPT SO<sub>2</sub> scrubber water is 9,198 1/kkg (2,204 gal/ton) of tapped tin, based on greater than 90 percent recycle. rate is allocated only to those plants which use pollution control to control SO2 emissions from smelting operations. Only one facility reported tin smelting operations and the use of wet scrubbing. Water use and discharge in Table V-1 (page 4068). presented a recycle rate of greater than 90 percent. facility has flow was revised following proposal based on data The BPT

obtained during a field sampling episode.

#### DEALUMINIZING RINSE

The BPT flow allowance proposed and promulgated 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 (page 4068). 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 proposed and promulgated 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 (page 4068). The BPT flow rate is based on the production normalized flow reported by this facility.

#### TIN HYDROXIDE WASH

The BPT wastewater discharge rate proposed and promulgated for tin hydroxide wash water is 11,953 1/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 (page 4069). 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 proposed and promulgated 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, page 4069). 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 proposed and promulgated for electrowinning solution from municipal solid waste is 119 1/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 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 The large flow is a direct result of this waste stream. impurities which are introduced into the electrowinning solution from the municipal solid waste.

This wastewater flow allowance for sites which process was calculated by subtracting the municipal solid waste 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 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 1/kkg of municipal solid waste scrap used as a raw material, as shown in Table V-6 (page 4069).

#### TIN HYDROXIDE SUPERNATANT FROM SCRAP

The BPT wastewater discharge rate proposed and promulgated for tin hydroxide supernatant from scrap is 55,640 1/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 (page 4070). 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 PLATING SOLUTIONS AND SLUDGES

The promulgated BPT wastewater discharge rate for tin hydroxide supernatant from plating solutions and sludges is 115,000 l/kkg (17,600 gal/ton) of tin metal recovered from plating solutions and sludges. This rate is allocated only to those facilities which recover tin from plating solutions and sludges by precipitation of tin hydroxide.

One facility reports this practice. Water use and wastewater discharge rates are presented in Table V-8 (page 4070). The Agency decided to combine two proposed subdivisions into one subdivision for promulgation. Tin hydroxide supernatant from spent plating solutions has been combined with tin hydroxide

supernatant from sludge solids to form this subdivision. This change will simplify the regulation, but will not cause the limitations with which any plant must comply to change. At proposal, a plant generating both wastewater from plating solutions and from sludges would have calculated separate mg/kg limits for each operation and summed them for a plant limitation. For plant 1036, the only facility discharging both streams, the promulgated mg/kg limitations for these operations will be identical to the proposed limitations.

#### TIN HYDROXIDE FILTRATE

The BPT wastewater discharge rate proposed and promulgated 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-9 (page 4070). 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 eight pollutants or pollutant parameters are selected for limitation under BPT and are listed below:

115. arsenic 121. cyanide 122. lead iron tin fluoride TSS pH

Because of the nature of the wastewaters in this subcategory, secondary tin plants which only smelt concentrates will not be regulated for cyanide or fluoride. Other secondary tin plants, those which do not smelt concentrates, will not be regulated for iron or arsenic.

#### EFFLUENT LIMITATIONS

The treatable concentrations achievable by application of the promulgated BPT are discussed in Section VII of Vol. I and summarized there in Table VII-21 (page 248). These treatable concentrations (both one day maximum and monthly average values) are multiplied by the BPT normalized discharge flows

#### SECONDARY TIN SUBCATEGORY SECT - IX

summarized in Table IX-1 (page 4247) 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 (page 4248) for each individual waste stream.

Table IX-1
BPT WASTEWATER DISCHARGE RATES FOR THE SECONDARY TIN SUBCATEGORY

Wastewater Stream	BPT Nor Dischar 1/kkg	malized ge Rate gal/ton	Production Normalizing Parameter
Tin smelter SO <sub>2</sub> scrubber	9,198	2,204	Crude tapped tin 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 plating solutions and sludges	115,000	27,600	Tin metal recovered from plat- ing solutions and sludges
Tin hydroxide filtrate	25,044	6,011	Tin metal produced

### SECONDARY TIN SUBCATEGORY SECT - IX

TABLE IX-2

BPT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

## (a) Tin Smelter SO2 Scrubber BPT

Pollutant or pollutant pro	perty a	aximum ny one	day	_	average
mg/kg	(lb/million	lbs) c	of crude	tapped	tin produced
Antimony *Arsenic Cadmium Chromium Copper *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Iron Manganese *Tin		26. 19. 3. 4. 17. 11. 3. 18. 13. 59. 51. 16. 11. 6. 3.	.400 .220 .127 .047 .480 .863 .660 .310 .771 .860 .430 .140 .050 .920 .040 .255 .495		11.770 8.554 1.380 1.656 9.198 1.840 11.680 5.059 1.564 8.370 5.611 29.430 23.360 7.726 5.611 2.667 2.024 179.400
*TSS *pH	Within the	range	of 7.5	to 10.0	at all times

<sup>\*</sup>Regulated Pollutant

### TABLE IX-2 (Continued)

# BPT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

# (b) Dealuminizing Rinse BPT

Pollutant			
		Maximum for	Maximum for
pollutant	property	any one day	monthly average
mg/k	kg (lb/millio	n 1bs) of dealu	minized scrap produced
Antimony		0.100	0.045
Arsenic			0.045
	•	0.073	0.033
Cadmium	1	0.012	0.005
Chromium		0.015	0.006
Copper		0.067	0.035
*Cyanide		0.010	0.004
*Lead		0.015	0.007
Nickel	<b>.</b>	0.067	0.045
Selenium		0.043	0.019
Silver		0.014	0.006
Thallium		0.072	0.032
Zinc		0.051	
Aluminum			0.021
Barium		0.225	0.112
		0.194	0.089
Boron		0.064	0.029
*Fluoride		1.225	0.697
Iron		0.042	0.021
Manganese	<b>)</b>	0.024	0.010
*Tin		0.013	0.008
*TSS		1.435	0.683
*pH	Within th		to 10.0 at all times
F	,,,,_,,,	ic range or 7.5	co ro.o at arr times

<sup>\*</sup>Regulated Pollutant

TABLE IX-2 (Continued)

# BPT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

# (c) Tin Mud Acid Neutralization Filtrate BPT

Pollutant pollutant			imum one		laximum onthly	for average	•
	mg/kg	(lb/mil dewater			eutral:	ized,	
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Fluoride Iron Manganese *Tin *TSS *pH		nin the	10 1 2 9 1 2 9 6 2 10 7 32 8 9 176 6 3 1 206	.480 .550 .716 .221 .589 .464 .1690 .369 .369 .369 .450 .010 .0286 .056 .056 .056 .056 .056 .056 .056 .05	co 10.0	6.460 4.694 .757 .908 5.047 .606 1.009 6.410 2.776 .858 4.593 3.079 16.150 12.820 4.239 100.400 3.079 1.464 1.110 98.420 at all	1 7 7 3 7 5 9 9 9 9 9 9 9 9 9

<sup>\*</sup>Regulated Pollutant

TABLE IX-2 (Continued)

### (d) <u>Tin Hydroxide Wash</u> BPT

Pollutant	or	Maximum for	Manimum 5
pollutant			
Porrucant	broberca	any one day	monthly average
ı	ng/kg (lb/mill	ion lbs) of	tin hydroxide washed
		<b>,</b>	Jaroniac wablica
Antimony		34.310	15.300
Arsenic		24.980	11.120
Cadmium		4.064	
Chromium		5.259	2.152
Copper		22.710	11.950
*Cyanide		3.466	1.434
*Lead		5.020	2.391
Nickel	; · ·	22.950	15.180
Selenium		14.700	6.574
Silver		4.901	2.032
Thallium		24.500	10.880
Zinc		17.450	7.291
Aluminum	to the second	76.860	38.250
Barium		66.340	30.360
Boron		21.990	10.040
*Fluoride		418.400	237.900
Iron		14.340	7.291
Manganese		8.128	3.466
*Tin		4.542	2.630
*TSS		490.100	233.100
*pH	Within the	e range of 7	.5 to 10.0 at all times

<sup>\*</sup>Regulated Pollutant

TABLE IX-2 (Continued)

### BPT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

(e) Spent Electrowinning Solution from New Scrap BPT

Pollutant pollutant		Maximum any one			imum thlv	for average	
-		_	_				
I	ng/kg (lb/mil	lion lbs)	of	cathode	tin	produce	d
Antimony		48.	220			21.500	
Arsenic		35.	110			15.620	
Cadmium		5.	712			2.520	ı
Chromium		7.	392			3.024	1
Copper		31.	920			16.800	
*Cyanide		4.	872			2.016	
*Lead		7.	056			3.360	}
Nickel		32.	260			21.340	<b>F</b>
Selenium		20.	660			9.240	į
Silver		6.	888			2.856	•
Thallium		34.	440			15.290	} •
Zinc		24.	530			10.250	
Aluminum		108.				53.760	)
Barium			240			42.670	}
Boron			910			14.110	
*Fluoride		588.				334.300	
Iron			160			10.250	
Manganes	_		420			4.872	2
*Tin	<b>-</b>		384			3.696	
*TSS		688				327.600	
*pH	Within	the range		7.5 to	10.0		

<sup>\*</sup>Regulated Pollutant

# TABLE IX-2 (Continued)

# BPT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

# (f) Spent ELectrowinning Solutions from Municipal Solid Waste BPT

Pollutant pollutant		erty		ximum y one				ximum nthly	for averag	e
· · · · · · · · · · · · · · · · · · ·		mg/kg	(1b/	millic	on 1	bs)	of .	MSW s	crap	•
	-	,	used	as a	raw	mat	eri.	al		
Antimony				0.	342				0.15	2:
Arsenic		-			249				0.11	
Cadmium					041				0.01	_
Chromium			4	0.	052				0.02	
Copper				0.	226	•			0.11	
*Cyanide				0.	035				0.01	
*Lead				0.	050	•			0.02	
Nickel				0.	228			*	0.15	
Selenium				0.	146	-		•	0.06	
Silver	•.			0.	049				0.02	0
Thallium				0.	244				0.10	8
Zinc				0.	174				0.07	3
Aluminum				0.	765		-	•	0.38	1
Barium					660			*	0.30	2
Boron					219				0.10	0 (
*Fluoride					165				2.36	8
Iron		-			143				0.07	3
Manganese	<u>.</u>				081				0.03	5
*Tin					045				0.02	6
*TSS					879				2.32	
*pH		Within	the	range	of	7.5	to	10.0	at all	times

<sup>\*</sup>Regulated Pollutant

TABLE IX-2 (Continued)

### BPT MASS LIMITATIONS FOR THE SECONDARY TIN !SUBCATEGORY

(g) Tin Hydroxide Supernatant from Scrap BPT

Pollutant pollutant		Maximum any one			imum hthly	for average	
	mg/kg	(lb/millio	on lbs	s) of t	in me	etal	
	<b>J.</b> . <b>J</b>	recovered					
Antimony		159	.700			71.220	
Arsenic		116	.300			51.750	
Cadmium		18	.920			8.346	
Chromium		24	.480			10.020	
Copper		105	.700			55.640	
*Cyanide		16	.140			6.677	
*Lead		23	.370			11.130	
Nickel		106	.800			70.660	
Selenium		68	.440			30.600	)
Silver		22	.810			9.459	
Thallium		114	.100			50.630	)
Zinc		81	.230			33.940	)
Aluminum		357	.800			178.000	
Barium	•	308	.800			141.300	)
Boron		102	.400			46.740	
*Fluoride		1,947	.000		1	,107.000	
Iron		66	.770			33.940	
Manganes	2	37	.840			16.140	)
*Tin	-	21	.140			12.240	)
*TSS		2,281	.000			,085.000	
*pH	Within	the range	e of	7.5 to	10.0	at all	times

<sup>\*</sup>Regulated Pollutant

### TABLE IX-2 (Continued)

# BPT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

# (h) Tin Hydroxide Supernatant from Plating Solutions and Sludges BPT

	Pollutant	Or	Marrimum for		
•	pollutant		Maximum for	Maximum for	
	Pollucanc	broberca	any one day	monthly average	
		ma /ka	/1b/m:11:am 1b-1		
	•	recovered f	(lb/million lbs)	OF tin metal	
	٠.	recovered r	rom pracing son	itions and sludges	
	Antimony		330.100	7.47.000	
	Arsenic			147.200	
	Cadmium		240.400	107.000	
	Chromium		39.100	17.250	
			50.600	20.700	
	Copper		218.500	115.000	
	*Cyanide		33.350	13.800	
	*Lead		48.300	23.000	
-	Nickel		220.800	146.100	
	Selenium		141.500	63.250	
	Silver		47.150	19.550	,
	Thallium	*	235.800	104.700	
	Zinc		167.900	70.150	
	Aluminum		739.500	368.000	
	Barium		638.300	292.100	
	Boron	٠.	211.600	96.600	
	*Fluoride		4,025.000		
	Iron		138.000	2,289.000	. •
	Manganese	•		70.150	*
	*Tin		78.200	33.350	
	*TSS		43.700	25.300	•
	*pH		4,715.000	2,243.000	
	. Pii	within	the range of 7.	5 to 10.0 at all time	es :

<sup>\*</sup>Regulated Pollutant

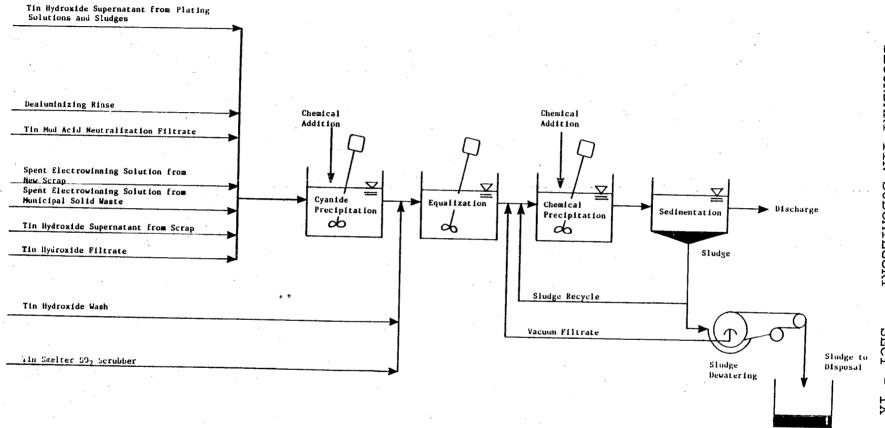
TABLE IX-2 (Continued)

# BPT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

# (i) Tin Hydroxide Filtrate BPT

Pollutant pollutant		Maximum for any one day	Maximum for monthly average
	mg/kg (lb/mi	llion lbs) of	tin metal produced
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Fluoride Iron Manganes *Tin		71.880 52.340 8.515 11.020 47.580 7.263 10.520 48.080 30.800 10.270 51.340 36.560 161.000 139.000 46.080 876.500 30.050 17.030 9.517	32.060 23.290 3.757 4.508 25.040 3.005 5.009 31.810 13.770 4.257 22.790 15.280 80.140 63.610 21.040 498.400 15.280 7.263 5.510 488.400
*TSS *pH	Within	the range of	7.5 to 10.0 at all time:

<sup>\*</sup>Regulated Pollutant



4257

Figure IX-1 BPT TREATMENT SCHEME FOR OPTION A

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#### SECTION X

## BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE

These effluent limitations 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 At a minimum BAT technology represents the best available technology at plants of various ages, sizes, processes, or other characteristics. BAT may be transferred from a different subcategory or category and 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 However, in assessing the proposed and promulgated 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 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 increased 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, page 4279) is based on

- o Preliminary treatment with cyanide precipitation
- o Chemical precipitation and sedimentation

Option C (Figure X-2, page 4280) is based on

- o Preliminary treatment with cyanide precipitation
- o Chemical precipitation and sedimentation
- o 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 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 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 secondary tin subcategory consists of all control and treatment requirements of Option A (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 priority 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

The pollutant removal estimates have been revised from proposal based on comments and new data; however, the methodology for calculating pollutant removals was not changed. The data used for estimating removals are the same as those used to revise the compliance costs. 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 operation (i.e., mass of pollutant generated unit per mass of product manufactured). This value, referred to as the raw waste, was used to estimate the mass of priority pollutants generated within the secondary 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 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 were 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 - PROPOSAL

BAT was proposed for the secondary tin subcategory based on Option C, consisting of ammonia steam stripping and cyanide precipitation pretreatment, chemical precipitation, sedimentation and filtration.

Implementation of the proposed BAT was estimated to remove 1,260 kg of priority metals annually. The proposed BAT was estimated to incur capital and annual costs, but those costs were

not presented because they were based on confidential information.

#### BAT OPTION SELECTION - PROMULGATION

proposal, EPA collected information concerning raw materials, and additional flow, production, and wastewater the tin smelter SO2 scrubber characteristics data for subdivision. This information lead EPA to revise the name of the subcategory following proposal from primary and secondary tin to secondary tin. The same plants and operations are included in subcategory for promulgation as at proposal. additional data were used to recalculate a production normalized flow rate and to revise pollutant removal and compliance cost estimates. In addition, EPA learned that one plant included as indirect discharger at proposal revised their and no longer discharges process wastewater. This enabled EPA to revise the subdivision scheme for this subcategory by combining two subdivisions into one subdivision, and also to revise the pollutant removal estimates and compliance costs.

BAT is promulgated for the secondary tin subcategory based on Option C, consisting of cyanide precipitation preliminary treatment, chemical precipitation, sedimentation and filtration. The promulgated treatment technology is identical to the proposed treatment technology with the exception of ammonia steam stripping, which is no longer required. The one facility which generated ammonia bearing wastewater has changed its process since proposal and is now a dry facility. Except for tin, the treatment performance concentrations, upon which the mass limitations are based, are equal to values used to calculate the proposed mass limitations.

EPA is promulgating multimedia filtration as part of the BAT technology because this technology results in additional removal of priority metals. Filtration is also presently demonstrated at 25 plants throughout the nonferrous metals manufacturing category. Filtration adds reliability to the treatment system by making it less susceptible to operator error and to sudden changes in raw wastewater flow and concentrations.

Implementation of the promulgated BAT limitations would remove annually an estimated 570 kg of priority metals, which is 26 kg of priority 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 (page 4269). The discharge rates are normalized on a production basis by relating the amount of wastewater generated to the mass of the intermediate or 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 (page 4270).

The BAT wastewater discharge rate used at promulgation is equal to the promulgated BPT wastewater discharge rate for all of the subdivisions of the 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

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. As discussed at proposal, the Agency has chosen not to regulate, specifically, all of the toxic pollutants selected in this analysis.

The high cost associated with analysis for priority metal pollutants has prompted EPA to develop an alternative method for regulating and monitoring priority pollutant discharges from the nonferrous metals manufacturing category. Rather than developing specific effluent mass limitations and standards for each of the priority metals found in treatable concentrations in the raw wastewater from a given subcategory, the Agency is promulgating 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 in this subcategory are listed below:

- 115. arsenic
- 121. cyanide
- 122. lead iron fluoride tin

Because of the nature of the wastewaters in this subcategory, secondary tin plants which only smelt concentrates will not be regulated for cyanide or fluoride. Other secondary tin plants, those which do not smelt concentrates, will not be regulated for iron or arsenic.

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

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 а chemical precipitation sedimentation treatment system operated for multiple metals removal. Filtration as part of the technology basis is likewise justified this technology because removes non-preferentially.

The priority metal pollutants selected for specific limitation in this subcategory are arsenic and lead. Tin is selected for limitation because it is useful as an indicator pollutant to insure proper performance in a chemical precipitation and sedimentation treatment system. The following toxic pollutants are excluded from limitation on the basis that they are effectively controlled by the limitations developed for arsenic, and lead:

- 114. antimony
- 118. cadmium
- 119. chromium
- 120. copper
- 124. nickel
- 125. selenium
- 126. silver
- 127. thallium
- 128. zinc

Cyanide is selected for limitation because the methods used to control arsenic and lead are not effective in the control of cyanide.

#### EFFLUENT LIMITATIONS

The concentrations achievable by application of BAT are discussed in Section VII of Vol. I and summarized there in Table VII-21 (page 248). The treatment effectiveness concentrations (both one day maximum and monthly average values) are multiplied by the BAT normalized discharge flows summarized in Table X-3 (page 4269) 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 promulgated BAT effluent limitations and are presented in Table X-4 (page 4270) for each wastewater stream.

Table X-1

SECONDARY TIN SUBCATEGORY POLLUTANT REMOVAL ESTIMATES
DIRECT DISCHARGERS

<u>Pollutant</u>	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	50.79	20.54	30.25	14.06	36.73
Arsenic	152.62	21.51	131.11	15.22	137.40
Cadmium	13.24	4.50	8.74	2.96	10.28
Chromium (Total)	2.98	0.60	2.37	0.56	2.41
Copper	18.75	17.20	1.54	16.13	2.61
Cyanide (Total)	144.87	1.03	143.83	0.98	143.88
Lead	123.01	5 <b>.</b> 64	117.37	4.14	118.87
Mercury	0.34	0.34	0.00	0.34	0.00
Nickel	24.45	6.22	18.22	5.23	19.22
Selenium	129.01	13.73	115.27	9.99	119.01
Silver	2.14	0.50	1.64	0.45	1.69
Thallium	15.63	4.08	11.55	3.72	11.91
Zinc	120.83	15 <b>.</b> 15	105.67	11.40	109.42
TOTAL PRIORITY POLLUTANTS	798.66	111.04	687.56	85.18	713.43
AT	36,396.37	81.57	36,314.79	54.26	36,342.10
Aluminum	215.02	177.48	37.53	177.28	37.73
Ammonia	9.12	9.12	0.00	7.69	1.42
Barium	869.57	9.40	860.17	<b>6.</b> 30	863.27
Boron Cobalt	6.96	1.74	5.22	1.18	5.78
Fluoride	237,848.06	626.23	237,221.82	498.12	237,349.93
Iron	7,731.14	14.27	7,716.86	9 <b>.</b> 75	7,721.39
Magnesium	338.84	3.48	335.36	2.33	336.51
Manganese	15.32	5 <b>.</b> 57	9.75	4.87	10.44
Tin	10,431,98	41.13	10,390.84	27.81	10,404.17
TOTAL NONCONVENTIONALS	293,862.38	969.99	292,892.34	789.59	293,072.74

Table X-1 (Continued)

SECONDARY TIN SUBCATEGORY POLLUTANT REMOVAL ESTIMATES
DIRECT DISCHARGERS

Pollutant	Raw	Option A	Option A	Option C	Option C
	Discharge	Discharge	Removed	Discharge	Removed
	(kg/yr)	(kg/yr)	(kg/yr)	(kg/yr)	(kg/yr)
TSS	507,638.47	735.39	506,903.08	157.18	507,481.29
Oil and Grease	678.27	193.89	484.38	189.36	488.90
TOTAL CONVENTIONALS	508,316.74	929.28	507,387.46	346.54	507,970.19
TOTAL POLLUTANTS	802,977.78	2,010.31	800,967.36	1,221.31	801,756.36

#### Table X-2

# COST OF COMPLIANCE FOR THE 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 have been claimed to be confidential.

Table X-3

BAT WASTEWATER DISCHARGE RATES FOR THE SECONDARY TIN SUBCATEGORY

Wastewater Stream	BAT Nor Dischar 1/kkg	malized ge Rate gal/ton	Production Normalizing Parameter
Tin smelter SO <sub>2</sub> scrubber	9,198	2,204	Crude tapped tin 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 plating solutions and sludges	115,000	27,600	Tin metal recovered from plat- ing solutions and sludges
Tin hydroxide filtrate	25,044	6,011	Tin metal produced

## (a) Tin Smelter SO2 Scrubber BAT

mg/kg (lb/million lbs) of crude tapped tin produced         Antimony       17.750       7.910         *Arsenic       12.790       5.703         Cadmium       1.840       0.736         Chromium       3.403       1.380         Copper       11.770       5.611         *Lead       2.575       1.196         Nickel       5.059       3.403         Selenium       7.542       3.403         Silver       2.667       1.104         Thallium       12.880       5.611         Zinc       9.382       3.863         Aluminum       56.200       24.930         Barium       10.580       4.691         Boron       16.920       7.726         *Iron       11.040       5.611	Pollutant or pollutant pr	operty a	aximum f ny one d	ay	-	average
*Arsenic 12.790 5.703 Cadmium 1.840 0.736 Chromium 3.403 1.380 Copper 11.770 5.611 *Lead 2.575 1.196 Nickel 5.059 3.403 Selenium 7.542 3.403 Silver 2.667 1.104 Thallium 12.880 5.611 Zinc 9.382 3.863 Aluminum 56.200 24.930 Barium 10.580 4.691 Boron 16.920 7.726 *Iron 11.040 5.611	mg/kg	(lb/million	lbs) of	crude	tapped	tin produced
Manganese 2.759 2.116 *Tin 3.495 2.024	*Arsenic Cadmium Chromium Copper *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Iron Manganese		12.7 1.8 3.4 11.7 2.5 5.0 7.5 2.6 12.8 9.3 56.2 10.5 16.9 11.0 2.7	90 40 03 70 75 59 42 67 80 80 20 40 59		5.703 0.736 1.380 5.611 1.196 3.403 1.104 5.611 3.863 24.930 4.691 7.726 5.611 2.116

<sup>\*</sup>Regulated Pollutant

### (b) Dealuminizing Rinse BAT

Pollutant pollutant		Maximum any one		Maximum monthly		age
mg/l	kg (lb/million	n lbs) o	f deal	uminized s	crap	produced
Antimony	-	0	.068		0.	030
Arsenic		0	.049			022
Cadmium	•	0	.007			003
Chromium		0	.013			005
Copper		. 0	.045	•		021
*Cyanide		0	.007			003
*Lead	-	0	.010			005
Nickel		0	.019			013
Selenium		. 0	.029		0.	013
Silver	*	0	.010	•	0.	004
Thallium	• •	· 0	.049		0.	021
Zinc		0	.036		0.	015
Aluminum		0	.214		0.	095
Barium		0	.040		0.	018
Boron	t .	0	.064		0.	029
*Fluoride		1	. 225		0.	697
Iron			.042		0.	021
Manganese	<b>)</b>		.011	•	0.	008
*Tin	,	0	.013		0.	800
		· '1		4.4		

<sup>\*</sup>Regulated Pollutant

### TABLE X-4 (Continued)

# BAT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

# (c) Tin Mud Acid Neutralization Filtrate BAT

Pollutant pollutant		Maximum any one	day		average	<u> </u>
	mq/kq	(lb/million	lbs) of	neutral	ized,	
	<b>.</b>	dewatered t	in mud p	roduced		
Antimony		9.	.741		4.340	
Arsenic			.015	1	3.129	
Cadmium			.009		0.404	
Chromium			.867		0.757	
Copper			.460	•	3.079	
*Cyanide			.009		0.404	
*Lead		1	.413		0.656	
Nickel		2	.776	-	1.867	
Selenium		and the second s	.139		1.867	
Silver		ì	.464		0.606	
Thallium		7	.066		3.079	
Zinc		5	.148		2.120	
Aluminum		30	.840		13.680	
Barium		5	.804		2.574	
Boron		9	. 286		4.239	
*Fluoride		176	.600	:	100.400	
Iron		6	.056		3.079	
Manganese	<u> </u>	1	.514		1.161	,
*Tin		. 1	.918		1.110	

<sup>\*</sup>Regulated Pollutant

TABLE X-4 (Continued)

## (d) <u>Tin Hydroxide Wash</u> BAT

Pollutant or pollutant property		imum for one day		Maximum monthly	for average	· · · · · · · ·
mg/kg (lb/	million	lbs) of	tin	hydroxid	le washed	
Antimony		23.070			10.280	
Arsenic	. •	16.610			7.411	
Cadmium		2.391			0.956	· .
Chromium		4.423		_	1.793	
Copper		15.300		*	7.291	
*Cyanide		2,391			0.956	
*Lead		3.347	3		1.554	
Nickel		6.574			4.423	1
Selenium		9.801			4.423	
Silver		3.466			1.434	
Thallium		16.730			7.291	
Zinc		12.190			5.020	
Aluminum	• •	73.030			32.390	
Barium		13.750	•		6.096	
Boron		21.990			10.040	
*Fluoride		418.400		* .	237.900	
Iron		14.340			7.291	
Manganese		3.586	•	*	2.749	
*Tin	• .	4.542			2.630	
· · · · · · · · · · · · · · · · · · ·						i

<sup>\*</sup>Regulated Pollutant

TABLE X-4 (Continued)

### (e) Spent Electrowinning Solution from New Scrap BAT

mg/kg (lb/million lbs) of cathode tin produced           Antimony         32.420         14.450           Arsenic         23.350         10.420           Cadmium         3.360         1.344           Chromium         6.216         2.520           Copper         21.500         10.250           *Cyanide         3.360         1.344           *Lead         4.704         2.184           Nickel         9.240         6.216           Selenium         13.780         6.216           Silver         4.872         2.016           Thallium         23.520         10.250           Zinc         17.140         7.056           Aluminum         102.600         45.530           Barium         19.320         8.568           Boron         30.910         14.110           *Fluoride         588.000         334.300           Iron         20.160         10.250           Manganese         5.040         3.864           *Tin         6.384         3.696	Pollutant	_			imum			imum		
Antimony 32.420 14.450 Arsenic 23.350 10.420 Cadmium 3.360 1.344 Chromium 6.216 2.520 Copper 21.500 10.250 *Cyanide 3.360 1.344 *Lead 4.704 2.184 Nickel 9.240 6.216 Selenium 13.780 6.216 Silver 4.872 2.016 Thallium 23.520 10.250 Zinc 17.140 7.056 Aluminum 19.320 8.568 Boron 30.910 14.110 *Fluoride 588.000 334.300 Iron 20.160 10.250 Manganese 5.040 3.864	pollutant	prope	erty	any	one	day	mont	tn⊥y	average	
Arsenic 23.350 10.420 Cadmium 3.360 1.344 Chromium 6.216 2.520 Copper 21.500 10.250 *Cyanide 3.360 1.344 *Lead 4.704 2.184 Nickel 9.240 6.216 Selenium 13.780 6.216 Silver 4.872 2.016 Thallium 23.520 10.250 Zinc 17.140 7.056 Aluminum 102.600 45.530 Barium 19.320 8.568 Boron 30.910 14.110 *Fluoride 588.000 334.300 Iron 20.160 10.250 Manganese 5.040 3.864	I	mg/kg	(lb/mil	lion	lbs)	of	cathode	tin	produced	
Cadmium       3.360       1.344         Chromium       6.216       2.520         Copper       21.500       10.250         *Cyanide       3.360       1.344         *Lead       4.704       2.184         Nickel       9.240       6.216         Selenium       13.780       6.216         Silver       4.872       2.016         Thallium       23.520       10.250         Zinc       17.140       7.056         Aluminum       102.600       45.530         Barium       19.320       8.568         Boron       30.910       14.110         *Fluoride       588.000       334.300         Iron       20.160       10.250         Manganese       5.040       3.864	Antimony				32.	420			14.450	
Chromium       6.216       2.520         Copper       21.500       10.250         *Cyanide       3.360       1.344         *Lead       4.704       2.184         Nickel       9.240       6.216         Selenium       13.780       6.216         Silver       4.872       2.016         Thallium       23.520       10.250         Zinc       17.140       7.056         Aluminum       102.600       45.530         Barium       19.320       8.568         Boron       30.910       14.110         *Fluoride       588.000       334.300         Iron       20.160       10.250         Manganese       5.040       3.864	Arsenic				23.	350			10.420	-
Copper       21.500       10.250         *Cyanide       3.360       1.344         *Lead       4.704       2.184         Nickel       9.240       6.216         Selenium       13.780       6.216         Silver       4.872       2.016         Thallium       23.520       10.250         Zinc       17.140       7.056         Aluminum       102.600       45.530         Barium       19.320       8.568         Boron       30.910       14.110         *Fluoride       588.000       334.300         Iron       20.160       10.250         Manganese       5.040       3.864	Cadmium				3.	360			1.344	
*Cyanide 3.360 1.344  *Lead 4.704 2.184  Nickel 9.240 6.216  Selenium 13.780 6.216  Silver 4.872 2.016  Thallium 23.520 10.250  Zinc 17.140 7.056  Aluminum 102.600 45.530  Barium 19.320 8.568  Boron 30.910 14.110  *Fluoride 588.000 334.300  Iron 20.160 10.250  Manganese 5.040 3.864	Chromium				6.	216			2.520	,,
*Cyanide 3.360 1.344  *Lead 4.704 2.184  Nickel 9.240 6.216  Selenium 13.780 6.216  Silver 4.872 2.016  Thallium 23.520 10.250  Zinc 17.140 7.056  Aluminum 102.600 45.530  Barium 19.320 8.568  Boron 30.910 14.110  *Fluoride 588.000 334.300  Iron 20.160 10.250  Manganese 5.040 3.864	Copper				21.	500			10.250	
*Lead 4.704 2.184 Nickel 9.240 6.216 Selenium 13.780 6.216 Silver 4.872 2.016 Thallium 23.520 10.250 Zinc 17.140 7.056 Aluminum 102.600 45.530 Barium 19.320 8.568 Boron 30.910 14.110 *Fluoride 588.000 334.300 Iron 20.160 10.250 Manganese 5.040 3.864										
Nickel       9.240       6.216         Selenium       13.780       6.216         Silver       4.872       2.016         Thallium       23.520       10.250         Zinc       17.140       7.056         Aluminum       102.600       45.530         Barium       19.320       8.568         Boron       30.910       14.110         *Fluoride       588.000       334.300         Iron       20.160       10.250         Manganese       5.040       3.864										
Selenium       13.780       6.216         Silver       4.872       2.016         Thallium       23.520       10.250         Zinc       17.140       7.056         Aluminum       102.600       45.530         Barium       19.320       8.568         Boron       30.910       14.110         *Fluoride       588.000       334.300         Iron       20.160       10.250         Manganese       5.040       3.864										
Silver       4.872       2.016         Thallium       23.520       10.250         Zinc       17.140       7.056         Aluminum       102.600       45.530         Barium       19.320       8.568         Boron       30.910       14.110         *Fluoride       588.000       334.300         Iron       20.160       10.250         Manganese       5.040       3.864					13.	780				
Thallium       23.520       10.250         Zinc       17.140       7.056         Aluminum       102.600       45.530         Barium       19.320       8.568         Boron       30.910       14.110         *Fluoride       588.000       334.300         Iron       20.160       10.250         Manganese       5.040       3.864										
Aluminum102.60045.530Barium19.3208.568Boron30.91014.110*Fluoride588.000334.300Iron20.16010.250Manganese5.0403.864	Thallium								10.250	
Barium19.3208.568Boron30.91014.110*Fluoride588.000334.300Iron20.16010.250Manganese5.0403.864	Zinc				17.	140			7.056	
Boron       30.910       14.110         *Fluoride       588.000       334.300         Iron       20.160       10.250         Manganese       5.040       3.864	Aluminum				102.	600			45.530	
*Fluoride 588.000 334.300 Iron 20.160 10.250 Manganese 5.040 3.864	Barium				19.	320			8.568	
Iron       20.160       10.250         Manganese       5.040       3.864	Boron				30.	910			14.110	
Manganese 5.040 3.864	*Fluoride				588.	000			334.300	
Manganese 5.040 3.864										
	Manganese	<b>∋</b>			5.	040			3.864	
	. •									

<sup>\*</sup>Regulated Pollutant

TABLE X-4 (Continued)

# (f) Spent Electrowinning Solution from Municipal Solid Waste BAT

Pollutant		Maximum		Maximum for
pollutant	property	any one	day	monthly average
	mg/kg	(lb/millio	on lbs)	of MSW scrap
	٠.	used as a	raw mat	erial
Antimony	- 		230	0.102
Arsenic		0.	165	0.074
Cadmium		0.	024	0.010
Chromium		0.	044	0.018
Copper	*** .	.0.	152	0.073
Cyanide		0.	024	0.010
Lead		0.	033	0.016
Nickel		0.	066	0.044
Selenium	* -		098	0.044
Silver		0.	0.35	0.014
Thallium			167	0.073
Zinc		0.	121	0.050
Aluminum	* 4	0.	727	0.322
Barium		0.	137	0.061
Boron	•	0.	219	0.100
Fluoride		4.	165	2.368
Iron		0.	143	0.073
Manganese		0.	036	0.027
Tin			045	0.026

<sup>\*</sup>Regulated Pollutant

TABLE X-4 (Continued)

(g) Tin Hydroxide Supernatant from Scrap BAT

Pollutant		Maximum any one		Maximum	for average	
pollutant	property	any one	day	Monenty	average	
	mg/kg	(lb/millio	on lbs)	of tin m	etal	
		recovere	d from s	crap		
Antimony		107	.400		47.850	
Arsenic			.340		34.500	
Cadmium			.130		4.451	
Chromium			.590		8.346	
Copper			.220		33.940	
*Cyanide			.130		4.451	
*Lead		15	.580		7.233	:
Nickel		30	.600		20.590	
Selenium		45	.620		20.590	
Silver		16	.140		6.677	`
Thallium		77	.900		33.940	
Zinc		56	.750		23.370	
Aluminum		340	.000		150.800	
Barium		63	.990		28.380	
Boron		102	.400		46.740	
*Fluoride		1,947	.000	1	,107.000	
Iron		66	.770		33.940	
Manganes	e	16	.690		12.800	
*Tin	_	21	.140		12.240	

<sup>\*</sup>Regulated Pollutant

### TABLE X-4 (Continued)

# BAT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

# (h) Tin Hydroxide Supernatant from Plating Solutions and Sludges BAT

Pollutant pollutant			ximum for onthly average
	mg/kc	(lb/million lbs) of	tin metal
	recovered	from plating solution	s and sludges
Antimony		222.000	98.900
Arsenic		159.900	71.300
Cadmium		23.000	9.200
Chromium		42.550	17.250
Copper	-	147.200	70.150
*Cyanide		23.000	9.200
*Lead		32.200	14.950
Nickel		63.250	42.550
Selenium		94.300	42.550
Silver	40	33.350	
Thallium		161.000	13.800
Zinc		117.300	70.150
Aluminum		702.700	48.300
Barium			311.700
Boron		132.300	58.650
*Fluoride		211.600	96.600
		4,025.000	2,289.000
Iron	•	138.000	70.150
Manganese		34.500	26.450
*Tin		43.700	25.300

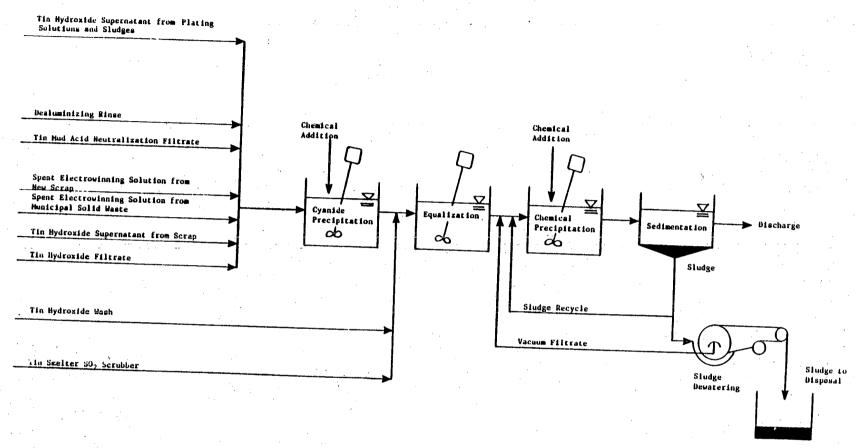
<sup>\*</sup>Regulated Pollutant

TABLE X-4 (Continued)

# (i) Tin Hydroxide Filtrate BAT

Morrimum	for Ma	ximum for
		onthly average
erty any one	uay IIIC	menty average
(15 /=:11:on 15	a) of tip m	netal produced
d (ID/WIIIIOU ID	s) Of Cin i	metar produced
48	. 330	21.540
		15.530
		2.004
		3.757
		15.280
		2.004
		3.256
		9.266
		9.266
		3.005
		15.280
25	.540	10.520
153	.000	67.870
28	.800	12.770
46	.080	21.040
		498.400
_ ·		15.280
		5.760
		5.510
9	• 71/	3,020
	g (lb/million lbs) 48 34 5 9 32 7 13 20 7 35 25 153 28 46 876 30 7	

<sup>\*</sup>Regulated Pollutant



4279

Figure X-1
BAT TREATMENT SCHEME FOR OPTION A

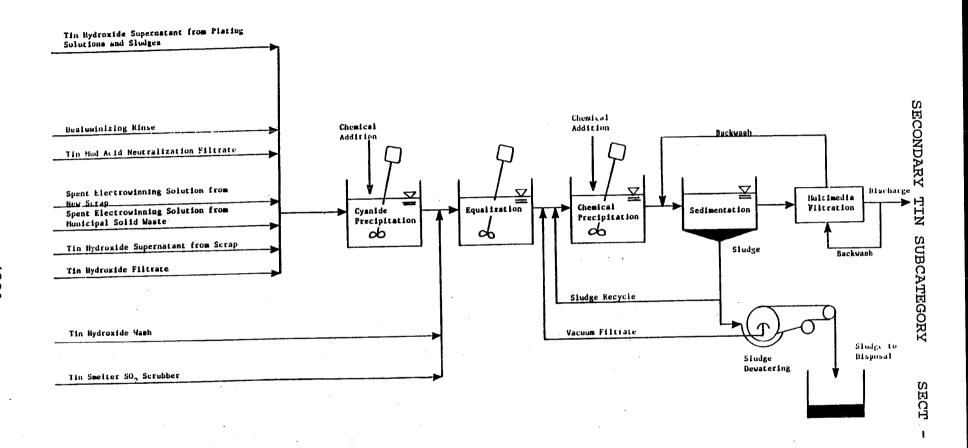


Figure X-2
BAT TREATMENT SCHEME FOR OPTION C

#### SECTION XI

#### NEW SOURCE PERFORMANCE STANDARDS

This section describes the technologies for treatment wastewater from new sources and presents mass discharge standards for regulatory pollutants for NSPS in the secondary tin subcategory, based on the selected treatment technology. plants have the opportunity to design the best and efficient production processes and wastewater treatment added technologies without facing the added costs and restrictions encountered in retrofitting an existing plant. Therefore, EPA has considered the best demonstrated process changes, in-plant controls, and end-of-pipe treatment technologies which reduce pollution to the maximum extent feasible.

#### TECHNICAL APPROACH TO NSPS

New source performance standards are equivalent to the available technology (BAT) selected for currently existing secondary tin plants. This result is a consequence of careful review by the Agency of a wide range of technology options new source treatment systems. This review of the secondary found no new, economically feasible, subcategory technologies which could considered demonstrated be 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 discharge rates, which are based on the best existing practices of the subcategory, can also be applied to new sources. rates are presented in Table XI-1 (page 4283).

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 consisting of cyanide precipitation (where required)
- o Chemical precipitation and sedimentation

#### OPTION C

- o Preliminary treatment consisting of cyanide precipitation (where required)
- Chemical precipitation and sedimentation
- Multimedia filtration

#### NSPS OPTION SELECTION - PROPOSAL

EPA proposed that the best available demonstrated technology for the primary and secondary tin subcategory be equivalent to Option C (ammonia steam stripping, cvanide precipitation. chemical precipitation, sedimentation, and filtration).

wastewater flow rates for NSPS were the same as the proposed BAT flow rates. Flow reduction measures for NSPS and not considered feasible because no new demonstrated technologies existed within the subcategory that improved on present water use practices in the subcategory. Therefore, EPA concluded that flow reduction beyond the allowances proposed for BPT or BAT was unachievable, and NSPS flow rates should be equal to those for BPT and BAT.

#### NSPS OPTION SELECTION - PROMULGATION

EPA is promulgating best available technology for the secondary subcategory equivalent to Option precipitation, chemical precipitation, sedimentation, filtration).

wastewater flow rates promulgated for NSPS are the same The promulgated BAT flow rates. The NSPS flow rates are 4283). XI-l (page presented in Table Additional reduction and more stringent treatment technologies demonstrated or readily transferable to the secondary not 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 4283). The mass of pollutant allowed to be discharged per mass of product is based upon the product of the appropriate treatment effectiveness concentration (mg/1) and the production normalized wastewater discharge flows. The results of these calculations are the production-based new source performance standards. These standards are presented in Table XI-2 (page 4284)

Table XI-1

NSPS WASTEWATER DISCHARGE RATES FOR THE SECONDARY TIN SUBCATEGORY

Wastewater Stream	NSPS Normalized Discharge Rate 1/kkg gal/ton		Production Normalizing Parameter
Tin smelter SO <sub>2</sub> scrubber	9,198	2,204	Crude tapped tin 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 plating solutions and sludges	115,000	27,600	Tin metal recovered from plat- ing solutions and sludges
Tin hydroxide filtrate	25,044	6,011	Tin metal produced

TABLE XI-2 NSPS FOR THE SECONDARY TIN SUBCATEGORY

# (a) Tin Smelter SO2 Scrubber NSPS

Pollutant o pollutant p	roperty	Maximum any one	day	_	average
mg/k	g (lb/millio	n lbs) (	of crude	tapped	tin produced
Antimony *Arsenic Cadmium Chromium Copper *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Iron Manganese *Tin		12 1 3 11 2 5 7 2 12 9 56 10 16 11	.750 .790 .840 .403 .770 .575 .059 .542 .667 .880 .382 .200 .580 .920 .040 .759		7.910 5.703 .736 1.380 5.611 1.196 3.403 1.104 5.611 3.863 24.930 4.691 7.726 5.611 2.116 2.024
*TSS *pH	Within t		.000 e of 7.5	to 10.0	110.400 at all times

<sup>\*</sup>Regulated Pollutant

### NSPS FOR THE SECONDARY TIN SUBCATEGORY

### (b) Dealuminizing Rinse NSPS

Pollutant		Maximum for	Maximum for	
pollutant	property	any one day	monthly average	e
mg/l	kg (lb/millio	n lbs) of deal	luminized scrap pro	oduced
Antimony		0.068		
Arsenic			0.03	
Cadmium	and the second s	0.049	0.02	
Chromium		0.007	0.00	
		0.013	0.00!	
Copper		0.045	0.02	L
*Cyanide		0.007	0.003	3
*Lead		0.010	0.005	5 .
Nickel		0.019	0.013	3
Selenium		0.029	0.013	3
Silver		0.010	0.004	1
Thallium		0.049	0.023	L ·
Zinc		0.036	0.015	
Aluminum	,	0.214	0.095	and the second second
Barium		0.040	0.018	
Boron		0.064	0.029	
*Fluoride		1.225	0.697	* *
Iron		0.042	0.021	
Manganese		0.011	0.008	
*Tin		0.013	0.008	
*TSS		0.525	0.420	
*рН	Within t		.5 to 10.0 at all	
· · · · · · · · · · · · · · · · · · ·		c range or /	.5 to 10.0 at all	times

<sup>\*</sup>Regulated Pollutant

### NSPS FOR THE SECONDARY TIN SUBCATEGORY

## (c) <u>Tin Mud Acid Neutralization</u> <u>Filtrate</u> NSPS

Pollutant o		Maximum		Maximum	
pollutant p	property	any one	day	monthly	average
	mg/kg	(1b/million dewatered t	lbs) of in mud p	neutral: coduced	ized,
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Fluoride Iron Manganese		7 1 6 1 2 4 1 7 5 30 5 9 176 6 1	.741 .015 .009 .867 .460 .009 .413 .776 .139 .464 .066 .148 .840 .804 .286 .600 .056 .514		4.340 3.129 0.404 0.757 3.079 0.404 0.656 1.867 1.867 0.606 3.079 2.120 13.680 2.574 4.239 100.400 3.079 1.161 1.110
*TSS *pH	With	75 nin the rang	.710 e of 7.5	to 10.0	60.560 at all times

<sup>\*</sup>Regulated Pollutant

### NSPS FOR THE SECONDARY TIN SUBCATEGORY

### (d) <u>Tin Hydroxide Wash</u> NSPS

Pollutant	or		Ma	ximum	for		Maximum	for	
pollutant		ertv		y one				average	
Formula	ргор		۵	, one	auy		montanty	average	<b>.</b> .
	mg/kg	(lb/mi	llio	n lbs	) of	tin	hydroxi	de washe	ed
Antimony		•		23	.070			10.280	)
Arsenic	•			16	610			7.411	_
Cadmium	1			. 2	391			$0.95\epsilon$	5
Chromium				4	.423			1.793	} . ;
Copper				15.	300			7.291	
*Cyanide			*	2.	391			0.956	
*Lead				3 .	347			1.554	
Nickel					574			4.423	
Selenium		•	-		801			4.423	
Silver					466		-	1.434	
Thallium					730			7.291	
Zinc					190			5.020	
Aluminum		¥ .			030			32.390	
Barium					750			6.096	
Boron	,				990			10.040	
*Fluoride	+ 1			418.				237.900	
Iron		3			340			7.291	
Manganese	9		-	,	586		,	2.749	
*Tin	•				542			2.630	
*TSS				179				143.400	
*pH		Within	the			7.5	to 10.0		

<sup>\*</sup>Regulated Pollutant

#### NSPS FOR THE SECONDARY TIN SUBCATEGORY

### (e) Spent Electrowinning Solution from New Scrap NSPS

Pollutant pollutant		ty		imum one				imum thly	for average	<u> </u>
	mg/kg (	lb/mil	lion	lbs	) of	cath	ode	tin	produce	ed
Antimony Arsenic Cadmium Chromium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Fluoride Iron Manganes				32 23 3 6 21 3 4 9 13 4 23 17 102 19 30 588 20	.420 .350 .360 .216 .500 .360 .704 .240 .780 .872 .520 .140 .600 .320 .910 .000 .160	Cath	oue		14.450 10.420 1.344 2.520 10.250 1.344 6.216 6.216 2.016 10.250 7.056 45.530 8.568 14.110 334.300 10.250	) ) 1 ) ) 1 1 5 5 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
*Tin *TSS *pH		√ithin	the	6 252	.384 .000	7.5	to	10.0	3.696 201.600 at all	) '

<sup>\*</sup>Regulated Pollutant

### NSPS FOR THE SECONDARY TIN SUBCATEGORY

# (f) Spent Electrowinning Solution from Municipal Solid Waste NSPS

Pollutant pollutant	or property	Maximum fo any one da		for average
	mg/kg	(lb/million used as a ra	lbs) of MSW s w material	crap
Antimony		0.23	Λ	0.102
Arsenic		0.16		0.102
Cadmium		0.02		0.074
Chromium		0.04		0.010
Copper		0.15		0.018
*Cyanide	•	0.02		0.073
*Lead		0.03	the contract of the contract o	0.016
Nickel		0.06		0.018
Selenium		0.09		0.044
Silver	* *,	0.03		0.014
Thallium		0.16	and the second s	0.014
Zinc		0.12		0.050
Aluminum		0.72		0.322
Barium		0.13		0.061
Boron		0.219		0.100
*Fluoride		4.16		2.368
Iron		0.14		0.073
Manganese		0.036		0.027
*Tin		0.045		0.027
*TSS		1.785		1.428
*pH	Within			at all times

<sup>\*</sup>Regulated Pollutant

### NSPS FOR THE SECONDARY TIN SUBCATEGORY

### (g) Tin Hydroxide Supernatant from Scrap NSPS

Pollutant pollutant		Maximum any one		Maximum monthly	for average
	mg/kg	(lb/millio	on lbs) o	f tin me	etal
	5,5	recovere	d from sc	rap	
Antimony		107	.400		47.850
Arsenic		77	.340		34.500
Cadmium		11	.130		4.451
Chromium		20	.590	•	8.346
Copper		71	.220		33.940
*Cyanide		11	.130		4.451
*Lead		15	.580		7.233
Nickel		30	.600		20.590
Selenium		45	.620		20.590
Silver		16	.140		6.677
Thallium		. 77	.900		33.940
Zinc		56	.750		23.370
Aluminum		340	.000	•	150.800
Barium		63	.990		28.380
Boron		102	.400		46.740
*Fluoride		1,947	.000	1	,107.000
Iron		66	.770		33.940
Manganese	2	16	.690		12.800
*Tin		21	.140		12.240
*TSS			.600		667.700
*pH	Within	the rang	e of 7.5	to 10.0	at all times

<sup>\*</sup>Regulated Pollutant

### NSPS FOR THE SECONDARY TIN SUBCATEGORY

# (h) Tin Hydroxide Supernatant from Plating Solutions and Sludges NSPS

Pollutant	or	Maximum for	Maximum for
pollutant	property	any one day	
	mg/kg	(lb/million l)	os) of tin metal
	recovered	from plating so	olutions and sludges
Antimony	in the second second	222.000	98.900
Arsenic		159.900	71.300
Cadmium		23.000	9.200
Chromium		42.550	17.250
Copper		147.200	70.150
*Cyanide		23.000	9.200
*Lead		32.200	14.950
Nickel		63.250	42.550
Selenium	*	94.300	42.550
Silver	*	33.350	13.800
Thallium	:	161.000	70.150
Zinc		117.300	48.300
Aluminum		702.700	311.700
Barium		132.300	58.650
Boron		211.600	96.600
*Fluoride		4,025.000	2,289.000
Iron	* · · · · · · · · · · · · · · · · · · ·	138.000	70.150
Manganese	· }	34.500	26.450
*Tin		43.700	25.300
*TSS		1,725.000	1,380.000
*рН	Within		7.5 to 10.0 at all times

<sup>\*</sup>Regulated Pollutant

### NSPS FOR THE SECONDARY TIN SUBCATEGORY

### (i) Tin Hydroxide Filtrate NSPS

Pollutant pollutant		Maximum for any one day	Maximum for monthly average
	mg/kg (lb/mi	llion lbs) of	tin metal produced
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Fluoride Iron Manganese *Tin	e	48.330 34.810 5.009 9.266 32.060 5.009 7.012 13.770 20.540 7.263 35.060 25.540 153.000 28.800 46.080 876.500 30.050 7.513 9.517	21.540 15.530 2.004 3.757 15.280 2.004 3.256 9.266 9.266 3.005 15.280 10.520 67.870 12.770 21.040 498.400 15.280 5.760 5.510
*TSS *PH	Within	375.700	300.500 7.5 to 10.0 at all times

<sup>\*</sup>Regulated Pollutant

#### SECTION XII

#### PRETREATMENT STANDARDS

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

#### TECHNICAL APPROACH TO PRETREATMENT

Before proposing and promulgating 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 that standards for indirect dischargers be equivalent to standards for direct dischargers while at the same time 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 (page 4296) shows the estimated pollutant removals for indirect dischargers. Compliance costs for indirect dischargers are presented in Table XII-2 (page 4297).

#### 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.

Treatment technologies considered for the PSNS and PSES options are:

#### OPTION A

- o Preliminary treatment consisting of cyanide precipitation (where required)
- o Chemical precipitation and sedimentation

#### OPTION C

- o Preliminary treatment consisting of cyanide precipitation (where required)
- o Chemical precipitation and sedimentation
- o Multimedia filtration

#### PSES AND PSNS OPTION SELECTION

Option C (cyanide precipitation, chemical precipitation, sedimentation and filtration) has been selected as the treatment technology basis for pretreatment standards for existing and new sources (PSES and PSNS). Option C prevents pass-through and is equivalent to BAT treatment for direct dischargers. In addition, Option C achieves effective removal of priority pollutants by incorporating filtration, which is demonstrated by 25 plants throughout the nonferrous metals manufacturing category.

The wastewater discharge rates for the promulgated PSES and PSNS are identical to the promulgated BAT discharge rates for each waste stream. The PSES and PSNS discharge rates are shown in Table XII-3 (page 4298). No additional flow reduction measures for PSES or PSNS are feasible; EPA does not believe that new plants could achieve flow reduction beyond the allowance promulgated for BAT.

Implementation of the promulgated PSES limitations would remove annually an estimated 167 kg of priority pollutants and 6,230 kg of tin. Capital cost for achieving promulgated PSES is \$160,187, and annual cost is \$50,044 (1982 dollars). The promulgated PSES will not result in adverse economic impacts. We believe that the promulgated 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 promulgate PSES and PSNS to prevent pass-through of arsenic, lead, fluoride, iron, and tin, which are the limited pollutants. Because of the nature of the wastewaters in this subcategory, secondary tin plants which only smelt concentrates will not be regulated for cyanide or fluoride. Other secondary tin plants, those which do not smelt concentrates, will not be regulated for iron or arsenic.

#### 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 promulgated treatment (mg/l) and the production concentrations for BAT are identical to those for PSES and PSNS. PSES are presented in Table XII-4 (page 4299) and NSPS are presented in Table XII-5 (page 4308).

Table XII-1

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	6.35	0.77	5.57	0.51	5.83
Antimony	7.25	0.56	6.68	0.37	6.87
Arsenic	1.16	0.08	1.07	0.05	1.10
Cadmium	1.46	0.09	1.36	0.07	1.38
Chromium (total)	1.15	0.64	0.50	0.43	0.71
Copper	19.79	0.07	19.71	0.05	19.73
Cyanide (total)		0.13	4.53	0.08	4.58
Lead	4.67		0	0.00	0
Mercury	0	0	11.90	0.24	12.47
Nickel	12.72	0.81		0.22	78.75
Selenium	78.98	0.33	78.64		1.07
Silver	1.15	0.11	1.03	0.07	7.07
Thallium	7.45	0.55	6.89	0.37	
Zinc	27.78	0.36	27.41	0.25	27.52
TOTAL PRIORITY POLLUTANTS	169.91	4.50	165.29	2.71	167.08
Aluminum	22.60	2.47	20.12	1.64	20.95
Fluoride	0.87	0.87	0	0.87	. 0
riuoride Tin	6,227.62	0.23	6,227.38	0.15	6,227.46
TOTAL NONCONVENTIONALS	6,251.09	3.57	6,247.50	2.66	6,248.41
TSS	490.43	13.25	477.17	2.87	487.55
Oil and Grease	7.42	7.42	0	7.42	0
TOTAL CONVENTIONALS	497.85	20.67	477.17	10.29	487.55
TOTAL POLLUTANTS	6,918.85	28.74	6,889.96	15.66	6,903.04

SECONDARY TIN SUBCATEGORY

SECT

### TABLE XII-2

#### COST OF COMPLIANCE FOR THE SECONDARY TIN SUBCATEGORY INDIRECT DISCHARGERS

Option	Proposal Capital Cost	Costs Annual Cost	Promulgat Capital Cost	
A	333400	112200	156612	46676
В.	341700	119900	160187	50044

Table XII-3

PSES AND PSNS WASTEWATER DISCHARGE RATES FOR THE SECONDARY TIN SUBCATEGORY

Wastewater Stream	PSES an Normal Discharg 1/kkg	ized	Production Normalizing Parameter
	9,198	2,204	Crude tapped tin produced
Tin smelter SO <sub>2</sub> scrubber	9,190	2,204	orace capped oral processes
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 plating solutions and sludges	115,000	27,600	Tin metal recovered from plat- ing solutions and sludges
Tin hydroxide filtrate	25,044	6,011	Tin metal produced

TABLE XII-4 PSES FOR THE SECONDARY TIN SUBCATEGORY

## (a) Tin Smelter SO2 Scrubber PSES

Pollutant pollutant		pperty	Maximum any one		Maximum monthly	for average	
mg,	/kg	(lb/millio	on lbs) o	of crude	tapped	tin produ	ıced
Antimony			17	.750		7.910	
*Arsenic			12.	.790		5.703	
Cadmium	,		1.	.840	•	0.736	
Chromium	<b>1.</b> .			.403	•	1.380	
Copper			11.	770		5.611	
*Lead			2.	575		1.196	
Nickel	*:	*	5.	059		3.403	
Selenium			7.	542		3.403	
Silver	,		2.	667		1.104	
Thallium			12.	880		5.611	
Zinc			. 9.	382		3.863	2
Aluminum			56.	200		24.930	•
Barium		•	10.	580	•	4.691	
Boron			16.	920		7.726	
*Iron			11.			5.611	
Manganese	•		2.	759		2.116	
*Tin		÷ .	3.	495		2.024	
			•				-

<sup>\*</sup>Regulated Pollutant

TABLE XII-4 PSES FOR THE SECONDARY TIN SUBCATEGORY

### (b) Dealuminizing Rinse PSES

Pollutant or pollutant pro		aximum ny one		Maximum monthly	for average	•
mg/kg	(lb/million	lbs) of	dealum	inized so	crap prod	uced
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Fluoride Iron			.068 .049 .007 .013 .045 .007 .010 .019 .029 .010 .049 .036 .214 .040		0.030 0.022 0.003 0.005 0.021 0.003 0.005 0.013 0.013 0.014 0.021 0.015 0.095 0.018 0.029 0.697 0.021	
Manganese *Tin		0	.011 .013		0.008	

<sup>\*</sup>Regulated Pollutant

### PSES FOR THE SECONDARY TIN SUBCATEGORY

## (c) Tin Mud Acid Neutralization Filtrate PSES

Pollutant		Maximum for	Maximum for
pollutant	property	any one day	monthly average
	mg/kg	(lb/million lbs) of	neutralized,
		dewatered tin mud p	roduced
Antimony		9.741	4.340
Arsenic		7.015	3.129
Cadmium		1.009	0.404
Chromium		1.867	0.757
Copper		6.460	3.079
*Cyanide		1.009	0.404
*Lead		1.413	0.656
Nickel		2.776	1.867
Selenium		4.139	1.867
Silver		1.464	0.606
Thallium		7.066	3.079
Zinc		5.148	2.120
Aluminum		30.840	13.680
Barium		5.804	2.574
Boron		9.286	4.239
*Fluoride		176.600	100.400
Iron		6.056	3.079
Manganese		1.514	1.161
*Tin		1.918	1.110

<sup>\*</sup>Regulated Pollutant

### TABLE XII-4 (Continued) PSES FOR THE SECONDARY TIN SUBCATEGORY

### (d) Tin Hydroxide Wash PSES

Pollutant pollutant	prope	_	Maxi any	one	day		Maximum monthly	ave		
I	ng/kg	(lb/mil	lion	lbs)	of	tin	hydroxio	de wa	asnea	
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Fluoride Iron				23. 16. 2. 4. 15. 2. 3. 6. 9. 3. 16. 12. 73. 21. 418.	070 610 391 423 300 391 347 574 801 466 730 030 990 400 340			10 7 1 7 1 4 4 1 7 5 32 6 10 237 7	.280 .411 .956 .793 .291 .956 .554 .423 .423 .434 .291 .020 .390 .040 .900 .291	
Manganes *Tin	е				.586 .542		*		.749 .630	

<sup>\*</sup>Regulated Pollutant

## PSES FOR THE SECONDARY TIN SUBCATEGORY

## (e) Spent Electrowinning Solution from New Scrap PSES

Pollutant	or	· · · · · · · · · · · · · · · · · · ·	Max	imum for	Maximum	for
pollutant	prope	erty		one day		average
		-		,o,are adj	MOHEHLY	average
1	mg/kg	(lb/mil	lion	lbs) of	cathode tin	produced
Antimony		• • • • • •		32.420	,	14.450
Arsenic	ė			23.350		10.420
Cadmium		*		3.360	•	
Chromium				6.216		1.344
Copper						2.520
*Cyanide				21.500		10.250
*Lead				3.360		1.344
				4.704	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	2.184
Nickel				9.240		6.216
Selenium			1.	13.780		6.216
Silver				4.872		2.016
Thallium				23.520		10.250
Zinc				17.140		7.056
Aluminum	-	•		102.600		
Barium				19.320		45.530
Boron				30.910		8.568
*Fluoride	:		•			14.110
Iron		-		588.000		334.300
			'	20.160		10.250
Manganese	,			5.040		3.864
*Tin				6.384		3.696

<sup>\*</sup>Regulated Pollutant

### PSES FOR THE SECONDARY TIN SUBCATEGORY

# (f) Spent ELectrowinning Solution from Municipal Solid Waste PSES

Pollutant or pollutant property	Maximum for any one day	Maximum for monthly average
mg/kg	g (lb/million lbs) used as a raw ma	of MSW scrap terial
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Fluoride Iron Manganese *Tin	.230 .165 .024 .044 .152 .024 .033 .066 .098 .035 .167 .121 .727 .137 .219 4.165 .143 .036 .045	.102 .074 .010 .018 .073 .010 .016 .044 .044 .014 .073 .050 .322 .061 .100 2.368 .073 .027

<sup>\*</sup>Regulated Pollutant

### PSES FOR THE SECONDARY TIN SUBCATEGORY

## (g) Tin Hydroxide Supernatant from Scrap PSES

Pollutant pollutant		Maximum for any one day	Maximum for monthly average
·.	mg/kg	(lb/million lbs)	
,	5/5	recovered from	scrap
Antimony			· · · · · · · · · · · · · · · · · · ·
Arsenic		107.400	47 <b>.8</b> 50
•		77.340	34.500
Cadmium		11.130	4.451
Chromium		20.590	8.346
Copper		71.220	33.940
*Cyanide	•	11.130	4.451
*Lead		15.580	7.233
Nickel		30.600	20.590
Selenium		45.620	20.590
Silver		16.140	6.677
Thallium	-	77.900	33.940
Zinc		56.750	
Aluminum		340.000	23.370
Barium	•	63.990	150.800
Boron			28.380
*Fluoride	•	102.400	46.740
Iron		1,947.000	1,107.000
		66.770	33.940
Manganese		16.690	12.800
*Tin	·	21.140	12.240

<sup>\*</sup>Regulated Pollutant

### PSES FOR THE SECONDARY TIN SUBCATEGORY

# (h) <u>Tin Hydroxide Supernatant from</u> <u>Plating Solutions and Sludges PSES</u>

Pollutant pollutant		Maximum any one		Maximum monthly	for average	
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium	property mg/kg recovered	any one (lb/million) from plating 222 159 23 42 147 23 32 63 94 33 161	day on lbs) ng solut .000 .900 .000 .550 .200 .200 .250 .300 .350	monthly	average etal	
Zinc Aluminum Barium Boron *Fluoride Iron Manganes *Tin		702 132 211 4,025 138 34	.300 .700 .300 .600 .000 .000	2	311.700 58.650 96.600 ,289.000 70.150 26.450 25.300	

<sup>\*</sup>Regulated Pollutant

### PSES FOR THE SECONDARY TIN SUBCATEGORY

## (i) Tin Hydroxide Filtrate PSES

Pollutant		Maximum for	Maximum for	
pollutant	property	any one day	monthly average	
	mg/kg (lb/mi	llion lbs) of	tin metal produced	
Antimony		48.330	21.540	
Arsenic		34.810	15.530	
Cadmium		5.009	2.004	
Chromium		9.266	3.757	
Copper		32.060	15.280	
*Cyanide		5.009		
*Lead		7.012	2.004	1.0
Nickel		13.770	3.256	
Selenium		20.540	9.266	
Silver		7.263	9.266	
Thallium		35.060	3.005	
Zinc			15.280	
Aluminum		25.540	10.520	
Barium		153.000	67.870	
Boron		28.800	12.770	
*Fluoride		46.080	21.040	
the second secon	7.	876.500	498.400	
Iron		30.050	15.280	
Manganese		7.513	5.760	
*Tin		9.517	5.510	

<sup>\*</sup>Regulated Pollutant

TABLE XII-5
PSNS FOR THE SECONDARY TIN SUBCATEGORY

## (a) Tin Smelter SO2 Scrubber PSNS

Pollutant or pollutant pro	operty an	aximum ny one lbs) o	day	-	for average
Antimony *Arsenic Cadmium Chromium Copper *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Iron Manganese *Tin		12. 1. 3. 11. 2. 5. 7. 2. 12. 9. 56. 10. 11.	750 790 840 403 770 575 059 542 667 880 382 200 580 920 040 759		7.910 5.703 0.736 1.380 5.611 1.196 3.403 3.403 1.104 5.611 3.863 24.930 4.691 7.726 5.611 2.116 2.024

<sup>\*</sup>Regulated Pollutant

## PSNS FOR THE SECONDARY TIN SUBCATEGORY

## (b) Dealuminizing Rinse PSNS

Pollutant	or	Maximum for	Maximum for
pollutant	property	any one day	monthly average
mg/l	kg (lb/millio	n lbs) of dealum	inized scrap produced
Antimony		0.068	0.030
Arsenic		0.049	0.022
Cadmium		0.007	0.003
Chromium		0.013	0.005
Copper		0.045	0.021
*Cyanide		0.007	0.003
*Lead		0.010	0.005
Nickel		0.019	0.013
Selenium	· · · · · · · · · · · · · · · · · · ·	0.029	0.013
Silver	•	0.010	0.004
Thallium		0.049	0.021
Zinc	entra de la companya de la companya de la companya de la companya de la companya de la companya de la companya	0.036	0.015
Aluminum		0.214	0.095
Barium		0.040	0.018
Boron		0.064	0.029
*Fluoride	14	1.225	0.697
Iron		0.042	0.021
Manganese *Tin	÷	0.011	0.008
		0.013	0.008

<sup>\*</sup>Regulated Pollutant

## TABLE XII-5 (Continued) PSNS FOR THE SECONDARY TIN SUBCATEGORY

## (c) Tin Mud Acid Neutralization Filtrate PSNS

Pollutant		Maximum for	Maximum for monthly average
pollutant		any one day	<u> </u>
	mg/kg	(lb/million lbs) of dewatered tin mud p	neutralized,
		dewatered till mad p	,, 044004
Antimony		9.741	4.340
Ancimony		7.015	3.129
Cadmium		1.009	0.404
Chromium		1.867	0.757
		6.460	3.079
Copper		1.009	0.404
*Cyanide *Lead		1.413	0.656
Nickel		2.776	1.867
Selenium		4.139	1.867
Silver		1.464	0.606
Thallium		7.066	3.079
Zinc		5.148	2.120
Aluminum		30.840	13.680
Barium		5.804	2.574
'		9.286	4.239
Boron		176.600	100.400
*Fluoride		6.056	3.079
Iron	•	1.514	1.161
Manganes *Tin	E	1.918	1.110
~~			

<sup>\*</sup>Regulated Pollutant

## PSNS FOR THE SECONDARY TIN SUBCATEGORY

## (d) Tin Hydroxide Wash PSNS

Pollutant	or	14.3	Morr	E				
pollutant	propo	x+12		imum fo		Maximum		
Pollacane	prope	тсу	any	one da	ıy	monthly	average	٠, ٠,
r	ng/kg	(lb/mil	lion	lbs) c	f tin	hydroxio	de washed	· · · · · · ·
Antimony			•	23.07		200		
Arsenic							10.280	
Cadmium			*	16.61	_		7.411	
Chromium		•		2.39			0.956	
Copper	•			4.42	_		1.793	
*Cyanide		. *		15.30	_		7.291	
				2.39	1		0.956	
*Lead				3.34	7.		1.554	
Nickel				6.57	4		4.423	
Selenium			,	9.80	1		4.423	
Silver		**		3.46			1.434	
Thallium				16.73				
Zinc	,		44 1	12.19		•	7.291	
Aluminum				73.03			5.020	
Barium							32.390	t
Boron	100		r	13.75	_		6.096	
*Fluoride				21.99		•	10.040	
Iron	٠.		- ,	418.400			237.900	
				14.340			7.291	
Manganese				3,586	5		2.749	
*Tin				4.542	?		2.630	

<sup>\*</sup>Regulated Pollutant

## PSNS FOR THE SECONDARY TIN SUBCATEGORY

## (e) Spent Electrowinning Solution from New Scrap PSNS

Pollutant or   Maximum for   Maximum for   monthly average					Morri	m11m	for	
mg/kg (lb/million lbs) of cathode tin produced  Antimony 32.420 14.450 Arsenic 23.350 10.420 Cadmium 6.216 2.520 Chromium 6.216 2.520 Copper 21.500 10.250 *Cyanide 4.704 2.184 *Lead 9.240 6.216	Pollutant or							
mg/kg (lb/million lbs) of cathode tin produced         Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel       32.420	pollutant pr	operty a	any one	day	mont	пту	average	
Selenium 2.016 Silver 4.872 2.016 Thallium 23.520 10.250	Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver	operty a	any one ion lbs) 32. 23. 3. 6. 21. 3. 4. 9. 13. 4. 23.	of 420 350 360 216 500 360 704 240 .780 .872 .520	mont	hly	produced  14.450 10.420 1.344 2.520 10.250 1.344 2.184 6.216 6.216 2.016 10.250	
Zinc Aluminum 102.600 45.530 Barium 19.320 8.568 Boron 30.910 41.110 588.000 334.300 *Fluoride 1ron 20.160 10.250 Manganese 5.040 3.864 3.696	Aluminum Barium Boron *Fluoride Iron Manganese		102 19 30 588 20 5	.600 .320 .910 .000 .160			45.530 8.568 14.110 334.300 10.250 3.864	
*Tin	×.T.TU		J					

<sup>\*</sup>Regulated Pollutant

### PSNS FOR THE SECONDARY TIN SUBCATEGORY

# (f) Spent ELectrowinning Solutions from Municipal Solid Waste PSNS

Pollutant		Maximum for	Maximum for
pollutant	property	any one day	monthly average
	mg/kg	(lb/million lbs)	of MSW scrap
		used as a raw ma	iterial
Antimony		0.230	0.102
Arsenic	,	0.165	0.074
Cadmium		0.024	0.010
Chromium		0.044	0.018
Copper		0.152	0.073
*Cyanide		0.024	0.010
*Lead		0.033	0.016
Nickel		0.066	0.044
Selenium		0.098	0.044
Silver		0.035	0.014
Thallium		0.167	0.073
Zinc		0.121	0.050
Aluminum		0.727	0.322
Barium	The second second	0.137	0.061
Boron		0.219	0.100
*Fluoride		4.165	2.368
Iron		0.143	0.073
Manganese	<b>.</b> .	0.036	0.027
*Tin	· · · · · · · · · · · · · · · · · · ·	0.045	0.026

<sup>\*</sup>Regulated Pollutant

### PSNS FOR THE SECONDARY TIN SUBCATEGORY

## (g) Tin Hydroxide Supernatant from Scrap PSNS

Pollutant pollutant	property	Maximum any one	day n		average	
	mg/kg	(lb/millio	on lbs) of	tin me	etal	
	<b>J.</b>		i from sci			
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Fluoride Iron		107 77 11 20 71 15 30 45 16 77 56 340 63 102 1,947 66	.400 .340 .130 .590 .220 .130 .580 .600 .620 .140 .900 .750 .000 .990		47.850 34.500 4.451 8.346 33.940 4.451 7.233 20.590 20.590 6.677 33.940 23.370 150.800 28.380 46.740	
Manganese *Tin	е		.690 .140		12.800 12.240	

<sup>\*</sup>Regulated Pollutant

#### Table XII-5 (Continued)

### PSNS FOR THE SECONDARY TIN SUBCATEGORY

PSNS

Secondary Tin
(h) Tin Hydroxide Supernatant from Plating Solutions and Sludges PSNS

Pollutant pollutant			ximum for onthly average
	mg/kg	(lb/million lbs) of	tin metal
	recovered f	rom plating solution	s and sludges
Antimony		222.000	98.900
Arsenic		159.900	71.300
Cadmium		23.000	9.200
Chromium		42.550	17.250
Copper		147.200	70.150
Cyanide		23.000	9.200
Lead	* * * * * * * * * * * * * * * * * * *	32.200	14.950
Nickel		63.250	42.550
Selenium		94.300	42.550
Silver		33.350	·
Thallium		161.000	13.800
Zinc		117.300	70.150
Aluminum		702.700	48.300
Barium		132.300	311.700
Boron		211.600	58.650
Fluoride	**	4,025.000	96.600
Iron			2,289.000
Manganese		138.000	70.150
Tin	the second second	34.500	26.450
		43.700	25.300

<sup>\*</sup>Regulated Pollutant

### PSNS FOR THE SECONDARY TIN SUBCATEGORY

### (i) Tin Hydroxide Filtrate PSNS

Pollutant pollutant			rimum :		Maximum monthly	for average	
	mg/kg	(lb/millio	on lbs	) of	tin metal	produced	
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Fluoride Iron Manganes			48. 34. 5. 9. 32. 5. 7. 13. 20. 7. 35. 25. 153. 28. 46. 876. 30.	330 810 009 266 060 012 770 540 263 060 540 080 500 050 513		21.540 15.530 2.004 3.757 15.280 2.004 3.256 9.266 9.266 3.005 15.280 10.520 67.870 12.770 21.040 498.400 15.280 5.760 5.510	
*Tin			9.	517		3.510	

<sup>\*</sup>Regulated Pollutant

#### SECTION XIII

#### BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY

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