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Office of Water

FINAL

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

Printed on Recycled Paper

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

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Primary Nickel and Cobalt

Secondary Nickel

Secondary Tin

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NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY

DEVELOPMENT DOCUMENT SUPPLEMENT

for the

Primary Beryllium Subcategory

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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 whether differences in raw materials, final products, manufacturing processes, equipment, age and size of plants, and usage required the development of separate water effluent and standards for different segments limitations of the subcategory. This involved a detailed analysis of wastewater discharge and treated effluent characteristics, including the sources and volumes of water used, the processes used, the sources of pollutants and wastewaters in the plant, and the 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,
- j 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-ofpipe 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,
- (0) 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

·	· · · ·	the second s	<u> </u>	· · · · · · · · · · · · · · · · · · ·
Pollutant or	Maximu	im for	Maximu	ım for
Pollutant Prop	erty Any Or	ne Day	Monthly	Average

Beryllium	2,763.000	1,235.000
Chromium (Total) 988.200	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
TSS	92,090.000	43,800.000
pH	Within the range of 7.5	to 10.0 at all times
	이 이 가지 않는 것 같아. 이 문제가 통해 감독하는 것이 있는	

(b) Solvent Extraction	n <u>Raffinate</u> <u>f</u> :	<u>rom Beryl Ore</u>	· .
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
mg/kg (lb/million	lbs) of bery	llium carbonate proc	luced
	" beryr ore a	5 Derytrium	
Beryllium	270.600	121.000	
Chromium (Total)	96.800	39.600	
Copper	418.000	220.000	
Cyanide (Total)	63.800	26.400	
Ammonia (as N)	29,330.000	12,890.000	
Fluoride	7,700.000	4,378.000	
TSS	9,020.000	4,290.000	
pH Within	the range of	7.5 to 10.0 at all	times
(c) <u>Beryllium</u> <u>Carbonat</u>	te <u>Filtrate</u>		
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
mg/kg (lb/million	lbs) of bery	llium carbonate proc	luced
	as berytt.	I UIII	
Beryllium	263 800	118.000	
Chromium (Total)	94.380	38,610	
Copper	407.600	214,500	
Cvanide (Total)	62.210	25.740	
Ammonia (as N)	28,590,000	12,570.000	
Fluoride	7,508.000	4,269.000	
TSS	8,795.000	4,183.000	
pH Within	the range of	7.5 to 10.0 at all	times
(d) Beryllium Hydroxid	de Filtrate	ВРТ	, <u></u> _, <u></u>
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
mg/kg (lb/million	lbs) of bery as beryll	llium hydroxide proc ium	luced
Beryllium	167.280	74.800	
Chromium (Total)	59.840	24.480	\$
Copper	258.400	136.000	· .
Cyanide (Total)	39.440	16.320	
Ammonia (as N)	18,128.800	7,969.600	
Fluoride	4,760.000	2,652.000	
	5,5/6.000	2,652.000	
pn Within	the range of	/.5 to 10.0 at all	times
(e) <u>Beryllium Oxide</u> Cal	lcining Furnad	ce Wet Air Pollution	<u>1</u>

Dollutont on			
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
	· · ·		
mg/kg (lb/mill:	ion lbs) of b	eryllium oxide produ	ced
· ·		· - · · · · · · · · · · · · · · · · · ·	
Beryllium	324.40	0 145.000	
Chromium (Total)	116.00		
Copper	501 00		
Cvanide (Total)		203.700	
Ammonia (ag N)		31.640	
Elucride	35,150.000	15,450.000	
Fluoride	9,230.000	5,248.000	
TSS	10,810.000	5,142.000	
pH Withir	n the range of	7.5 to 10.0 at all	times
	· · · · · · · · · · · · · · · · · · ·		
(f) Beryllium Hydroxi	de Supernatar	nt BPT	
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthlu Augrage	
	miy one bay	Monthly Average	
ma/ka (lb/million	lbal of hore	11	· · · · ·
	TDS) OF Dery	illum nyaroxide proc	luced
LIOM SCI	ap and residu	les as beryllium	
Derrillium			
Beryllium	282.900	126.500	
Chromium (Total)	101.200	41.400	
Copper	437.000	230,000	
Cyanide (Total)	66.700	27 600	
Ammonia (as N)	30-660.000	13 490 000	
Fluoride	160,300,000		-
TSS	9 430 000	/1,200.000	
DH Within	9,430.000	4,485.000	
	the range of	7.5 to 10.0 at all	times
· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·	
	, 1	~	
(g) <u>Process</u> Water			
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
			-
mg/kg (lb/millio	n lbs) of ber	vllium pebbles produ	ced
	· · · · · · · · · · · · · · · · · · ·	I PEDDreb Produ	ceu .
Bervllium	215,000	96 140	
Chromium (Total)	76 910		
Conner		31.400	
Cvanide (Total)	332.100	1/4.800	te e tra
Demonia (10tal)	50.690	20.980	
Ammonia (as N)	23,300.000	10,240.000	
riuoride	6,118.000	3,479.000	
TS S	7,167.000	3,409,000	
pH Within	the range of	7.5 to 10.0 at all	timee
			CTWGD

(h) <u>Fluoride</u> <u>Furnace</u>	<u>Scrubber</u> BI	т
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/milli	on lbs) of ber	yllium 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	n the range of	7.5 to 10.0 at all times
(i) Chip Treatment W	astewater BPI	1
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/millio	n lbs) of bery	llium scrap chips treated
Bervllium	9,533	4,263
Chromium (Total)	3,410	1,395
Copper	14.730	7,750
Cvanide (Total)	2.248	0,930
Ammonia (as N)	1,033,000	454.200
Fluoride	271.300	154.200
TSS	317,800	151.100
pH Within	n the range of	7.5 to 10.0 at all times
(j) <u>Beryllium Pebble</u> <u>Control</u> BPT	<u>Plant</u> Area Ve	ent Wet Air Pollution
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/millio	on lbs) of ber	yllium 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 Withir	n the range of	7.5 to 10.0 at all times

(k) <u>Beryl</u> <u>Ore</u> <u>Gangue</u>	Dewatering BF	2 ଫ
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (pounds per)	million pounds	s) of beryl ore processed
Bervllium	1.283	0.574
Chromium (Total)	0.459	0.188
Copper	1,982	1.043
Cvanide (Total)	0.302	0.125
Ammonia (as N)	139.032	61,120
Fluoride	36.505	20.756
T T G O T T G C	42.763	20.339
nH Within	the range of	75 ± 0.000 at all times
	che range or	7.5 CO 10.0 at all times
(1) Bertrandite Ore C	angue Dewateri	ng BPT
(1) <u>Dertrandite</u> <u>Ore</u> <u>G</u>	<u>angue</u> <u>Dewater</u>	
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (pounds per m	illion pounds)	of bertrandite processed
D	2 070	7 400
Beryllium	3.2/9	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	93.275	53.034
TSS	109,265	51.968
pH Within	the range of	7.5 to 10.0 at all times
(m) <u>Beryl</u> <u>Ore Process</u>	ING BPT	
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (pounds per n	million pounds) of beryl ore processed
Beryllium	8 983	4 017
Chromium (Total)	3 212	1 215
Copper	13 876	7 202
Cuanide (Total)	2 210	0 976
Ammonia (ag N)	2.110 073 /00	0.070 127 056
Fluorido	2/3.420 255 605	447.300 1/5 000
r tuol tue	200,400	140.330
	277.423 	142.409
ph Within	the range of	1.5 to iv.v at all times
	1	

(n) <u>A</u>	luminu	<u>ım Ir</u>	on s	Slud	ge	(AIS)	Are	<u>ea</u> 1	Was	stev	vate	er	BI	PT.	
Pollut	ant or				Max	imum	for		3	Ma	axir	num	l fo	or	
POLIUC	ant Pi	oper	ιy		Ally	one	Day		I	10110		y H	ivei	aye	
······································	mg/kg	(pou	inds car	per rbon	mi ate	llior proc	n pou luced	ind: 1 a	s) s t	of ery	to!	tal ium	. be ເ	eryll	Lium
Bervll	ium				5	75.64	10			2	247	. 40	0		
Chromi	um (To	tal)			2	05.92	20				84	.24	0		
Copper	• - •	,			8	89.20	0			4	168	.00	0		
Cyanid	e (Tot	al)			1:	35.72	20				56.	.16	0		
Ammoni	a (as	N)		6	2,38	84.40	0		2	27,4	124	.80	0		
Fluori	de			1	6,38	80.00	0			9,3	313.	.20	0		
TSS				ļ	9,18	88.00	0			9,]	L26.	.00	0		
рН 			With	nin	the	ranç	je of	E 7	• 5	to	10.	• 0	at	all	times
(o) <u>B</u>	ertrar	ndite	<u>Ore</u>	e <u>Le</u>	ach	ing S	Scrub	bbe	r	BPJ	2				
Polluta	ant or				Max:	imum	for	. <u> </u>		Ма	axir	num	i fo	or	
Pollut	ant Pr	oper	ty		Any	One	Day		M	iont	hly	γA	ver	age	
				mg/	kg (of be	ertra	and	ite	e 01	e				
Beryll	ium				-	1.859)				0.	.83	1		
Chromi	um (To	tal)			(0.665	;				0.	. 27	2		
Copper						2.871	-				1.	.51	1		
Cyanid	e (Tot	al)			(0.438	5				0.	.18	1		
Ammonia	a (as	N)			20	1.416	•				88	.54	:5		
Fluori	ae				52	2.885)				30.	.06	9		
755 ~ ^u			Mitt		0. + h o	1.951		= 7	E	+ ~	29	•40	5	<u></u>	times
рп 			WIU	1111		rang		- /	• •		т о .	• •	at	all	
(p) <u>B</u>	ertrar CCD) S	dite crub	Ore ber	e <u>Co</u> BP'	unte T	ercur	rent		nd	Dec	ant	tat	ior	<u>1</u>	
Polluta	ant or]	Max	imum	for			Ма	ixin	num	fc	or	
Polluta	ant Pr	oper	ty	4	Any	One	Day		M	Iont	hly	γA	ver	age	
		m	ig/kg	, of	be	rtran	dite	e 01	re	pro	ces	sse	d		
Beryll	ium				0	.124					0.	.05	6		
Chromi	um (To	otal)			0	.044					0.	.01	.8		
Copper	_ / ·	. .			0	.192					0.	.10	1		
Cyanid	e (Tot	a⊥)			0	.029					0.	.01	2		
Ammonia	a (as	N)			13. 2	.463					5.	.91	9		
riuori(mee	le				، ک ۸	כנכ. רו <i>ו</i> ר					2.	.UI 07	0		
nH GGT			With	in .	4, tho	• 141 rana		= 7	5	to	10	• 7 / 0	0 a+`	211	times
P.II			77 L L L		CILE	rang		- /	• •		то.	• •	تدل	атт	CTUCE

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:

(a) Solvent Extraction Raffinate from Bertrandite Ore BAT

Pollutant	or		Maximum	for	Maximum for
Pollutant	Property	-	Any One	Day	Monthly Average

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 Raffinate from Beryl Ore BAT

Pollutant orMaximum forMaximum forPollutant PropertyAny One DayMonthly Average

•		· · · · · · · · · · · · · · · · · · ·
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
	and the second	

(c) Beryllium Carbonate Filtrate BAT

Pollutant or	Maximum	for	Maximum for
Pollutant Property	Any One	Day M	onthly Average
· · · · · · · · · · · · · · · · · · ·			
mg/kg (lb/million	lbs) of	beryllium	carbonate produced
	as be	eryllium	
Beryllium	175	5.900	79.370
Chromium (Total)	79	9.370	32.180
Copper	274	4.600	130.800
Cvanide (Total)	42	2.900	17.160
Ammonia (as N)	28,590	0.000	12,570,000
Fluoride	7,508	3.000	4,269,000
	.,		

(d) Beryllium Hydro	Dxide Filtrate BA	L .
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/	million lbs) of be	eryllium hydroxide
	produced as bery	yllium
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,/60.000	2,706.400
(e) Beryllium Oxide	Calcining Furnace	e Wet Air Pollution
Control BAT		· · · ·
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/mil	lion lbs) of bery	llium oxide produced
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 Hydro	oxide Supernatant	BAT
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/milli from s	on lbs) of berylli crap and residues	lum hydroxide produced as beryllium
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

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(g) Process Water Maximum for Pollutant or Maximum for Pollutant Property Monthly Average Any One Day mg/kg (lb/million lbs) of beryllium pebbles produced Beryllium 143.300 64.680 Chromium (Total) 64.680 26.220 Copper 223.700 106.600 Cyanide (Total) 13.980 34.960 Ammonia (as N) 23,300.000 10,240.000 Fluoride 6,118.000 3,479.000 Fluoride Furnace Scrubber BAT (h) Pollutant or Maximum for Maximum for Any One Day Pollutant Property Monthly Average mg/kg (lb/million lbs) of beryllium 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 (i) Chip Treatment Wastewater BAT Pollutant or Maximum for Maximum for Pollutant Property Any One Day Monthly Average mg/kg (lb/million lbs) of beryllium scrap chips treated Beryllium 6.355 2.868 Chromium (Total) 2.868 1.163 4.728 Copper 9.920 Cyanide (Total) 1.550 0.620 Ammonia (as N) 1,033.000 454.200 Fluoride 271.300 154.200

Pollutant for	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
-	:	
mg/kg (lb/millior	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
		-

(j) <u>Beryllium Pebble</u> <u>Plant Area</u> <u>Vent Wet Air</u> <u>Pollution</u> <u>Control</u> BAT

(k) Beryl Ore Gangue Dewatering BAT

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (pounds per	million pounds)	of beryl ore processed
Bervllium	0.855	0.386
Chromium (Total)	0.386	0.156
Copper	1.335	0.636
Cvanide (Total)	0.209	0.083
Ammonia (as N)	139.032	61.120
Fluoride	36.505	20.756

(1) Bertrandite Ore Gangue Dewatering BAT

Maximum for	Maximum for	
Any One Day	Monthly Average	
million pounds) of	bertrandite ore proces	ssed
2.185	0.986	
0.986	0.400	
3.411	1.626	
0.533	0.213	
355.245	156.169	
93.275	53.034	
	Maximum for Any One Day million pounds) of 2.185 0.986 3.411 0.533 355.245 93.275	Maximum for Maximum for Any One Day Monthly Average million pounds) of bertrandite ore proces 2.185 0.986 0.986 0.400 3.411 1.626 0.533 0.213 355.245 156.169 93.275 53.034

(m) <u>Beryl</u> <u>Ore</u> <u>Proce</u>	ssing BAT	
Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for 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
(n) <u>Aluminum Iron</u> S	ludge <u>(AIS)</u> Area	Wastewater BAT
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (pounds per m	illion pounds) of produced as ber	total beryllium carbonate yllium
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) <u>Bertrandite</u> Ore	Leaching Scrubbe	r BAT
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg	of bertrandite o	re 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

(CCD) Scrubber	BAT	
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	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

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

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) <u>BOIVENC</u> Exclaction	ton Rallinate from Bertrandite Ore NSPS
Pollutant or Pollutant Property	Maximum for Maximum for Any One Day Monthly Average
mg/kg (lb/millic from	on lbs) of beryllium carbonate produced bertrandite ore as beryllium
Beryllium Chromium (Total) Copper Cyanide (Total) Ammonia (as N) Fluoride TSS pH Withi	1,842.000 831.000 2,875.000 449.200 299,400.000 78,610.000 33,690.000 1,370.000 131,600.000 44,700.000 26,950.000 n the range of 7.5 to 10.0 at all times

(b) Solvent Extra	action Raffinate fro	om <u>Beryl</u> <u>Ore</u> NSPS	• •
Pollutant or	Maximum for	Maximum for	
Pollutant Property	y Any One Day	Monthly Average	
	llion that of horyll	ium combonata analu	
	from bervl ore as	bervllium	cea
	from beryr ore as	Serymina	· ·
Beryllium	180.400	81.400	
Chromium (Total)	81.400	33.000	·
Copper	281.600	134.200	
Cyanide (Total)			
Fluoride	7 700 000	12,890.000 4 378 000	
TSS	3,300,000	2,640,000	-
DH W:	ithin the range of 7	'.5 to 10.0 at all t	mes
Z			
(c) Beryllium Car	rbonate Filtrate NS	PS	
Pollutant or	Maximum for	Maximum for	·
Pollutant Property	Any One Day	Monthly Average	
<u>_</u>			
mg/kg (lb/mi	llion lbs) of beryll as berylliu	ium carbonate produc m	ced
Beryllium	175.900	79.370	
Chromium (Total)	79.370	32.180	
Copper	274.600	130.800	
Cyanide (Total)			
Fluoride	7 508 000	4 269 000	
TSS	3,218,000	2,574,000	
H W:	ithin the range of 7	.5 to 10.0 at all ti	mes
F			
(d) <u>Beryllium Hy</u> o	droxide Filtrate NS	PS	
Pollutant or	Maximum for	Maximum for	·· <u></u>
Pollutant Property	Any One Day	Monthly Average	
mg/kg (lb/million	lbs) of beryllium h	ydroxide produced as	beryllium
Bervllium	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	
TSS	2,040.000	1,632.000	
bu Mi	train the range of /	.5 to IV.V at all ti	mes

(e)	Beryllium Oxide C Control NSPS	Calcining	Furn	ace <u>Wet</u>	<u>Air</u>	<u>Polluti</u>	on
P011	utant or	Maximum	for	M	aximu	m for	· · ·
Poll	utant Property	Any One	Day	Mon	thly	Average	
	mg/kg (lb/milli	on lbs) (of be	ryllium	oxid	le produ	ced
Berv	llium	216	5.200			97.570	•
Chro	mium (Total)	9	7.570			39.560	•
Copp	er	337	7.500			160.900	
Cyan	ide (Total)	52	2.740			21.100	
Ammo	nia (as N)	35,150	0.000		15,	450.000	
Fluo	ride	9,230	0.000		5,	248.000	
TSS		3,956	5.000		3,	164.000	
рН	Within	the rang	ge of	7.5 to	10.0	at all	times
(f)	Beryllium Hydroxi	de Superi	natan	t. NSPS			
Poll	utant or	Maximum	for	Ma	aximu	m for	
Poll	utant Property	Any One	Day	Mon	thly	Average	
	mg/kg (lb/million from scr	lbs) of ap and re	bery: esidu	llium hy es as be	ydrox eryll	ide prod ium	duced
Bery	llium	188	3.600	9. T		85.100	
Chro	mium (Total)	85	5.10Q			34.500	
Copp	er	294	1.400		-	140.300	х.
Cyan	ide (Total)	46	5.000			18.400	-
Ammo	nia (as N)	30,660	0.000	:	13,	480.000	
Fluo	ride	160,300	000.000		71,	200.000	
TSS	· · · · · · · · · · · · · · · · · · ·	3,450	0.000		2,	760.000	
рH	Within	the rang	ge of	7.5 to	10.0	at all	times
(g)	Process Water NS	PS		· · ·			
Poll	utant or	Maximum	for	N	laxim	um for	
Poll	utant Property	Any One	Day	Mont	hly	Average	
	mg/kg (lb/millio	n lbs) of	bery	yllium p	pebbl	es produ	ıced
Bery	llium	143	8.300			64.680	
Chro	mium (Total)	64	1.68Q			26.220	
Сорр	er	223	3.700			106.600	
Cyan	ide (Total)	34	.960		,	13.980	
Ammo	nia (as N)	23,300	.000		10,	240.000	
Fluo	ride	6,118	3.000		З,	479.000	
TSS		2,622	2.000		2,	098.000	_
рH	Within	the rang	ge of	7.5 to	10.0	at all	times

(h) <u>Fluoride</u> Furnace	<u>e Scrubber</u> NSP	S	
Dollutont or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
mg/kg (lb/mill)	ion lbs) of ber	yllium pebbles produ	uced
Berullium	0.000	0.000	
Chromium (Total)	0.000	0.000	
Copper	0.000	0.000	
Cvanide (Total)	0.000	0.000	·
Ammonia (as N)	0.000	0.000	
Fluoride	0.000	0.000	
TSS	0.000	0.000	
pH With	in the range of	7.5 to 10.0 at all	times
(i) hip Treatment W	astewater NSPS		·
(1) <u>http iteacment</u>			
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
mg/kg (lb/milli	on lbs) of bery	llium scrap chips t	reated
Beryllium	6.355	2.868	
Chromium (Total)	2.868	1.163	
Copper	9.920	4.728	
Cvanide (Total)	1.550	0.620	
Ammonia (as N)	1,033.000	454.200	
Fluoride	271.300	154.200	
TSS	116.300	93.000	
pH With	in the range of	7.5 to 10.0 at all	times
(j) <u>Beryllium</u> Pebbl Control NSPS	e Plant Area Ve	ent Wet Air Pollutio	<u>n</u>
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
mg/kg (lb/mill	ion lbs) of ber	yllium pebbles prod	luced
Bervllium	0.000) 0.000)
Chromium (Total)	0.000) 0.000	ł.
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 With	in the range of	E 7.5 to 10.0 at all	. times
(k) Beryl Ore Gangu	le Dewatering 1	NSPS	,
Pollutant or	Maximum for	Maximum for	· · · · · · · · · · · · · · · · · · ·
Pollutant Property	Any One Day	Monthly Aver	age
TOTTACANCE TEODOLON	1 1 1 1	-	

mg/kg (pounds per mi	llion pounds)	of beryl ore pr	ocessed
Beryllium	0.855	0.386	۰.
Chromium (Total)	0.386	0.156	
Copper	1.335	0.636	
Cyanide (Total)	0.209	0.083	
Ammonia (as N)	139.032	61.120	-
luoride	36.505	20.756	
SS	15.645	12.516	
oH Within t	he range of 7.	.5 to 10.0 at al	l times
1) Bertrandite Ore Gan	igue Dewaterin	g NSPS	
'Ollutant or M	laximum for	Maximum for	
Ollutant Property A	ny One Day	Monthly Avera	ge
mg/kg (pounds per milli	on pounds) of	bertrandite ore	process
Beryllium	2.185	0.986	
Chromium (Total)	0.986	0.400	
lopper	3.411	1.626	
yanide (Total)	0.533	0.213	
mmonia (as N)	355.245	156.169	
luoride	93.275	53.034	
SS	39.975	31.980	
H Within t	he range of 7	.5 to 10.0 at al.	l times
· · · · · · · · · · · · · · · · · · ·		· · ·	
m) <u>Beryl Ore</u> <u>Processin</u>	g NSPS		
ollutant or M	aximum for	Maximum for	
ollutant Property A	ny One Day	Monthly Avera	je
mg/kg (pounds per mi	llion pounds)	of beryl ore pro	cessed
	- · ·		

5, 5 (F	······································	-	
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	1 A
Fluoride	255.605	145.330	
TSS	109.545	87.636	
рН	Within the range of 7.5	to 10.0 at all	times

(n) <u>Aluminum Ir</u>	on Sludg	e (AIS)	Area	Wastew	ater	NSPS	
			607	N	[<u></u>	- for	<u></u>
Pollutant or	IM D	aximum	LOF	M =			_
Pollutant Proper	ty A	ny One	Day	MOR	itniy /	Averag	e
mg/kg (pounds p	er milli	on pour	nds) o	f total	bery	llium	carbonate
	pr	oduced	as be	ryllium	າ [–]		
Down11:um		202 -	160		172	160	
Chromium (Motol)		1 2 2 3 - 1	60		70	200	
Chromium (Total)		T/2.1	100		295	+ 400 / QA	
Copper Guanida (Matal)		02.6	140 100		200	.400	
Cyanide (Total)		(2204)			16	• 4 40	
Ammonia (as N)		02304.4	100		2/424	.000	
Fluoride		16380.0			9313	.200	
'TSS		/020.0	100		2010	.000	
рн м	itnin th	e range	e or /	.5 to 1	.0.0 a	t all	times
(c) Bertrandite	Ore Lea	ching 9	Scrubb	or NSI			<u> </u>
(0) <u>Dertrandrice</u>	<u>OIE</u> <u>Dea</u>			<u>CI</u> NDI	0		
Pollutant or	М	aximum	for	N	laximu	m for	
Pollutant Proper	ty A	ny One	Day	Mor	thly A	Averag	e .
m	g/kg of	bertrar	ndite	ore pro	cesse	d	
Bervllium		1.230	•		0	. 559	
Chromium (Total)		0.559	, ,		Ő	.227	
Copper		1.934	1		Ő	.922	
Cvanide (Total)		0 302	, ,		Ő	.121	
Ammonia (ag N)		201 416			88	545	
Fluorido		57 995	;		20	060	
		22.000	;		10	122	
		22.000		7 5 5 6		• 1 3 2	Limaa
рн		ne ranç	je or	7.5 to	TO.0		cimes
(p) Bertrandite	Ore Coun	tercuri	ent a	nd Deca	ntati	on	
(P) <u>CCD</u> Scrubb	er NSPS		<u> </u>	<u></u>		<u> </u>	
Pollutant or	M	aximum	for	Ν	laximu	m for	
Pollutant Proper	ty A	ny One	Day	Mor	thly A	Averag	e
mg/kg of bertran	dite ore	proces	sed				
		-	_	-	-		
Beryllium		0.083	5		0	.037	
Chromium (Total)		0.037	1		0	.015	
Copper		0.129			0	.062	
Cyanide (Total)		0.020)		0	.008	
Ammonia (as N)		13.463	3		5	.919	
Fluoride		3.535	5		2	.010	
TSS	-	1.515	5		1	.212	
PH	Within t	he rang	ge 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

<u> </u>		
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/million	lbs) of beryl	lium carbonate produced
from b	ertrandite ore	as beryllium
	,	_
Beryllium	1,842.000	831.000
Chromium (Total)	831.000	336,900
Copper	2,875,000	1,370,000
Cvanide (Total)	449,200	179.700
Ammonia (as N)	299,400,000	131,600,000
Fluoride	78,610,000	44,700,000
11401140	/0/010.000	
(b) Solvent Extractio	n Daffinato fr	M Roryl Oro DCNC
(b) <u>borvent</u> <u>Extractio</u>	<u>n Karrinace II</u>	<u>M Beryr Ole</u> Fans
Pollutant or	Maximum for	Mayimum for
Pollutant Droparty		Maximum for
Pollucanc Propercy	Any One Day	Monthly Average
		1
mg/kg (ID/million	IDS) OF DETYL	Lium carbonate produced
ΓΓΟ	m beryi ore as	beryllium
Beryllium	180.000	81.000
Chromium (Total)	81.400	33.000
Copper	281.600	134.200
Cyanide (Total)	44.000	17.600

29,330.000

7,700.000

12,890.000

4,378.000

Ammonia (as N)

Fluoride

(c) <u>Beryllium</u> <u>Carbon</u>	ate Filtrate PS	ND	-
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
mg/kg (lb/millio	n lbs) of beryll	ium carbonate produc	ed
	as berylliu	m	
Downllium	175,900	79.370	
Chromium (Total)	79.370	32.180	
Copper	274.600	130.800	
Cvanide (Total)	42.900	17.160	
Ammonia (as N)	28,590.000	12,570.000	
Fluoride	7,508.000	4,269.000	
(d) Beryllium Hydrox	ide Filtrate PS	SNS	•
$(\mathbf{u}) \underline{\mathbf{berymin}} \underline{\mathbf{ayuron}}$			
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
mg/kg (lb/millic	on lbs) of beryll	lium hydroxide produc	ced
	as berylliu	ım	
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	
	Colcining Eurne	The Wet Air Pollution	
(e) Beryllium Oxide Control PSNS	carering runa		
	Nouimum For	Maximum for	
Pollutant or		Monthly Average	
Pollutant Property	Any one bay	nonen_j molecje	
mg/kg (lb/mill	lion lbs) of ber	yllium oxide produce	d
Borwllium	216.200	97.570	
Chromium (Total)	97.570	39.560	i. E
Copper	337.500	160.900	
Cvanide (Total)	52.740	21.100	
Ammonia (as N)	35,150.000	15,450.000	
Fluoride	9,230,000	5,248.000	

PRIMARY BERYLLIUM SUBCATEGORY SECT - II

(1) <u>Beryllium</u> Hydrox	supernatant	rənə	
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	• •
mg/kg (lb/millic	on lbs) of berylli	um hydroxide produce	<u>d</u>
from so	rap and residues	as beryllium	
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 Water</u> F	SNS		
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
orracane rropercy	Kily One Day	Monenty 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	
(b) Elucride Eurnace	Sarubbar DSNS		<u> </u>
(ii) <u>Fildofilde</u> <u>Fullace</u>	<u>SCIUDDEI</u> FSNS		
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
mg/kg (lb/milli	on lbs) of beryll	ium pebbles produced	1
Bervllium	0.000	0.000	
Chromium (Total)	0,000	0.000	
lopper	0.000	0.000	۰.
Cvanide (Total)	0.000	0.000	· · .
Ammonia (as N)	0,000	0.000	
Pluoride	0.000	0.000	

(1) Chip Treatment Wa	SLEWALEI FOND	
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
Forrucane rropercy		1 5
mg/kg (lb/million	lbs) of berylli	um scrap chips treated
Porullium	6.355	2.868
Chromium (Total)	2,868	1.163
Connor	9,920	4.728
Cupper Cuppido (Total)	1,550	0.620
Ammonia (ad N)	1,033,000	454.200
Elucrido	271.300	154.200
FIGUIDE	271.000	
(J) <u>Beryllium Pebble</u> <u>Control</u> PSNS	Plant Area Vent	Wet Air Pollution
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/millio	n lbs) of beryll	lium pebbles produced
Berullium	0.000	0.000
Chromium (Total)	0.000	0.000
Copper	0.000	0.000
Cvanide (Total)	0.000	0.000
Ammonia (as N)	0.000	0.000
Fluoride	0.000	0.000
(k) <u>Beryl Ore Gangue</u>	Dewatering PSNS	5
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (pounds per	million pounds)	of beryl ore processed
Boryllium	0.855	0.386
Chromium (Total)	0.386	0.156
Copper	1.335	0.636
Cvanide (Total)	0.209	0.083
Ammonia (ag N)	139.032	61.120
Eluoride	36.505	20.756
LTUOLTGE	30.000	

(i) Chip Treatment Wastewater PSNS

PRIMARY BERYLLIUM SUBCATEGORY SECT - II

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
······································	1	
(m) <u>Beryl Ore 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
(n) <u>Aluminum Iron</u> S	ludge <u>(AIS)</u> Area	Wastewater PSNS
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any 1 Day	Monthly Average
mg/kg (pounds	per million pound	ls) of total beryllium
car	bonate produced a	s beryllium
Beryllium	383.760	173.160
Chromium (Total)	173.160	70.200
Copper	599.040	285.480
	93,600	37.440
Cyanide (Total)		
Cyanide (Total) Ammonia (as N)	62384.400	27424.800

PRIMARY BERYLLIUM SUBCATEGORY SECT - II

(0) <u>Dertranditte</u> <u>Ore</u>	<u>Deaching</u> <u>Derubb</u>	er i biib
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg of bertrandite	e 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</u> Ore (CCD) <u>Scrubber</u>	e <u>Countercurrent</u> PSNS	and Decantation
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	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

(o) Bertrandite Ore Leaching Scrubber PSNS

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 80 copper or other master alloy, and the remaining 20 percent represents approximately equal quantities of beryllium as the oxide and as the pure metal. Beryllium copper alloy, containing 0.5 to 2.75 percent beryllium is used in various electrical and mechanical applications including current carrying springs, 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 heat in resistor cores, integrated circuit chip sink carriers, traveling wave tubes, and laser tubes. Pure beryllium metal is used primarily in aerospace applications including missile aircraft brakes, nozzles, optics, components, and nuclear 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 (4BeO₂SiO₂H₂O). Imported and domestically produced beryl ore (3BeOAl₂O₃6SiO₂) 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 is washed and tailings removed in mixture countercurrent The sludge from the thickeners is pumped thickeners. 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 at about $16\overline{25}^{\circ}C$. The molten material is guenched with cold water to produce a glassy material called frit. The frit is dried, ground and leached with strong sulfuric acid, forming а mixture of beryllium sulfate, aluminum sulfate, and silica. is added to the mixture and the silica is separated in a Water series of countercurrent decantation steps. The resultant silica sludge 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 in an 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 sold directly to customers. The process is or 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°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 The resultant ammonium beryllium fluoride solution is (BeF₂). 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 (BeF₂). 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). This 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 any 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 the primary beryllium subcategory. These are recovery of beryllium as a hydroxide from low-grade sources and treatment of 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 from customers) is very recovered by 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 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.

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-bycase 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 metal has been operating since 1957.



Beryllium Hydroxide



BERYLLIUM HYDROXIDE PRODUCTION PROCESS



Figure III-2

BERYLLIUM OXIDE PRODUCTION PROCESS



TTEALC III J

BERYLLIUM METAL PRODUCTION PROCESS



3649

PRIMARY BERYLLIUM

SUBCATEGORY

SECT

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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 limitations and standards based on a specific set of for 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,

(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.

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

PRIMARY BERYLLIUM SUBCATEGORY SECT - IV

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 ammonium stream 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 to control reuse. 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, are not independent factors and do not affect they the subcategorization which has been applied. Certain other factors, such as plant age, plant size, and the number of employees, were evaluated and determined to be inappropriate for use as also primary beryllium further subdivision of the bases for subcategory.

PRODUCTION NORMALIZING PARAMETERS

As discussed previously, the effluent limitations and standards developed in this document establish mass limitations on the

PRIMARY BERYLLIUM SUBCATEGORY SECT - IV

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.

Building Block

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

kkg of beryllium carbonate produced from bertrandite ore as beryllium

PNP

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

Building Block

14. AIS area wastewater

- 15. Bertrandite ore leaching scrubber
- 16. Bertrandite ore counter current decantation scrubber

 \underline{PNP}

kkg of total beryllium carbonate produced as beryllium

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.

PRIMARY BERYLLIUM SUBCATEGORY SECT - V

SECTION V

WATER USE AND WASTEWATER CHARACTERISTICS

This 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 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.

Two principal data sources were used in the development of effluent limitations and standards for this subcategory; 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 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 no reason to expect that TCDD or asbestos would be present in 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 As 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 in the wastewater characteristics associated with these subdivisions are +0be expected. For this reason, wastewater streams corresponding to each subdivision are addressed separately in the discussions that follow. These wastewater sources 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,
- (o) 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 of recycle and makeup 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 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. As 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. Ä 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	0
Beryllium	1	1
Cadmium	0	0
Chromium	a 0	0
Copper	1	1
Cyanide	1	0
Lead	1	1
Mercury	0	Ō
Nickel	1	0
Selenium	0	· 0
Silver	· · · 0	· 0 · · ·
Thallium	0	0
Zinc	0	0
and the second		-

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.

PRIMARY BERYLLIUM SUBCATEGORY SECT - V

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 laboratoryspecific 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.

statistical analysis of data includes some samples measured The concentrations considered not quantifiable. For at 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 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 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 from the furnaces are controlled with emissions caustic The scrubber liquor is discharged as a wastewater scrubbers. stream. The production normalized water use and discharge rates beryllium oxide calcining furnace wet air pollution control for shown in Table V-5 (page 3664) in liters per metric ton of are 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

PRIMARY BERYLLIUM SUBCATEGORY SECT - V

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 (BeF₂) intermediate is produced by heating ammonium beryllium fluoride in a graphite induction furnace and driving off ammonium fluoride (NH₄F). 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 beryllium pebbles, however, is small enough to the 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.

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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, gangue 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 and 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.

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

(10³ 1/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

TABLE V-2

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

(10³ 1/kkg of beryllium carbonate produced from beryl ore as beryllium)

<u>Plant</u> Code	Percent Recycle	Production Normalized Water <u>Use</u>	Production Normalized Discharge Rate
1177	0	220	220

TABLE V-3

WATER USE AND DISCHARGE RATES FOR BERYLLIUM CARBONATE FILTRATE

(10³ l/kkg of beryllium carbonate produced as beryllium)

<u>Plant</u> Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Rate
1177	0	214.5	214.5

WATER USE AND DISCHARGE RATES FOR BERYLLIUM HYDROXIDE FILTRATE

(10³ l/kkg of beryllium carbonate produced as beryllium)

<u>Plant</u> Code	Percent Recycle	Production Normalized Water <u>Use</u>	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

(10³ 1/kkg of beryllium oxide produced)

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

TABLE V-6

WATER USE AND DISCHARGE RATES FOR BERYLLIUM HYDROXIDE SUPERNATANT

(10³ 1/kkg of beryllium hydroxide produced from scrap and residues as beryllium)

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

WATER USE AND DISCHARGE RATES FOR PROCESS WATER

(10³ l/kkg of beryllium pebbles produced)

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

TABLE V-8

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

(10³ l/kkg of beryllium carbonate produced from bertrandite ore as beryllium)

<u>Plant</u> <u>Code</u>	Percent Recycle	Production Normalized Water <u>Use</u>	Production Normalized Discharge Rate
1111	100	NR	0

TABLE V-9

WATER USE AND DISCHARGE RATES FOR CHIP TREATMENT WASTEWATER

(10³ l/kkg of beryllium scrap chips treated)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Rate		
1111	0	7.75	7.75		

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

(10³ 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

	Pollutant	Stream Sample		<u>Concentrations (mg/l)</u>			
	rollucant	Code	<u>Typet</u>	Source	Day 1	Day 2	Day 3
Toxic	Pollutants						
114.	antimony	481 484	6 6	<0.003	<0.003 0.015	<0.003 0.013	<0.003 <0.003
. 115	arsenic	481 484	6 6	<0.003	<0.003 <0.003	<0.003 <0.003	<0.003 <0.003
117.	beryllium	481 484	6 6	<0.001	0.49 2.0	0.89 1.20	0.88 0.98
118.	cadmium	481 484	6 6	<0.004	0.005 <0.004	<0.004 0.012	<0.004 0.015
119.	chromium (total)	481 484	6 6	0.017	0.055	0.042	0.042 0.13
120.	copper	481 484	6 6	0.47	0.13 1.5	0.17 0.38	0.12 0.16
122.	lead	481 484	6 6	<0.16	<0.168 <0.168	<0.168 <0.168	<0.168 <0.16
123 . n	mercury	481 484	6 6	<0.0002	<0.0002 <0.0002	<0.0002 <0.0002	<0.0002 <0.0002

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Table V-11 (Continued)

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

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n. 11	Stream Code	Sample Typet	Conc	centratio Day 1	ns (mg/1) Day 2	Day 3	IMA
Pollutant	0000	19901	<u></u>				RY
Toxic Pollutants (Continued)							BE
124. nickel	481 484	6 6	<0.006	0.043 0.022	0.019	0.022 0.036	RYLLI
125. selenium	481 484	6 6	<0.003	<0.003 <0.003	<0.003 <0.003	<0.003 <0.003	UM SU
126. silver	481 484	6 6	<0.0005	0.10 0.066	0.024 0.070	0.033 0.10	BCATE
127. thallium	481 484	6 6	<0.002	<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	SEC
Nonconventional Pollutants							н I
acidity	481 484	6 6	<1	<1 <1	<1 <1	<1 <1	4
alkalinity	481 484	6 6	311 1	,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

Dollistant.	Stream	Sample	Cor	centrati	ons (mg/l))
rondant	Code	Typet	Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
ammonia nitrogen	481 484	6 6	6.6	<0.02 35	<0.02 50	120 77
barium	481 484	6 6		0.027- 0.15	0.23 0.076	0.19 0.15
boron	481 484	б б	<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	<1	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	,250 ,900	13 35
iron	481 484	6 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	Sample	Concentrations (mg/1)
	Code	Typet	Source Day 1 Day 2 Day 3
Nonconventional Pollutants (Continued)			
magnesium	481 484	6 6	361521151.91518
manganese	481	6	0.013 0.039 0.058 0.064
	484	6	0.067 0.072 0.076
molybdenum	481	6	0.005 0.046 0.059 0.030
	484	6	0.043 0.052 0.063
phosphate	481	6	<0.732 1.1 8.0 1.6
	484	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	6	1,400 39,000 6,500 7,300
	484	6	24,000 29,000 18,000
tin	481 484	6 6	<0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12 <0.12
titanium	481	6	0.73 0.035 <0.010 <0.010
	484	6	<0.010 0.40 0.16
total dissolved solids (TDS)	481	6	550 39,000 8,200 33,000
	484	6	22,000 42,000 23,000

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PRIMARY BERYLLIUM SUBCATEGORY SECT

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

Pollutant	Stream Code	Sample Typet	Con	centratio	ns (mg/1)	
Nonconventional Pollutants (Continued)		<u></u>	Dource	Day	Day Z	Day 5
total organic carbon (TOC)	481 484	6 6	<1	10 8	11 8	11 2
total solids (TS)	481 484	6	55039 22	,000 - 8 ,000 42	,280 34 ,000 25	,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			на Карало — Малана Карало — Малана	*. •		
oil and grease	481 484	1	<1	<1 <1	26 <1	۲۱ ک ۲۱ ۲
total suspended solids (TSS)	481 484	6 6	4	100 45	33 60	ı 55 ج
pH (standard units)	481 484	6 6	6.84	8.10 7.58	8.24 6.86	7.52 6.90

Table V-12

PRIMARY BERYLLIUM SAMPLING DATA BERYLLIUM HYDROXIDE SUPERNATANT RAW WASTEWATER

	Pollutant	Stream Code	Sample Type†	Conc Source	entrations Day 1	s (mg/1) Day 2	Day 3
Toxic	Pollutants						
114.	antimony	491	1	<0.003	<0.003		
115.	arsenic	491	1	<0.003	<0.003		
117.	beryllium	491	··· <u>1</u> · ·	<0.001	12		
118.	cadmium	491	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.	zinc	491	1	0.018	0.19		

PRIMARY BERYLLIUM SUBCATEGORY SECT -

PRIMARY BERYLLIUM SAMPLING DATA BERYLLIUM HYDROXIDE SUPERNATANT RAW WASTEWATER

Pollutant		Stream Code	Sample Typet	Concentrations Source Day 1	(mg/1) Day 2 Day	PRIMAF
Nonconventional Pollutants	3				• • • • • • •	H X2
acidity		491	. 1 .	< 1 < 1	· · · ·	BERY
alkalinity	ж	491	1	311 2,450		LLIU
aluminum		491	1	<0.100 13		S N
ammonia nitrogen		491	1	6.6 13.4		UBC.
barium	•	491	1	0.20 0.57		ATEO
boron		491	· 1 1	<0.018 <0.018	•	ORY
calcium		491	1	57 3.5		
chemical oxygen demand (CC	DD)	491	1	<1 300		SEC
chloride		491	1	95 520	· · ·	H I
cobalt		491	1	<0.012 0.019		4
fluoride	1. A. A.	491	. 1	0.81 1,600		
iron		491	1	1.4 3.2		•
magnesium		491	1	36 2.7	· · · ·	· .

PRIMARY BERYLLIUM SAMPLING DATA BERYLLIUM HYDROXIDE SUPERNATANT RAW WASTEWATER

Pollutant	Stream Code	Sample Typet	Concentrations (mg/1) Source Day 1 Day 2 Day 3
Nonconventional Pollutants (Continued)			
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

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PRIMARY BERYLLIUM SUBCATEGORY SECT

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PRIMARY BERYLLIUM SAMPLING DATA BERYLLIUM HYDROXIDE SUPERNATANT RAW WASTEWATER

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

tSample Type Code: 1 - One-time grab

PRIMARY BERYLLIUM SUBCATEGORY

SECT - V

Table V-13

PRIMARY BERYLLIUM SAMPLING DATA PROCESS WATER RAW WASTEWATER

		Stream	Sample	Concentrations (mg/l)				
	Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	
Coxic	Pollutants				·			
1.	acenaphthene	426	1	ND	*	*		
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		

PRIMARY BERYLLIUM SUBCATEGORY SECT

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PRIMARY BERYLLIUM SAMPLING DATA PROCESS WATER RAW WASTEWATER

	Pollutant	Stream Code	Sample Typet	Conce Source	entration Day 1	<u>s (mg/1)</u> Day_2	<u>y 3</u>
Toxic	Pollutants (Continued)			· · · · ·			· _
10.	1,2-dichloroethane	426	· 1	*	*	0.211 0.142	· ·
1-1	1,1,1-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	*	ND ND	· · ·
17.	bis(chloromethyl)ether	426	1 1 1	ND	ND	ND ND	
18.	bis(2-chloroethyl)ether	426	1	ND	ND	ND ND	

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PRIMARY BERYLLIUM SUBCATEGORY SECT

PRIMARY BERYLLIUM SAMPLING DATA PROCESS WATER RAW WASTEWATER

	Pollutant	Stream Code	Sample Typet	Conce Source	ntrations Day 1	(mg/1) Day 2	Day 3
Toxic	Pollutants (Continued)						
19.	2-chloroethyl vinyl ether	426	1	*	0.101	0.015 0.030	
20.	2-chloronaphthalene	426	1	ND	ND	ND ND	
21.	2,4,6-trichlorophenol	426	1	ND	ND	ND ND	-
22.	p-chloro-m-cresol	426	1	ND	*	ND 0.072	
23.	chloroform	426	1	*	0.044	0.106 0.109	
24.	2-chlorophenol	426	1	ND	ŇD	ND ND	
25.	1,2-dichlorobenzene	426	1	ND	ND	ND ND	·
26.	1,3-dichlorobenzene	426	1	ND	ND	N D N D	
27.	1,4-dichlorobenzene	426	1	ND	ND	ND ND	

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PRIMARY BERYLLIUM SUBCATEGORY SECT

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PRIMARY BERYLLIUM SAMPLING DATA PROCESS WATER RAW WASTEWATER

	Pollutant	Stream Code		Sample Turnet	Concentrations (mg/1)					
Tout			code	турет	Source	Day 1	Day 2	Day 3		
10x10	Pollutants (Continued)				·			4 . -		
28.	3,3'-dichlorobenzidine	•	426	1	ND	ND	ND ND			
29.	1,1-dichloroethylene		426	·	* ***	0 0/7	0 1 1 T	۲ ب		
				•	-	0.047	0.111	ב ס		
30.	1,2- <u>trans</u> -dichloroethylene		426	1 a. 2000 - 2000 2000	*	0.053	0.134 0.133			
31.	2,4-dichlorophenol		426	1	ND	ND	ND ND	РССКК		
32.	1,2-dichloropropane	•	426	1	*	0.043	0.113	ŭ		
33.	1,3-dichloropropene		426	1	*	*	0.036	因 C C H 一		
34.	2,4-dimethylphenol		426	1 .	ND	ND	ND ND	_ <		
35.	2,4-dinitrotoluene	•	426	1	ND	ND	N D *			
36.	2,6-dinitrotoluene		426	1	*	*	* *			

PRIMARY BERYLLIUM SUBCATEGORY SECT

PRIMARY BERYLLIUM SAMPLING DATA PROCESS WATER RAW WASTEWATER

	Pollutant	Stream Code	Sample Typet	Conc Source	entration: Day 1	s (mg/l) Day 2	Day 3	PRIMARY
foxic	Pollutants (Continued)							BEF
37.	1,2-diphenylhydrazine	426	1	*	*	*		ITTAN
38.	ethylbenzene	426	1	*	*	* *		UM SUI
39.	fluoranthene	426	1	*	ND	ND *		BCATE
40.	4-chlorophenyl phenyl ether	426	1	ND	ND	ND ND		JORY
41.	4-bromophenyl phenyl ether	426	1	ND	ND	ND ND		SEC
42.	bis(2-chloroisopropyl)ether	426	1	ND	ND	ND ND		Ĥ Ⅰ ✓
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	*	*	* *		

PRIMARY BERYLLIUM SAMPLING DATA PROCESS WATER RAW WASTEWATER

Pollutant	Stream	Sample	Concentrations (mg/1)					
<u></u>	Lode	Typet	Source	Day 1	Day 2	Day 3		
Toxic Pollutants (Continued)								
46. methyl bromide (bromomethar	ne) 426	1	ND	*	*			
47. bromoform (tribromomethane)	426	1	**	*	0.130			
48. dichlorobromomethane	426	1	*	0.021	0.077			
49. trichlorofluoromethane	426	1	ND	ND				
50. dichlorodifluoromethane	426	1	ND	ND	ND	•		
51. chlorodibromomethane	426	1	*	0.080	ND 0.288 0.139			
52. hexachlorobutadiene	426	1	ND	ND	ND ND			
53. hexachlorocyclopentadiene	426	1	ND	ND	ND ND			
54. isophorone	426	1	ND	ND				

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PRIMARY BERYLLIUM SUBCATEGORY

PRIMARY BERYLLIUM SAMPLING DATA PROCESS WATER RAW WASTEWATER

		Stream	Sample	Concentrations (mg/1)				
	Pollutant	Code	Typet	Source	Day 1	Day 2	<u>Day 3</u>	
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		

PRIMARY BERYLLIUM SUBCATEGORY SECT -

PRIMARY BERYLLIUM SAMPLING DATA PROCESS WATER RAW WASTEWATER

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Pollutant		Stream	Sample	Concentrations (mg/l)				
Toxi	c Pollutants (Continued)		турет	Source	Day 1	Day 2	Day 3	
64.	pentachlorophenol	426	1	ND	ND			
65.	phenol	426	1	ND	ND	ND ND ND	· · · · · · · · · · ·	
66.	bis(2-ethylhexyl) phthalate	426	1	0.024	*	*		
67.	butyl benzyl phthalate	426	1	*	*	*		
68.	di-n-butyl phthalate	426	1	0.157	0.034	0.134 ND	s ⁷	
69.	di-n-octyl phthalate	426	1	*	ND	ND		
70.	diethyl phthalate	426	1	0.076	*	ND 0.270		
71.	dimethyl phthalate	426	1	ND	*	ND *		
72.	benzo(a)anthracene	426	1	*	ND		i	

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PRIMARY BERYLLIUM SUBCATEGORY SECT

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PRIMARY BERYLLIUM SAMPLING DATA PROCESS WATER RAW WASTEWATER

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	Pollutant	Stream Code	Sample Typet	Concer Soúrce	Day 1	(mg/1) Day 2	Day 3	MARY
Toxic	Pollutants (Continued)							BEF
73.	benzo(a)pyrene	426	1	*	ND	ND ND		UTTTA
74.	benzo(b)fluoranthene	426	1	0.016	ND	ND *		IM' SUE
75.	benzo(k)fluoranthane	426	1	0.011	ND	ND *		CATEC
76.	chrysene	426	1	0.017	ND	ND ND		ORY
77.	acenaphthylene	426	1	ND	ND	*		SEC
78.	anthracene (a)	426	1	ND	*	*		Т - - V
79.	benzo(ghi)perylene	426	1 • • •	ND	ND	ND *		
80.	fluorene	426	. 1	ND	*	*		
81.	phenanthrene (a)	426	1	ND	*	*	÷. ·	

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PRIMARY BERYLLIUM SAMPLING DATA PROCESS WATER RAW WASTEWATER

· ·		Stream	Sample	Con	centratio	ns (mg/l)		PRIN
	Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	IAR
Toxi	c Pollutants (Continued)							н
82.	dibenzo(a,h)anthracene	426	1	ND	ND	ND ND	4 .	ERYLL
83.	indeno (1,2,3-c,d)pyrene	426		ND	ND	ND		TUM
						ND	and and a second se	JS
84.	pyrene	426	1	*	ND	ND *		IBCATI
85.	tetrachloroethylene	426	1	*	0.184	0.474 0.481		IGORY
86.	toluene	426	1	0.085	0.029	0.085 0.065		E S
87.	trichloroethylene	426	1	*	0.017	0.015		CH I
88.	vinyl chloride (chloroethylene)	426	1	ND	*	*	•	4
• • •						*		:
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	

PRIMARY BERYLLIUM SAMPLING DATA PROCESS WATER RAW WASTEWATER

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	Pollutant	Stream Code	Sample Typet	Conc Source	entration Day 1	s (mg/1) Day 2	Day 3	RIMARY
Toxic	Pollutants (Continued)							BE
117.	beryllium	426	1 QC	<0.001	230	86 84	36	RYLLI
118.	cadmium	426	1 QC	<0.004	0.047	0.007 0.005	0.023	JM SUE
119.	chromium (total)	426	1 QC	0.017	0.11	0.058 0.059	0.090	3CATEG
120.	copper	426	1 QC	0.47	1.6	1.2	1.5	ORY
121.	cyanide (total)	426	1			32.6**		ល
122.	lead	426	1 QC	<0.16	<0.16	<0.168 <0.168	<0.16	ECT -
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	

PRIMARY BERYLLIUM SAMPLING DATA PROCESS WATER RAW WASTEWATER

Pollutant	Stream Code	Sample Typet	Concentrat Source Day	ions (mg/l) 1 Day 2) Day 3
Toxic Pollutants (Continued)	÷	,		······	
126. silver	426	1 QC	<0.0005 <0.00	0.006	<0.0005
127. thallium	426	1	<0.002 ~~<0.00	2 - <0.002	<0.002
128. zinc	426	QC 1 QC	0.018 0.10	<0.002 0.047 0.041	0.091 b
Nonconventional Pollutants	· · · ·	•		0.011	лтно Тно
acidity	426	1 QC	<1 <1	<1 <1	<1
alkalinity	426	1 QC	311 1,300	1,400 1 1,270	,560 K
aluminum	426	1 QC	<0.100 26	18 19	16 I
ammonia nitrogen	426	1		4,300**	
barium	426	1 QC	0.20 3.3	2.0 3.6	2.3
boron	426	1 QC	<0.018 53	44 39	37

PRIMARY BERYLLIUM SUBCATEGORY

PRIMARY BERYLLIUM SAMPLING DATA PROCESS WATER RAW WASTEWATER

	Stream	Sample	Concentrations (mg/1)				
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	IARY
Nonconventional Pollutants (Continue	ed)						Z BE
calcium	426	1 QC	57	<0.090	0.44 0.97	4.0	RYLLI
chemical oxygen demand (COD)	426	1 QC	<1	55 1 1	,600 1, ,600	990	UM SU
chloride	426	1 QC	95	66	<1 <1	<1	IBCATE
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	SE
iron	426	1 QC	1.4	3.6	4.2 3.6	3.9	CT I
magnesium	426	1 QC	36	1.1	0.19 0.29	2.5	V
manganese	426	1 QC	0.013	0.065	0.036 0.030	0.083	
molybdenum	426	1 QC	0.005	0.092	0.013	0.068	

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PRIMARY BERYLLIUM SAMPLING DATA PROCESS WATER RAW WASTEWATER

Pollutant	Stream Code	Sample Typet	Co Source	ncentrat: Day	ions (mg/1) Day 2	Day 3	
Nonconventional Pollutants (Continued	I)			-		<u>_</u>	- 471 171
phosphate	426	1 QC	<0.732	17.	6.6 6.0	9.2	DEVIT
sodium	- 426		- 17	56	41		
		QC			40		III.
sulfate	426	1 1 QC	1,400	130	100 100	83	SUBCA
tin	426	1 QC	<0.12	<0.12	<0.12 <0.12	<0.12	NOPEL
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	, 200	98 129	570	
vanadium	426	1 QC	<0.006	0.22	<0.006 <0.006	0.10	

PRIMARY BERYLLIUM SAMPLING DATA PROCESS WATER RAW WASTEWATER

Pollutant	Stream Code	Sample Typet	Conc Source	entration Day 1	ns (mg/1) Day 2	Day 3	PRIMAR!
Nonconventional Pollutants (Continued) yttrium	426	1 QC	<0.001	<0.001	<0.001 <0.001	<0.001	Y BERYLLI
Conventional Pollutants	,						ШU
oil and grease	426	1 . QC		<1	5.2 7.9	15	SUBC
total suspended solids (TSS)	426	1 QC	4	34	<1 <1	4	A'I'EGO
pH (standard units)	426	1 QC	6.84	7.94	8.09 7.99	7.83	RY

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.

アドログ SUBCATEGORY SECT

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Table V-14

PRIMARY BERYLLIUM SAMPLING DATA PEBBLE PLANT AREA VENT SCRUBBER RAW WASTEWATER

• •	Pollutont	Stream	Sample	Concentrations (mg/l)			
	rorracant	Code	Typet	Source Day	<u>1 Day 2 Day 3</u>		
Toxi	e Pollutants						
114.	antimony	473	1 QC	<0.003	<0.003 <0.003		
1 -1 5	-arsenic-	473	1 QC	<0.003	0.042 0.060		
117.	beryllium	473	1 QC	<0.001	210 210		
118.	cadmium	473	1 QC	<0.004	0.033 0.034		
119.	chromium (total)	473	1 QC	0.017	0.14 0.093		
120.	copper	473	1 QC	0.47	0.58 0.50		
122.	lead	473	1 QC	<0.16	<0.168 <0.168		
123.	mercury	473	1 QC	<0.0002	0.0004 0.0003		

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PRIMARY BERYLLIUM SUBCATEGORY SECT -

PRIMARY BERYLLIUM SAMPLING DATA PEBBLE PLANT AREA VENT SCRUBBER RAW WASTEWATER

	Stream	Sample	Concentrations (mg/l)			
Pollutant	Code	Typet	Source Day	1 Day 2 Day 3	3	
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		

3692

PRIMARY BERYLLIUM SUBCATEGORY

SECT -

PRIMARY BERYLLIUM SAMPLING DATA PEBBLE PLANT AREA VENT SCRUBBER RAW WASTEWATER

Dollars	Stream	Sample	Conce	ntrations (mg/l)	
Pollutant	Code	Typet	Source	Day 1 Day 2 Da	iy 3
Nonconventional Pollutants (Continued)		· · ·		
ammonia nitrogen	473	1 QC	6.6	<0.02 <0.02	
barium	473	1 QC	0.20	21 24	
boron	473	1 QC	<0.018	57 62	
calcium	473	1 QC	57	4.5 4.9	
chemical oxygen demand (COD)	473	1 QC	< 1	1,930 1,900	
chloride	473	1 QC	95	61 36	E F
cobalt	473	1 QC	<0.012	0.074 0.035	~
fluoride	473	1 QC	0.81	6,650 6,350	

3693

PRIMARY BERYLLIUM SUBCATEGORY

SECT 1

PRIMARY BERYLLIUM SAMPLING DATA PEBBLE PLANT AREA VENT SCRUBBER RAW WASTEWATER

Pollutant	Stream Code	Sample Typet	Conce Source	entrations (mg/l) Day 1 Day 2 Day 3
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 QC	1,400	140 150
tin	473	1 QC	<0.12	<0.12 <0.12
titanium	473	1 QC	0.73	1.6 1.4

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PRIMARY BERYLLIUM SUBCATEGORY SECT -

PRIMARY BERYLLIUM SAMPLING DATA PEBBLE PLANT AREA VENT SCRUBBER RAW WASTEWATER

Pollutant	Stream Code	Sample Typet	Conc Source	entrations (mg/l) Day 1 Day 2 Da	ay 3
Nonconventional Pollutants (Continued	1)	•			
total dissolved solids (TDS)	473	1 QC	550	3,910 3,500	
total_organic_carbon (TOC)			<pre></pre>		
total solids (TS)	473	1 QC	550	3,900 3,700	
vanadium	473	1 QC	<0.006	0.12 0.011	
yttrium	473	1 QC	<0.001	<0.001 <0.001	C
Conventional Pollutants					1 (
oil and grease	473	1 QC	<1	<1 8	<
total suspended solids (TSS)	473	1 QC	4	5 23	
pH (standard units)	473	1 QC	6.84	5.41 5.43	

tSample Type Code: 1 - One-time grab

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PRIMARY BERY M SUBCATEG ORV. ゴ

Table V-15

PRIMARY BERYLLIUM SAMPLING DATA CHIP TREATMENT RAW WASTEWATER

	Pollutant	Stream Code	Sample Type†	Conce Source	entrations Day 1	s (mg/1) Day 2	Day 3	PRIMARY
<u>Toxic</u>	Pollutants							7 BI
114.	antimony	495	1	<0.003			<0.003	IRYI
115.	arsenic	495	1	<0.003			<0.003	LTI.
117.	beryllium	495	• • • • • • • •	<0.001		· · · 3,	300	. ຊ ຊ
118.	cadmium	495	1	<0.004	·		0.063	UBC
119.	chromium (total)	495	1.	0.017			7.4	ATEG
120.	copper	495	1	0.47			1.4	;ORY
122.	lead	495	1	<0.16			0.20	
123.	mercury	495	1	<0.0002	•		<0.0002	SEC
124.	nickel	495	1	<0.006		. *	0.78	н Г
125.	selenium	495	1	<0.003			<0.003	4
126.	silver	495	1	<0.0005			0.040	
127.	thallium	495	1	<0.002			<0.002	•
128.	zinc	495	1	0.018		•	7.2	
• = = •								

PRIMARY BERYLLIUM SAMPLING DATA CHIP TREATMENT RAW WASTEWATER

Dollar and	Stream	Sample	Concentrations (mg/l)			
Pollutant	Code	Typet	Source	Day 1 I	Day 2 Day 3	
Nonconventional Pollutants		н — н - н - н				
acidity	495	1	<1		6,300	
alkalinity	495	_ 1 (311		<1	
aluminum	495	1	<0.100		110	
ammonia nitrogen	495	. 1	6.6		<0.02	
barium	495	1	0.20		0.068	
boron	495	1	<0.18	· · · · · · · · · · · · · · · · · · ·	2.3	
calcium	495	1	57		8.8	
chemical oxygen demand (COD)	495	1	<1	· · · ·	300 ¥	
chloride	495	1	95		170	
cobalt	495	1	<0.012		0.10	
fluoride	495	1	0.81	an trainin An trainin An trainin An trainin	2,500	
iron	495	1	1.4		87	
magnesium	495	i e 1	36	• •	37	

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PRIMARY BERYLLIUM SAMPLING DATA CHIP TREATMENT RAW WASTEWATER

	Stream	Sample	e Concentrations (mg/l)				
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	
Nonconventional Pollutants (Continued))						
manganese	495	1	0.013			9.9	
molybdenum	495 -	. 1	0.005			0.44	
phosphate	495	1	<0.732			18	
sodium	495	1	17		-	51	
sulfate	495	1	1,400			73	
tin	495	. 1	<0.12			<0.12	
titanium	495	1	0.73			3.9	
total dissolved solids (TDS)	495	1	550		34	,000	
total organic carbon (TOC)	495	1	<1			170	
total solids (TS)	495	1 ·	550		35	,000	
vanadium	495	1	<0.006			0.35	
yttrium	495	1	<0.001			<0.001	

PRIMARY BERYLLIUM SUBCATEGORY SECT -

PRIMARY BERYLLIUM SAMPLING DATA CHIP TREATMENT RAW WASTEWATER

D-11	Stream	Sample	Conc	entration	ns (mg/l)	
Pollutant	Code	<u>Typet</u>	Source	Day 1	Day 2	Day
Conventional Pollutants						. · · · ·
oil and grease	495	. 1	<1			35
otal suspended solids (TSS)	495	1	4			370
oH (standard units)	495	. 1	6.84	•		0.97
				•		
	· ·					

SECT

3699

tSample Type Code: 1 - One-time grab

Table V-16

PRIMARY BERYLLIUM SAMPLING DATA TRIANGULAR LAGOON EFFLUENT

		Stream	Sample	Concentrations (mg/1)				
	Pollutant	Code	Typet	Source	Day 1	Day 2	<u>Day 3</u>	
Toxic	Pollutants						2 F	
114.	antimony	477	2 QC	<0.003	<0.003	<0.003 <0.003	<0.003	
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	
118.	cadmium	477	2 QC	<0.004	0.027	<0.004 <0.004	0.009	
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	
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	

3700

BERYLLIUM SUBCATEGORY

PRIMARY BERYLLIUM SAMPLING DATA TRIANGULAR LAGOON EFFLUENT

Pollutant	Stream	Sample	Con	centratio	ons (mg/l)		
rollucane	Code	Typet	Source	Day 1	Day 2	Day 3	
Toxic Pollutants (Continued)			· · · · ·				
124. nickel	477	2 QC	<0.006	0.26	0.015	0.65	
125. selenium	477	2	<0.003	<0.003	<0.003	<0.003	1 1 2
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	T EOOF
128. zinc	477	2 QC	0.018	0.42	0.11 0.052	0.51	- H
Nonconventional Pollutants	·		-	- · ·			0 1 0
acidity	477	2 QC	<1	<1	<1 <1	<1	+ - <
alkalinity	477	2 QC	- 311 1 1 1 1	263	600 600	240	
aluminum	477	2 QC	<0.100	5.0	0.44 0.71	4.1	

PRIMARY BERYLLIUM SAMPLING DATA TRIANGULAR LAGOON EFFLUENT

	Stream	Sample	Concentrations (mg/1)				
Pollutant	Code	Typet	Source	Day 1	<u>Day 2</u>	Day 3	
Nonconventional Pollutants (Continued))						
ammonia nitrogen	477	2 QC	6.6	13.4	6.9 9.1	<0.02	
barium	477	2 .QC	0.20	0.28	0.21 0.25	0.33	
boron	477	2 QC	<0.018	1.5	0.99 1.2	0.90	
calcium	477	2 QC	57	40	22 22	66	
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	4,500	

3702

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PRIMARY BERYLLIUM SAMPLING DATA TRIANGULAR LAGOON EFFLUENT

<u>Pollutant</u>	n Server and Server	Stream Code	Sample Typet	Co Source	ncentrati Day 1	ons (mg/1) Day 2	Day-3	7 7 7 7
Nonconventional Pollutants	(Continued)							77777
iron	· · · · · · · · · · · · · · · · · · ·	477	2 QC	1.4	1.7	0.83 0.87	2.5	
magnesium	· · · · · · · · · · · · · · · · · · ·	477	2 -QC	36	32	4.0 5.2	38	
manganese		477	2 QC	0.013	0.094	0.045 0.035	0.11	י שטמטני
molybdenum		477	2 QC	0.005	0.095	0.024 0.029	0.031	чтьсон
phosphate		477	2 QC	<0.732	480	3.8 4.4	170	Ê
sodium		477	2 QC	17	2,500 2 2	,100 2 ,000	,300	TOTS
sulfate		477	2 QC	1,400	7,000 3 3	,900 4 ,900	,300	
tin	5	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	

PRIMARY BERYLLIUM SAMPLING DATA TRIANGULAR LAGOON EFFLUENT

	Stream	Sample	Concentrations (mg/1)				
Pollutant	Code	<u>Type†</u>	Source	<u>Day 1</u>	Day 2	Day 3	MAR
Nonconventional Pollutants (Continued)							В К
total dissolved solids (TDS)	477	2 QC	550 12	,000 10, 10,	,000 14 ,000	,000	ERYLI
total organic carbon (TOC)	477	2 QC	<1	45	19 19	19	TUW S
total solids (TS)	477	2 QC	550 12	,000 11 · - 11	000 15	,000	SUBCAI
vanadium	477	2 QC	<0.006	0.15	<0.006 <0.006	<0.006	TEGORY
yttrium	477	2 QC	<0.001	<0.006	<0.001 <0.001	<0.001	N
Conventional Pollutants		· · ·	х				IC T
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	
†Sample Type Code: 1 - One-time grab			· · · ·		ion		

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

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> SECT 1

Table V-17

PRIMARY BERYLLIUM SAMPLING DATA NUMBER 6 LAGOON EFFLUENT

	Pollutant	Stream Code	Sample Typet	Conc	centratio	ns (mg/l)		רעב
Toxic	Pollutants		<u></u>	Dource	Day I	<u>Day z</u>	Day 3	
1.	acenaphthene	427	6	ND	ND	ND	ND	
2.	acrolein	427	1	ND	ND			
3.	acrylonitrile	427	1	* *	*	*	MD 	
4.	benzene	427	1	*	*	0.011	0.014	н ОС
5.	benzidine	427	6	ND	ND	ND	ND	נאטם
6.	carbon tetrachloride	427	· 1	*	*	*	*	- 10 00
7.	chlorobenzene	427	1	*	*	*	*	л Л
8.	1,2,4-trichlorobenzene	427	6	ND	ND	ND	ND	ت
9.	hexachlorobenzene	427	6	ND	ND	ND	ND	ECT
10.	1,2-dichloroethane	427	1	*	*	*	*	` I <
11.	1,1,1-trichloroethane	427	1	*	*	*	*	
12.	hexachloroethane	427	6	ND	ND	*	*	
13.	1,1-dichloroethane	427	1	*	*	*	*	
14.	1,1,2-trichloroethane	427	1	*	*	*	*	

PRIMARY BERYLLIUM SAMPLING DATA NUMBER 6 LAGOON EFFLUENT

	Pollutant	Stream Code	Sample Typet	Conce Source	entration Day 1	s (mg/1) Day 2	Day 3	PRIMAE
Toxic	Pollutants (Continued)							Т Д2
15.	1,1,2,2-tetrachloroethane	427	1	*	*	*	*	3ERY
16.	chloroethane	427	1	ND	ND	ND	ND	LLI
17.	bis(chloromethyl)ether	427	1	ND	ND	ND	ND	UM
18.	bis(2-chloroethyl)ether	427	··· 6	ND	ND	ND	ND	SUBC
19.	2-chloroethyl vinyl ether	427	1	*	*	*	*	ATE
20.	2-chlorónaphthalene	427	6	ND	ND	ND	ND	GOR
21.	2,4,6-trichlorophenol	427	6	ND	ND	ND	ND	к
22.	p-chloro-m-cresol	427	6	ND	*	ND	ND	SE
23.	chloroform	427	1	*	*	*	*	CI
24.	2-chlorophenol	427	6	ND	ND	ND	ND	۲ ۲
27.	1 2-dichlorobenzene	427	6	ND	ND	ND	ND	
25.	1.3-dichlorobenzene	427	6	ND	ND	ND	ND	
20.	1, 4 dichlorobenzene	427	6	ND	ND	ND	ND	
27:	3,3'-dichlorobenzidine	427	6	ND	ND	ND	ND	
PRIMARY BERYLLIUM SAMPLING DATA NUMBER 6 LAGOON EFFLUENT

Pollutant	Stream Code	Sample Typet	Con Source	ncentrati Day 1	ons (mg/l) Day 2	Day 3	
Toxic Pollutants (Continued)		- -	•		· · · ·	н. н. С	МАК
29. 1,1-dichloroethylene	427	1	*	*	*	*	ц Ч
30. 1,2-trans-dichloroethylene	427	1	*	*	*	*	SRYL
31. 2,4-dichlorophenol	427	6	ND		• • • • • • • • • • • • • • • • • • •	ND.	L L U L L
32. 1,2-dichloropropane	427	1	*	*	*	*	NS M
33. 1,3-dichloropropene	427	1	. *	×	*	*	JBCA
34. 2,4-dimethylphenol	427	6	ND	ND	ND	ND	TEG
35. 2,4-dinitrotoluene	427	6	ND	ND	ND	ND	ORY
36. 2,6-dinitrotoluene	427	6	*	*	*	*	
37. 1,2-diphenylhydrazine	427	6	*	ND	*	ND	SEC.
38. ethylbenzene	427	1	*	*	*	*	Ч
39. fluoranthene	427	6	*	ND	ND	ND	4
40. 4-chlorophenyl phenyl ether	427	6	ND	ND	ND		
41. 4-bromophenyl phenyl ether	427	6	ND	ND			
42. bis(2-chloroisopropyl)ether	427	6	ND	ND	*	ND	

PRIMARY BERYLLIUM SAMPLING DATA NUMBER 6 LAGOON EFFLUENT

	Pollutant	Stream Code	Sample Type†	Con Source	centration Day 1	ns (mg/1) Day 2	Day 3	PRIMA
Toxic	Pollutants (Continued)							RY I
43.	bis(2-chloroethoxy)methane	427	6	*	*	*	*	BERY
44.	methylene chloride	427	1 .	*	*	*	*	TTT
45.	methyl chloride (chloromethane)	427	1	*	*	*	*	UM
46.	methyl bromide (bromomethane)	- 427 -	1 -	·· ND - ·	- · · ND · ··	ND -	ND .	SUBC
47.	bromoform (tribromomethane)	427	1	*	*	*	*	ATE
48.	dichlorobromomethane	427	1	*	*	*	*	GOR
49.	trichlorofluoromethane	427	1	ND	ND	ND	ND	қ
50.	dichlorodifluoromethane	427	1	ND	ND	ND	ND	л Б
51:	chlorodibromomethane	427	. 1	*	ND	ND	*.	CH
52.	hexachlorobutadiene	427	6	ND	ND	ND	ND	י ג
53	hexachlorocyclopentadiene	427	6	ND	ND	ND	ND	
5%	isophorone	427	6	ND	ND	ND	ND	
54.	nanhthalana	427	6	*	ND	*	*	
55.	naphunatene	· · · ·	<u> </u>	ND	ND	*	*	-
56.	nitrobenzene	441	v	112				

SUBCATEGORY SECT -

PRIMARY BERYLLIUM SAMPLING DATA NUMBER 6 LAGOON EFFLUENT

	<u>Pollutant</u>	Stream Code	Sample Typet	Conce Source	entration Day 1	<u>s (mg/l)</u> 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			N-D	ND	N-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

PRIMARY BERYLLIUM SAMPLING DATA NUMBER 6 LAGOON EFFLUENT

		Stream	Sample	Concentrations (mg/1)				
	Pollutant	Code	Typet	Source	Day 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	N D	
73.	benzo(a)pyrene	427	6	*	ND	ŅD	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	*	*	
70.	henzo(ghi)pervlene	427	6	ND	ND	ND	ND	
90	fluorene	427	6	ND	ND	ND	ND	
30.	rhonenthrono (a)	427	6	ND	ND	*	*	
81.	diberge (e, b) enthragene	427	6	ND	ND	ND	ND	
82.	dibenzo(a, n) antinacene	427	6	ND	ND	ND	ND	
83.	indeno (1,2,3-c,d)pyrene	441	6	*	ND	ND .	ND	
84.	pyrene	4Z/	O		Rυ	1112		

PRIMARY BERYLLIUM SUBCATEGORY SECT

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PRIMARY BERYLLIUM SAMPLING DATA NUMBER 6 LAGOON EFFLUENT

Pollutant		Stream	Sample	Concentrations (mg/l)				
·	Torrucant	Lode	Typet	Source	Day 1	Day 2	Day 3	7147
Toxi	c Pollutants (Continued)				·			τ'λι
85.	tetrachloroethylene	427	ана ана 1, ма	*	*	*	*	מחמ
86.	toluene	427	1	0.085	*	*	*	ТТХУ
87.	trichloroethylene	427		*****		*	*	IND T'
88.	vinyl chloride (chloroethylene)	427	1	ND	ND	ND	*	ROS
114.	antimony	427	6	<0.003	<0.003	<0.003	<0.003	CATI
115.	arsenic	427	6	<0.003	<0.003	<0.003	<0.003	<u> </u>
117.	beryllium	427	6	<0.001	0.029	0.27	0.024	ĸ
118.	cadmium	427	6	<0.004	0.005	<0.004	<0.004	N N
119.	chromium (total)	427	. 6 .	0.017	0.013	0.047	0.034	ĊĦ
120.	copper	427	6	0.47	0.75	0.59	0.38	ו ל
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	

PRIMARY BERYLLIUM SAMPLING DATA NUMBER 6 LAGOON EFFLUENT

	Stream	Sample	Concentrations (mg/1)					
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	LIMAI	
Toxic Pollutants (Continued)							ЯĶ	
125. selenium	427	6	<0.003	<0.003	<0.003	<0.003	BER	
126. silver	427	6	<0,0005	0.017	0.011	0.019	YLL:	
127. thallium	427	6	<0.002	<0.002	<0.002	<0.002	LUM	
128. zinc	427	. 6 .	- 0.018-	0.006	.0.048	0.019	SUBC	
Nonconventional Pollutants				· ·	•		ATE	
acidity	427	6	<1	<1	<1	<1	GOR	
alkalinity	427	6	311	92	80	82	К	
aluminum	427	6	<0.100	0.28	<0.100	<0.100	IS	
ammonia nitrogen	427	6	6.6	8.9	<0.02	210	ICT.	
ammonia merogen	427	6	0.20	0.15	0.27	0.23	י ע	
Darrum	427	6	<0.018	1.2	1.7	1.7		
boron	427	6	57	140	97	120		
calcium		6	<1	31	47	25		
chemical oxygen demand (COD)	427	Ŭ	05	510	830	810		
chloride	427	0	. 90	510	030	5.5		

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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		-6	1.4 1.4 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	<0.732 2.8 1.7 2.6
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 < 0.12
titanium	427	6	0.73 0.78 0.70 <0.010
total dissolved solids (TDS)	427	6	550 10.000 9.300 210
total organic carbon (TOC)	427	6	<1 12 18 12
total solids (TS)	427	6	550 11,000 9,800 300

PRIMARY BERYLLIUM SAMPLING DATA NUMBER 6 LAGOON EFFLUENT

Pollutant	Stream Code	Sample Typet	Conc Source	centration Day 1	ns (mg/1) Day 2	Day 3	PRIMARY
Nonconventional Pollutants (Continued))						BER
vanadium	427	6	<0.006	<0.006	<0.006	<0.006	UTT
yttrium	427	6	<0.001	<0.001	<0.001	<0.001	,IUM \$
Conventional Pollutants	· · · ·						EDS
oil and grease	427	1	<1	<1	<1	5	CAT
total suspended solids (TSS)	427	6	4	23	22	34	EGOI
pH (standard units)	427	6	6.84	8.63	8.25	8.29	RY

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

*Less than or equal to 0.010 mg/l.

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Table V-18

PRIMARY BERYLLIUM SAMPLING DATA LIME TANK EFFLUENT

	Pollutant	Stream Code	Sample Typet	Con Source	centration	ns $(mg/1)$	Dext 2	PRTI
Toxic	Pollutants				249 1	<u>Day Z</u>	Day 5	MARY
114.	antimony	487	1	<0.003	<0.003	<0.003	<0.003	BEF
115.	arsenic	487	1	<0.003	0.47	0.33	<0.003	TTA?
117.	beryllium	487	1·	<0.001	-240	100	550	TUM
118.	cadmium	487	1	<0.004	0.13	0.032	0.23	SUB
119.	chromium (total)	487	1	0.017	8.4	2.0	13	CATE
120.	copper	487	1 · · · · ·	0.47	2.5	13	7.7	GOR
121.	cyanide (total)	487	1	0.12	11	21	<0.02	К
122.	lead	487	1	<0.16	1.1	0.54	2.3	N N
123.	mercury	487	1	<0.0002	<0.0002	<0.0002	<0.0002	G
124.	nickel	487	1	<0.006	<0.300	0.50	3.9	4
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	<0.002	<0.002	<0.002	<0.002	
128.	zinc	487	1	0.018	2.6	0.93	4.1	

PRIMARY BERYLLIUM SAMPLING DATA LIME TANK EFFLUENT

Pollutant	Stream Code	Sample Typet	Concentrations (mg/1) Source Day 1 Day 2 Day 3
Nonconventional Pollutants			н ġ
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

PRIMARY BERYLLIUM SAMPLING DATA LIME TANK EFFLUENT

Pollutant	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	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 ⁶
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

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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

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Table V-19

PRIMARY BERYLLIUM SAMPLING DATA STRIPPER EFFLUENT

	Pollutant	• •	Stream	Sample	Con	centratio	ns (mg/l)		۲ با
	Iollucant		<u>Code</u>	Typet	Source	Day 1	Day 2	Day 3	Th
Toxic	<u>e Pollutants</u>						· · · · · · · · · · · · · · · · · · ·	· · · ·	АКХ
, <mark>114.</mark>	antimony	· ·	488	1	<0.003	<0.003	<0.003	<0.003	
115.	arsenic		488	1	<0.003	0.53	<0.003	0.15	7 X X Y Y
117.	beryllium		488		<0-1	-340	39	480	MOT'
118.	cadmium		488	1	<0.004	0.18	0.014	0.019	SUE
119.	chromium (total)		488	1	0.017	11	0.91	0.33	CAT
120.	copper		488	1	0.47	3.2	5.7	4.5	EGOI
121.	cyanide (total)		488	1	0.12	4.2	2.4	<0.02	Ϋ́
122.	lead		488	1	<0.16	1.8	0.19	0.20	S
123.	mercury	· · ·	488	1	<0.0002	<0.0002	<0.0002	<0.0002	ECH
124.	nickel		488	1	<0.006	<0.006	0.34	0.15	י ל
125.	selenium		488	. 1	<0.003	<0.003	<0.003	<0.003	
126.	silver		488	1,	<0.0005	0.15	0.025	0.013	
127.	thallium		488	· 1	<0.002	<0.002	<0.002	<0.002	
128.	zinc		488	1	0.018	4.0	0.63	0.41	

PRIMARY BERYLLIUM SAMPLING DATA STRIPPER EFFLUENT

Pollutant	Stream Code	Sample Typet	Co Source	oncentrati Day 1	ons (mg/l Day 2) 	PRIMARY
Nonconventional Pollutants							B
acidity	488	1	<1	<1	<1	<1	ERY
alkalinity	488	1	311	9,900	6,000	25	LLI
aluminum	488		<0.100	<0.100) 32	43	UM 2
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	30RY
calcium	488	1	57	16,000	7,300	7,500	•
chemical oxygen demand (COD)	488	1	< 1	<1	1,300	1,320	SEC
chloride	488	1	95	130	<1	1,700	́Н і
cobalt	488	.1	<0.012	0.21	0.067	0.051	4
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	

PRIMARY BERYLLIUM SAMPLING DATA STRIPPER EFFLUENT

Pollutant	Stream <u>Code</u>	Sample Typet	Concen Source	trations (mg Day 1 Day	$\frac{g}{1}$
Nonconventional Pollutants (Continued)				·	<u></u>
manganese	488	1	0.013	8.1 1.2	2 0.62
molybdenum	488	1	0.005	0.39 0.0	073 0.11
phosphate	488		<0.732 5	6 2.1	<0.732
sodium	488	1	17 70	0 220	510
sulfate	488	1 1	,400 15,00	0 1,000	420
tin	488	1	<0.12 <	0.12 <0.1	2 <0.12
titanium	488	n (1 , 1 ¹)	0.73 1	2 2.5	3.2
total dissolved solids (TDS)	488	1	550 13,000	0 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 0.2	3 0.21
yttrium	488	1	<0.001 <0	.001 <0.00	01 <0.001

PRIMARY BERYLLIUM SAMPLING DATA STRIPPER EFFLUENT

Pollutant	Stream Code	Sample Typet	Con Source	ncentrati Day 1	ions (mg/1) Day 2	Day 3	PRIMAR
Conventional Pollutants							к h
oil and grease	488	1	<1	11	<1	18	3EKY
total suspended solids (TSS)	488	1	4 15	0,000	12,000	68	
pH (standard units)	488	1	6.84	8.61	7.85	9.09) M U

tSample Type Code: 1 - One-time grab

MARY BERYLLIUM SUBCATEGORY

Table V-20

PRIMARY BERYLLIUM SAMPLING DATA NUMBER 5 LAGOON

	Pollutant			Stream	Sample	Con	centration	s (mg/1)	1 2
-	TOTTULANC			Code	Type†	Source	Day 1	Day 2	Day 3
Toxi	c Pollutants					· · · · · · · · · · · · · · · · · · ·			· .
114.	antimony	÷. т		480	1	<0.003	<0.003		
115.	arsenic			480	1	<0.003	<0.003		
	beryllium	· · ·		-480-	······································	<0.001	0.74		
118.	cadmium	· · ·	•	480	1	<0.004	<0.004		
119.	chromium (total)			480	1	0.017	0.043		
120.	copper	-		480	1	0.47	0.17		
121.	cyanide (total)			480	1	0.12	. ¹ -		
122.	lead		•	480	1	<0.16	<0.168		
123.	mercury		r 1	480	1 · · ·	<0.0002	<0.0002		
124.	nickel	•		480	1	<0.006	0.11		
125.	selenium	а 1		480	1	<0.003	<0.003	- -	
126.	silver		· · · · ·	480	1	<0.0005	0.093		٤
127.	thallium			480	1	<0.002	<0.003		
128.	zinc			480	1 1	0.018	0.034		

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PRIMARY BERYLLIUM SAMPLING DATA NUMBER 5 LAGOON

	Stream	Sample	Con	centration	<u>s (mg/l)</u>	
Pollutant	Code	Typet	Source	Day 1	<u>Day 2</u>	Day 3
Nonconventional Pollutants		ŗ				
acidity	480	. 1	<1	<1		
alkalinity	480	1	311	180		
aluminum	4 8 0	1	<0.100	0.19	· · · · · · · · ·	
ammonia nitrogen	480	1	6.6	53		-
barium	480	1 .	0.20	0.22		
boron	480	1	<0.018	1.5		
calcium	480	1	57	100		
chemical oxygen demand (COD)	480	. 1	<1	31		
chloride	48 0	1	95	570	5.	
aphalt	480	1	<0.012	0.024	•	•.
fluoride	480	1	0.81	43		
i ron	480	1	1.4	0.41		
	480	1	36	57		

PRIMARY BERYLLIUM SUBCATEGORY SECT

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PRIMARY BERYLLIUM SAMPLING DATA NUMBER 5 LAGOON

Pollutant	Stream Code	Sample Typet	Conce	entratio	ns (mg/1)	PR
Nonconventional Pollutants (Continued	 1)	<u>-79-1</u>	Dource	Day I	Day 2	Day 3 IMAR
manganese	480	1	0.013	0.059		Y BE
molybdenum	480	1	0.005	0.21		RYLI
phosphare	-480	1	<0.732	2.8	یس در می میں میں میں میں معرف المان کا م	L T UN
sodium	480	1	17 4,4	00	1	US 1
sulfate	480	1 1	,400 16,0	00		BCAJ
tin	480	1	<0.12	<0.12		ľΈGO
titanium	480	1	0.73	<0.010		ŔŸ
total dissolved solids (TDS)	480	1	550 19.0	00	na serie de la caracteria. Notas de la caracteria de	70
total organic carbon (TOC)	480	1	<1	7.0)臣CT
total solids (TS)	480	1	550 20,0	00	**************************************	1
vanadium	480	1	<0.006	0.017		~
yttrium	480	1	<0.001	<0.001		•
				1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -		

PRIMARY BERYLLIUM SAMPLING DATA NUMBER 5 LAGOON

Pollutant	Stream Code	Sample Typet	Con Source	centration Day 1	ns (mg/1) Day 2	Day 3	PRIMARY
Conventional Pollutants							Ц
oil and grease	480	1	<1	<1			R K K F
total suspended solids (TSS)	480	1	4	54			μLU.
pH (standard units)	480	1	6.84	8.89			י ע כ

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tSample Type Code: 1 - One-time grab







Figure V-2

SAMPLING LOCATIONS AT BERYLLIUM PLANT A -BERYLLIUM METAL PRODUCTION AREA

PRIMARY BERYLLIUM SUBCATEGORY SECT - VI

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 the concentrations are above the 2.6 mg/l treatable of concentration. Most of the specific methods used to remove toxic so by converting these metals to precipitates, metals do and toxic-metal-containing precipitates should be these not discharged. Meeting a limitation on total suspended solids helps ensure that removal of these precipitated toxic metals has been For these reasons, total suspended solids effective. 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

PRIMARY BERYLLIUM SUBCATEGORY SECT - VI

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. 13. 15. 19.	1,2-dichloroethane 1,1-dichloroethane 1,1,2,2-tetrachloroethane 2-chloroethyl vinyl ether	
22.	p-chloro-m-cresol	
23.	chloroform	
29.	1,1-dichloroethylene	_
30.	1,2-trans-dichloroethylend	s
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	
L18.	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. Acrylonitrile 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 The treatable concentrations observed are wastewater samples. The Agency has no reason to 0.188, 0.207, and 0.617 mg/l. believe that treatable concentrations of benzene should be in primary beryllium wastewaters. The Agency believes present 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 identified treatment technology (0.010 mg/l) in achievable by The treatable three raw wastewater samples. of three out observed are 0.069, 0.161 and 0.164 mg/1. The concentrations 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.

PRIMARY BERYLLIUM SUBCATEGORY SECT - VI

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.

1,1-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 1,1-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. 1,1-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.

1,1-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 1,1-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. 1,1-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 0.133 The Agency has no reason to Believe that treatable mq/l. 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 analytical error or site specific factors. 1,2-Transdichloroethylene is therefore not selected for further 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 1,3dichloropropene 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

PRIMARY BERYLLIUM SUBCATEGORY SECT - VI

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 of three raw wastewater samples. The treatable three 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 representative and may be due to analytical error or site not 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 mq/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

PRIMARY BERYLLIUM SUBCATEGORY SECT - VI

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 split sample from the Agency's sampling visit which was а 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

•	<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	PRIMAR
1.	acenaphthene	0.010	0.010	1	3		a			R
2٠	acrolein	0.010	0.010	1	3		, 3			- Hert
3.	acrylonitrile	0.010	0.010	· · · ·	3	,				Ĕ
4.	benzene	0.010	0.010	1	3			1	. 3	, Y
5.	benzidine	0.010	0.010	1	3	· 3			3	」 い
6.	carbon tetrachloride	0.010	0.010	1	3	2		1	_	H
7.	chlorobenzene	0.010	0.010	1					3	_Ĥ
.8.	1,2,4-trichlorobenzene	0.010	0.010	1	3	้า	3			G
9.	hexachlorobenzene	0.010	0.010	1	ĩ	3	· · · · · · · · · · · · · · · · · · ·			i S
10.	1,2~dichlorobenzene	0.010	0.010	1	3	5	1 .			Ś
11.	1,1,1-trichlorobenzene	0.010	0.010	1	3		2	a de la companya de	- 2	ä
12.	hexachloroethane	0.010	0.010	1	3	1	2	1. State 1.		Ю
13.	1,1-dichloroethane	0.010	0.010	1	3	• •	2			5
14.	1,1,2-trichloroethane	0.010	0.010	1	3		ъ ·		3	ĥ
15.	1,1,2,2-tetrachloroethane	01010	0.010	1.	3		·) ,			H
16.	chloroethane	0.010	0.010	1	3	2 .	1			ନୁ
17.	bis(chloromethyl)ether	0.010	0.010	1	3	ĩ	•		P.,	읽
18.	bis(2-chloroethyl)ether	0.010	0.010	1	3	3		·	•	Я
19.	2-chloroethyl vinyl ether	0.010	0.010	1	3	5			,	•
20.	2-chloronaphthalene	0.010	0.010	1	· 3	3	1.5	1	3	
21.	2,4,6-trichlorophenol	0.010	0.010	1	3	3				
22.	parachlorometa cresol	0.010	0.010	1	3	1	· 1			Ŋ
23.	chloroform	0.010	0.010	1	3	• •	and the second second		1	Ē
24.	2-chlorophenol	0.010	0.010	1	3	่า		1	3	ദ
25.	1,2-dichlorobenzene	0.010	0.010	1	3	3				Ч
26.	1,3-dichlorobenzene	0.010	0.010	. 1	3	ĩ				1
27.	1,4-dichlorobenzene	0.010	0.010	1	3	3 .		•	1	
28.	3,3'-dichlorobenzidine	0.010	0.010	1	3	3	1	-		\leq
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	з		· ·		
32.	1,2-dichloropropane	0.010	0.010	1	3	•				
33.	1,3-dichloropropylene	0.010	0.010	1	3	3	1		3	
34.	2,4-dimethylphenol	0.010	0.010	1	3	3	•		2	
35.	2,4-dintrotoluene	0.010	0.010	1	. 3	3			4	
36.	2,6-dintrotoluene	0.010	0.010	1	š	.	· · · · · · · · · · · · · · · · · · ·		a the second second	
37.	1,2-diphenylhydrazine	0.010	0.010	1	. 3		3	1. A.		
18.	ethylbenzene	0.010	0.010	1	3		3	*		
59.	f Luorant.hene	0.010	0.010	1	3	2	1			

PRIMARY BERYLLIUM SUBCATEGORY SECT

FREQUENCY OF OCCURRENCE OF PRIORITY POLLUTANTS PRIMARY BERYLLIUM SUBCATEGORY RAW WASTEWATER

	<u>Pollutant</u>	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentra- tion (mg/1)(b)	Number of Streams Analyzed	Number of Samples Analyzed	ND	Detected Below Quantification Concentration	Below Treat- able Concen- tration	Above Treat- able Concen- tration
	t - 11	0.010	0.010	1	3	3			
40.	4-chlorophenyl phenyl ether	0.010	0.010	1	3	3			
41.	4-promophenyi phenyi ether	0.010	0.010	1	3	3			
42.	Dis(2-chiorothory)methane	0.010	0.010	1	3	2	1		3
43.	Dis(2-chioroechoxy/mechane	0.010	0.010	1	3				3
44.	methylene chloride	0.010	0.010	1	3		3		
45.	methyl bromide	0.010	0.010	1	3		3		· 2
40,	bromoform	0.010	0.010	1	3		1		3
47.	dichlorobromomethane	0.010	0.010	1	3	~			3
29.	trichlorofluoromethane	0.010	0.010	1	ť	د د			
50.	dichlorodifluoromethane	0.010	0.010	1. J.	3	.	x		· 3
51.	chlorodibromomethane	0.010	0.010	1	. 3	2	`	'n	-
52.	hexachlorobutadiene		0.010	·· · 1	5			· · ·	
53.	hexachlorocyclopentadiene	0.010	0.010	1	د د	Э			
54.	isophorone	0.010	0.010	1	3	5	. 3		-
55.	naphthalene	0.010	0.010	1	2	2	1		
56.	nitrobenzene	0.010	0.010	1	3	2	·. · ·		
57.	2-nitrophenol	0.010	0.010	. 1	3	ר ז			
58.	4-nitrophenol	0.010	0.010	1	· J	3			1 A.
59.	2,4-dinitrophenol	0.010	0.010		3	3			
60.	4,6-dinitro-o-cresol	0.010	0.010	1	3	2	1	t	
61.	n-nitrosodimethylamine	0.010	0.010	-	3	1	2		
62.	n-nitrosodiphenylamine	0.010	0.010		3	. 3			
63.	n-nitroso-n-propylamine	0.010	0.010		3	3			
64.	pentachlorophenol	0.010	0.010	-	3	3	•		
65.	phenol	0.010	0.010	1.	3	-	3		
66.	bis(2-ethylhexyl)phthalate	0.010	0.010	1	3		. 3		. · ·
67.	bútyl benzyl phthalate	0.010	0.010	1	3	1	* · · · · · · · · · · · · · · · · · · ·		2
68.	di-n-butyl phthalate	0.010	0.010	1	. 3	3		1 A A A A A A A A A A A A A A A A A A A	•
69.	di-n-octyl phthalate	0.010	0.010	. 1	3		2		1
70.	diethyl phthalate	0.010	0.010	, 1	× 3	1	2		
71.	dimethyl phthalate	0.010	0.010	1	3	3	e de la companya de l		
72.	benzo(a)anthracene	0.010	0.010	1	3	3		· · ·	
73.	benzo(a)pyrene	0.010	0.010	1	3	2.	. 1		
74.	3,4-benzofluoranthene	0,010	0.010	1	3	2	1		
75.	benzo(k)fluoranthene	0.010	0.010	1	3	3			
76.	chrysene	0.010	0.010	1	3	1	2		÷
77.	acenaphthylene	0.010	0.010	1 1	, 3		3 -		
78.	anthracene	0.010	0.010	1	3	2	1		
79.	henzo(g,h,i)perviene	0.010	0.0.0						

PRIMARY BERYLLIUM SUBCATEGORY SECT

Detected

Detected

FREQUENCY OF OCCURRENCE OF PRIORITY POLLUTANTS PRIMARY BERYLLIUM SUBCATEGORY RAW WASTEWATER

.	Pollutant	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentra- tion (mg/l)(b)	Nu S <u>An</u>	umber of Streams Malyzed	Number of Samples Analyzed	ND	Detected Below Quantification Concentration	Detected Below Treat- able Concen- tration	Detected Above Treat- able Concen- tration
80.	fluorene	0.010	0.010	11 A.	1 .	3	14	3	· · · ·	·
81.	phenanthrene	0.010	0.010		1	3		3		·
82.	dibenzo(a,h)anthracene	0.010	0.010		1	3		5		
83.	indeno(1,2,3-cd)pyrene	0.010	0.010	· · ·	1	3	3	1999 - A.		
84.	pyrene	0.010	0.010		1	ĩ		1		
85.	tetrachloroethylene	0.010	0.010	·	1	3	-	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -		
86.	toluene	0.010	0.010		1	3				3
87.	trichloroethylene	0.010	0.010		1.	3				3
- 88	vinyl chloride	0.010	0.010			3				
114.	antimony	0.100	0.47		6	14	- 1	14	÷ .	
115.	arsenic	0.010	0.34		6	14	·	14,		
117.	beryllium	0.010	0.20		6	14		10	4	
118.	cadmium	0.002	0.049		6	14		· .	•	14
119.	chromium	0.005	0.07		6	14		4	. 9	1
120.	copper	0.009	0.39		6	14		•	6	8
121.	cyanide (c)	0.02	0.047		1 .	1	1 - L		5	9
122.	lead	0.020	0.08		6	14	· · · .	10		1
123.	mercury	0.0001	0.036		6	14		13		1
124.	nickel	0.005	0.22		6	14		8	6.	· · ·
125.	selenium	0.01	0.20		6	14	1.2.1.1		,13	1
126.	silver	0.02	0.07	÷	6	14		14		
127.	thallium	0.100	0.34		٠ د	14		6	5	3
128.	zinc	0.050	0.23		6	14		14	9	1

(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.

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- (c) Analytical quantification concentration for EPA Method 335.2, Total Cyanide Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020,
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TABLE VI-2

TOXIC POLLUTANTS NEVER DETECTED

2	acrolein	
5	benzidine	
2. g	1 2 4-trichlorobenzene	
0.	hevachlorohenzene	
יב די	hig (gbloromerbyl) ether (deleted)	
1/.	his (2-chloroethyl) ether	
T8.	Dis (2-Chioloechyi) echer	
20.	2-Chioronaphinaiene	
21.	2,4,6-trichlorophenol	
22.	2-chlorophenol	
23.	1,2-dichlorobenzene	
26.	1,3-dichlorobenzene	
27.	1,4-dichlorobenzene	
28.	3,3'-dichlorobenzidine	
31.	2,4-dichlorophenol	
33.	1,2-dichloropropylene (1,3-dichloropropene)	
34.	2,4-dimethylphenol	
35.	2.4-dinitrotoluene	
40.	4-chlorophenyl phenyl ether	
41.	4-bromophenyl phenyl ether	
42	his(2-chloroisopropyl) ether	
10	drichlorofluoromethane (deleted)	
50	dichlorodifluoromethane (delered)	
50.	A 6-dipicro-o-cresol	
60.	N-nitrogodi-n-propylamine	
03.	N-microsour n propramine	, i
04.		
65.	phenor	
69.	harma (a) anthracana (1 2-benzanthracene)	
72.	Denzo (a) antifiatene $(1/2)$ benzonvrene)	
73.	penzo (a)pyrene (3,4-benzopyrene)	
76.	chrysene	`
82.	dibenzo (a,n)anthracene (1.2.5.6 dibenzulenenvrene)	
83.	indeno (1.2.3-cd)pyrene (w,e,-O-phenyrenepyrene)	
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.	Alpha-endosulfan*	1
96.	Beta-endosulfan*	
97.	endosulfan sulfate*	
98.	endrin*	
99.	endrin aldehyde*	
100.	heptachlor*	
	1	• •
TOXIC POLLUTANTS NEVER DETECTED

101.	heptachlor epoxide*
102.	Alpha-BHC*
103.	Beta-BHC*
104.	Gamma-BHC (lindane)*
105.	Delta-BHC*
106.	PCB-1244 (Arochlor 1242)*
107.	PCB-1254 (Arochlor 1244)*
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)
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

1.	acenaphthene
7.	chlorobenzene
11.	1,1,1-trichloroethane
12.	hexachloroethane
14.	1,1,2-trichloroethane
16.	chloroethane
36.	2,6-dinitrotoluene
37.	1,2-diphenylhydrazine
38.	ethylbenzene
39.	fluoranthene
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.	vinvl 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 in 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 these 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. None have chemical precipitation, sedimentation and filtration. As such, three options have been selected for consideration for BPT, BAT, NSPS, and pretreatment based on combined treatment of these 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,

- (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

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.

PRIMARY BERYLLIUM SUBCATEGORY

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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 not 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 small excess (5-10 %) of lime is added during treatment, а the 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 sludges other industries such as the iron and steel industry. A small amount of excess lime was added during treatment, and the sludges subsequently generated passed the toxicity test. See CFR CFR Thus, the Agency believes that the wastewater 8261.24. sludges 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, Finally, RCRA regulations establish standards 1980). 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)

4

Option	<u>Capital</u> Cost	Annual Cost
A	226500	251200
в	256200	265600

3752

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 and facilities involved, the manufacturing processes used, nonwater quality environmental impacts (including energy requirements), and other factors the Administrator considers appropriate. Tn 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. 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

the development of BPT mass limitations The for first requirement to calculate these limitations is to account for Therefore, production and flow variability from plant to plant. 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 stream primarily because plants stream-by-stream basis, in this 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 BPT 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 the effluent limitations guidelines.

The mass loadings which are allowed under BPT for each plant will be the sum of the individual mass loadings for the various wastewater sources which are found at particular plants. Accordingly, all the wastewater generated within a plant may be combined for treatment in a single or common treatment system, but the effluent limitations for these combined wastewaters are based on the various wastewater sources which actually contribute to the combined flow. This method accounts for the variety of combinations of wastewater sources and production processes which may be found at primary 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 (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. 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, cyanide precipitation pretreatment for selected and 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 are ammonia bearing wastewaters associated with treating 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 technology's performance on nonferrous of this metals wastewater because manufacturing category raw wastewater concentrations of ammonia are of the same order of magnitude in the respective raw wastewater matrices.

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

The Agency has verified the 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 cvanide beryllium concentrations (prior to dilution with waste streams without 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 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 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 $52,660 \ 1/kkg$ (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 1/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

The BPT wastewater discharge rate proposed for beryllium hydroxide supernatant was 104,324 l/kkg (25,000 gal/ton) of beryllium hydroxide produced from scrap and residues (as 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 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 beryllium hydroxide supernatant is 430,000 l/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 in 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 (BeF₂) 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 (l,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.

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
	pH .

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

Wastewater Stream	BPT No: <u>Dischar</u> 103 <u>1/kkg</u>	rmalized <u>ge Rate</u> <u>103 gal/ton</u>	Productin <u>Normalized</u> Parameter
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

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BPT WASTEWATER DISCHARGE RATES FOR THE PRIMARY BERYLLIUM SUBCATEGORY

	BPT No Dischar	ormalized ge Ra <u>te</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
Bervllium 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	0.101	0.024	Bertrandite ore processed

XI

TABLE IX-2

BPT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

(a) Solvent Extraction Raffinate from Bertrandite Ore BPT

Pollutant	or	Maximum for	Maximum for	
pollutant	property	any one day	monthly average	
	mg/kg (1b/mi	llion lbs) of	beryllium carbonate	
	produced	from bertrand	lite ore (as Be)	
Beryllium Chromium Copper Cyanide Ammonia Fluoride TSS pH	Within	2,763.000 988.200 4,267.000 651.300 299,400.000 78,610.000 92,090.000 the range of	$1,235.000 \\ 404.300 \\ 2,246.000 \\ 269.500 \\ 131,600.000 \\ 44,700.000 \\ 43,800.000 \\ 7.5 to 10.0 at all t$	imes

(b) Solvent Extraction Raffinate from Beryl Ore BPT

Pollutant pollutant	or property	Maximum for any one day	Maximum for monthly average	
	mg/kg (lb/mi produ	llion lbs) of ced from beryl	beryllium carbonate ore (as Be)	;
Beryllium Chromium Copper Cyanide Ammonia Fluoride TSS pH	Within	270.600 96.800 418.000 63.800 29,330.000 7,700.000 9,020.000 the range of	$121.000 \\ 39.600 \\ 220.000 \\ 26.400 \\ 12,890.000 \\ 4,378.000 \\ 4,290.000 \\ 7.5 to 10.0 at all$	times

BPT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

(c) Beryllium Carbonate Filtrate BPT

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

(d) Beryllium Hydroxide Filtrate BPT

Pollutant pollutant	or property	Maximum for any one day	Maximum for monthly average	
	mg/kg (lb/mi	llion lbs) of be produced (as l	eryllium hydroxide Be)	
Beryllium Chromium Copper Cyanide Ammonia Fluoride TSS pH	Within	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 .5 to 10.0 at all t	times

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TABLE IX-2 (Continued)

BPT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

(e) Beryllium Oxide Calcining Furnace Wet APC BPT

Pollutant pollutant	or property	Maximum for any one day	Maximum for monthly average	
mg/	kg (lb/millic	on lbs) of beryll	lium oxide produced	1
Beryllium Chromium Copper Cyanide Ammonia Fluoride TSS pH	Within	324.400 116.000 501.000 76.470 35,150.000 9,230.000 10,810.000 the range of 7.5	145.000 47.470 263.700 31.640 15,450.000 5,248.000 5,142.000 5 to 10.0 at all ti	imes

(f) Beryllium Hydroxide Supernatant BPT

Pollutant	or	Maximum for	Maximum for	-
pollutant	property	any one day	monthly average	
••••••••••••••••••••••••••••••••••••••	mg/kg (lb/m	illion lbs) of	beryllium hydroxide	
	produced	LIOM SCIAP and	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	
рН	Within	the range of	7.5 to 10.0 at all tim	nes

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BPT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

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(g) Process Water BPT

Pollutant or pollutant property	Maximum for any one day	Maximum for monthly average	
mg/kg (lb/millie	on lbs) of beryl	lium pebbles produced	•
Beryllium Chromium Copper Cyanide Ammonia Fluoride TSS pH Within	215.000 76.910 332.100 50.690 23,300.000 6,118.000 7,167.000 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 propert	Maximum for y any one day	Maximum for monthly average
mg/kg (lb/m	illion lbs) of beryl	lium pebbles produced
Beryllium Chromium Copper Cyanide Ammonia Fluoride TSS pH W	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 0.000 0.000 0.000 7.5 to 10.0 at all times

TABLE IX-2 (Continued)

BPT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

(i) Chip Treatment Wastewater BAT

Pollutant pollutant	or property	Maximum any one	for day	Maximum monthly	for average	
mg/kg	(lb/million	lbs) of	berylli	um scrap	chips th	reated
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	Within	the rang	ge of 7.	5 to 10.0) at all	times

(j) Beryllium Pebble Plant Area Vent Wet APC BPT

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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 processe	đ
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	ź
Fluoride	36.505	20.756	
Total Suspended Solids	42.763	20.339	
pH Within t	the range of 7.5	to 10.0 at all times	•

(1) Bertrandite Ore Gangue Dewatering BPT

Pollutant or M	Maximum for	Maximum for	
Pollutant Property P	Any One Day	Monthly Average	
mg/kg (pounds per milli	on pounds) of	bertrandite ore process	sed
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	93.275	53.034	
Total Suspended Solids	109.265	51.968	
pH Within th	ne range of 7.5	51.968 5 to 10.0 at all times.	

BPT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

(m) <u>Beryl Ore Processing</u> BPT

Pollutant or Ma	aximum for	Maximum for
Pollutant Property An	ay One Day	Monthly Average
mg/kg (pounds per mil	lion 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
Total Suspended Solids	299.423	142.409
pH Within the	range of 7.5 to	5 10.0 at all times.

BPT

(n) <u>Aluminum Iron</u> <u>Sludge</u> (AIS) <u>Area</u> <u>Wastewater</u> BPT

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Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (pounds pe	er million pound	ls) of total beryllium
car	bonate produced	l (as Be)
Beryllium	575.640	257.400
Chromium (Total)	205.920	84.240
Copper	889.200	468.000
Cyanide (Total)	135.720	56.160
Ammonia (as N)	62384.400	27424.800
Fluoride	16380.000	9313.200
Total Suspended Solids	19188.000	9126.000
pH Within	the range of 7.	5 to 10.0 at all times.

*Regulated Pollutant

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BPT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

(o) Bertrandite Ore Leaching Scrubber BPT

Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg o	f bertrandite or	re processed
Beryllium	1.859	0.831
Chromium (Total)	0.665	0.272
Copper	2.871	1.511
Cyanide (Total)	0.438	0.181
Ammonia (as N)	201.416	88.545
Fluoride	52.885	30.069
Total Suspended Solids	61.951	29.465
pH Within	the range of 7.5	5 to 10.0 at all times.

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

Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg d	of bertrandite o	re processed
Beryllium	0.124	0.056
Chromium (Total)	0.044	0.018
Copper	0.192	0.101
Cyanide (Total)	0.029	0.012
Ammonia (as N)	13.463	5.919
Fluoride	3.535	2.010
Total Suspended Solid	s 4.141	1.970
pH Within	the range of 7.	5 to 10.0 at all times.



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 mass loadings for BPT and BAT are due to increased treatment the 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

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

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

- o Recycle of scrubber liquors
- 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 scrubber liquors, ammonia steam stripping, and cvanide 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 solids, 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 At each sampled facility, the sampling data regulation. 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 The mass of pollutant discharged was then other plant flows. 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 The pollutant removal estimates for direct dischargers option. the primary beryllium subcategory are presented in Table X-1 in (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 and operating costs are determined by what treatment it has in place and by its individual process wastewater discharge flow. As discussed above, this flow is either the actual or the BAT 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. Α 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-ofpipe 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 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 1/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)	PRIMAR
Antimony Arsenic Beryllium Cadmium Chromium (Total) Copper Cyanide (Total) Lead Mercury Nickel Selenium Silver Thallium	$\begin{array}{c} 0.0225\\ 1.7080\\ 2,157.5560\\ 0.4495\\ 2.2698\\ 26.0466\\ 535.7427\\ 0.0225\\ 0.0225\\ 0.0225\\ 0.9439\\ 0.0000\\ 0.4944\\ 0.0000\end{array}$	0.0225 1.7080 6.7420 0.4495 1.8878 1-3.0346 1.5731 0.0225 0.0225 0.9439 0.0000 0.4944	$\begin{array}{c} 0.0000\\ 0.0000\\ 2,150.8140\\ 0.0000\\ 0.3820\\ 13.0121\\ 534.1696\\ 0.0000\\ 0.000$	$\begin{array}{c} 0.0225\\ 1.7080\\ 4.4947\\ 0.4495\\ 1.5731\\ 8.7646\\ 1.0562\\ 0.0225\\ 0.0225\\ 0.0225\\ 0.9439\\ 0.0000\\ 0.4944\end{array}$	$\begin{array}{c} 0.0000\\ 0.0000\\ 2,153.0613\\ 0.0000\\ 0.6967\\ 17.2820\\ 534.6864\\ 0.0000\\ 0.0000\\ 0.0000\\ 0.0000\\ 0.0000\\ 0.0000\\ 0.0000\end{array}$	RY BERYLLIUM SUBCATEGON
Zinc TOTAL PRIORITY POLLUTANTS	2.1574 2,727.4358	2.1574 29.0581	0.0000 0.0000 2,698.3777	0.0000 2.1574 21.7093	0.0000 0.0000 2,705.7265	X
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	ECT - X
TSS	129,324.1387 582.2401	1,049.5064 269.6805	128,274.6323 312.5596	1,049.5064 58.4308	128,274.6323 523.8093	
TOTAL CONVENTIONALS	1/9.6/46 761.9147	179.6746 449.3551	0.0000 312.5596	179.6746 238.1054	0.0000 523.8093	•
TOTAL POLLUTANTS	132,813.4892	1,527.9196	131,285.5696	1,309.3211	131,504.1681	

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PRIMARY BERYLLIUM SUBCATEGORY

TABLE X-2

COST OF COMPLIANCE FOR THE PRIMARY BERYLLIUM SUBCATEGORY DIRECT DISCHARGERS

(March 1982 Dollars)

Option	<u>Capital</u> Cost	<u>Annual</u> Cost
A	226500	251200
В	256200	265600

Table X-3

BAT WASTEWATER DISCHARGE RATES FOR THE PRIMARY BERYLLIUM SUBCATEGORY

	BAT NO	ormalized	
Wastewater Stream	<u>Dischar</u> 103 <u>1/kkg</u>	<u>ige 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 furnative wet air pollution control	ce 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

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Table X-3 (Continued)

BAT WASTEWATER DISCHARGE RATES FOR THE PRIMARY BERYLLIUM SUBCATEGORY

	BAT No <u>Dischar</u>	rmalized <u>ge Rate</u>	Productin
Wastewater Stream	<u>103</u> <u>1/kkg</u>	103 gal/ton	Normalized Faranceor
Beryllium ore gangue dewatering	1.043	0.25	Beryllium ore processed
Bertrandite ore gangue	2.665	0.639	Bertrandite ore processed
Bervllium 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

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TABLE X-4

BAT MASS LIMITATIONS	FOR THE PRIMARY	BERYLLIUM SUBCATEGORY
(a) Solvent Extraction	Raffinate from Be	ertrandite Ore BAT
Pollutant or	Maximum for	Maximum for
pollutant property	any one day	monthly average
mg/kg (lb/mil	lion lbs) of bery	vllium carbonate
produced	from bertrandite	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	299,400.000	131,600.000
Fluoride	78,610.000	44,700.000
		· · · · · · · · · · · · · · · · · · ·
(b) Solvent Extraction	Raffinate from I	Beryl Ore BAT
Pollutant or	Maximum for	Maximum for
pollutant property	any one day	monthly average
mg/kg (lb/mil	lion lbs) of bery	vllium carbonate
produc	ed from bervl or	e (as Be)
Bervllium	180,400	81,400
Chromium	81,400	33.000
Copper	281,600	134.200
Cvanide	44,000	17.600
Ammonia	29.330.000	12.890.000
Fluoride	7,700,000	4.378.000
(c) <u>Beryllium</u> <u>Carbonate</u>	<u>Filtrate</u> BAT	
Pollutant or	Maximum for	Maximum for
pollutant property	any one day	monthly average
mg/kg (lb/million lbs)	of beryllium car	bonate produced (as Be
Bervllium	175,900	79.370
Chromium	79.370	32,180
Copper	274,600	130,800
Cvanide	42,900	17,160
Ammonia	28.590.000	12,570,000
Fluoride	7.508.000	4.269.000
	· · · · · · · · · · · · · · · · · · ·	

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TABLE X-4 (Continued)

BAT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

(d) Beryllium Hydroxide Filtrate BAT

Pollutant or	Maximum for	Maximum for
pollutant property	any one day	monthly average
mg/kg (lb/million lb	s) of beryllium hyd	roxide 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	7,969.600
Fluoride	4,760.000	2,706.400
	- <u></u>	:

(e) Beryllium Oxide Calcining Furnace Wet APC BAT

Pollutant o pollutant p	r roperty	Maximum any one	for day	Maximum monthly	for average
mg/k	g (lb/million	lbs) of be	eryllium	oxide prod	luced
Beryllium		216.200		97.57	0
Chromium		97.570		39.56	50
Copper		337.500		160.90)0
Cyanide		52.740		21.10	0
Ammonia	3	5,150.000		15,450.00	00
Fluoride		9,230.000		5,248.00	0

(f) Beryllium Hydroxide Supernatant BAT

Pollutant	or	Maximum	for	Maximum	for
pollutant	property	any one	day	monthly	average
	mg/kg (lb/milli	Lon 1bs) of	berylliur	n hydroxi	lde
	produced, from	n scrap and	l residues	(as Be)	
Beryllium	-	188.600	-	85.100)
Chromium		85.100		34.500)
Copper		294.400		140.300) (
Cyanide		46.000		18.400)
Ammonia	30	,660.000	13	3,480.000)
Fluoride	160	,300.000	7]	L,200.000)

TABLE X-4 (Continued)

BAT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

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

Pollutant or pollutant pr	operty	Maximum any one	for day	Maximum monthly	for average
mg/kg	(1b/million	lbs) of be	ryllium	pebbles pro	duced
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)

1

(h) Fluoride Furnace Scrubber BAT

Pollutant or pollutant pr	r roperty	Maximum for any one day	Maximum for monthly average
mg/kg	(lb/million	lbs) of beryllium	n pebbles produced
Beryllium Chromium Copper Cyanide Ammonia Fluoride		0.000 0.000 0.000 0.000 0.000 0.000	$\begin{array}{c} 0.000\\ 0.000\\ 0.000\\ 0.000\\ 0.000\\ 0.000\\ 0.000\\ 0.000\end{array}$

(i) Chip Treatment Wastewater BAT

Pollutant of pollutant p	or property	N ĉ	Maximum any one	for day	Ma mo	aximum onthly	for average
mg/kg	(lb/million	lbs)	of ber	yllium	scrap	chips	treated
Beryllium Chromium	-		6.355 2.868	1		2.80 1.10	58 (53
Copper Cyanide			9.920 1.550			4.72	28 20
Ammonia Fluoride		1,0 2)33.000 271.300			454.20 154.20	00 00

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 day	monthly average
mg/kg (lb/millic	on lbs) of beryllium	pebbles produced
Beryllium	0.000	0.000
Chromium	0.000	0.000
Copper	0.000	0.000
Cyanide	0.000	0.000
Ammonia Fluoride	0.000	0.000 0.000

(k) Beryl Ore Gangue Dewatering BAT

Pollutant or	Maximum for	Maximum for
pollutant property	any one day	monthly average
mg/kg (pounds pe	r 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 Dewatering BAT

Pollutant or pollutant property	Maximum any one	for day	Maximum monthly	for average
mg/kg (pounds per	million pounds)	of bertra	ndite ore	processed
Beryllium	2.185		0.986	N
Chromium (Total)	0.986		0.400	
Copper	3.411	1	1.626	
Cyanide (Total)	0.533		0.213	· ·
Ammonia (as N)	355.245	1!	56.169	
Fluoride	93,275		53.034	

BAT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

(m) Beryl Ore Processing BAT

Pollutant or pollutant property		Maxi any	mum fo one da	r Y	M. me	axim onth	ım for Ly average
mg/kg (pounds per	mil	Lion <u>r</u>	oounds)	of	beryl	ore	processed
Beryllium Chromium (Total)		5.988	3		2 1	.702	
Copper Cyanide (Total)		9.348	3 		4 0	.455 .584	
Ammonia (as N) Fluoride	9 25	73.490) 5		427 145	.956 .330	

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

Pollutant or pollutant property	Maximum any one	for Maxin day month	num for nly average
mg/kg (pounds per	million pounds) produced (a	of total beryll s Be)	lium carbonat
Beryllium	383.760	173.16	50
Chromium (Total)	173.160	70.20)0
Copper	599.040	285.48	30 · .
Cyanide (Total)	93.600	37.44	0
Ammonia (as N)	62,384.400	27,424.80)0
Fluoride	16,380.000	9,313.20	00

(o) Bertrandite Ore Leaching Scrubber BAT

Pollutant or	Maximum for	Maximum for
pollutant property	any one day	monthly average
mg/kg o	f bertrandite ore p	rocessed
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

BAT MASS LIMITATIONS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

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

Pollutant or	Maximum for	Maximum	for
pollutant property	any one day	monthly	average
mg/kg	of bertrandite ore p	rocessed	
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	





BAT TREATMENT SCHEME FOR OPTION A

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BAT TREATMENT SCHEME FOR OPTION C

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SECT 1 ×

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 This result is a consequence of primary beryllium plants. 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 similar to those from existing plants, since the processes be 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
- Ammonia steam stripping and cyanide precipitation for selected waste streams
- o Chemical precipitation and sedimentation

OPTION C

- o Recycle of scrubber liquors
- 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 The mass of pollutant allowed to be discharged per 3786). mass product (mg/kg) is based on the product of the appropriate of 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. Т the exception of fluoride for beryllium with 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 <u>Stream</u>	NSPS No Dischard 103 1/kkg	ormalized <u>ge 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	e 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		Beryllium pebbles produced

PRIMARY BERYLLIUM SUBCATEGORY SECT -IX

NSPS WASTEWATER DISCHARGE RATES FOR THE PRIMARY BERYLLIUM SUBCATEGORY

Wastewater Stream	NSPS 1 <u>Discha</u> 103 <u>1/kkg</u>	Normalized <u>rge Rate</u> <u>103</u> 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

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XI

TABLE XI-2

NSPS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

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(a)	Solver	nt Extraction	Raffina	ate fr	<u>om Bert</u>	randi	ite Ore	NSPS
0011	litant	or	Mavimur	for	May	imum	for	<u>t</u>
poll	Lutant	property	any one	e day	mor	thly	average	
		ma/ka (lb/mi	llion lk	ns) of	hervll	ium c	rarbonat	<u> </u>
		produced	from be	ertran	dite or	e (as	s Be)	<u> </u>
		Produced					5 20)	
Berv	7llium		1.842	.000		8	331.000	
Chro	mium		831	.000			336,900	
Copr	ber		2,875	.000		1,3	370.000	21 A.
Cvar	nide		449	.200]	L79.700	
Ammo	nia		299,400	.000		131,6	500.000	
Fluc	oride		78,610	.000		44.7	700.000	•
TSS			33,690	.000		26,9	950.000	, ,
σH		Within	the ran	nge of	7.5 to	10.0) at all	times
E				.ge •=	/ • • • • •			021100
(b)	Solver	nt Extraction	Raffina	ate fr	om Bery	<u>1 Ore</u>	NSPS	······································
Poll	utant	or	Maximun	n for	Max	imum	for	
poll	utant	property	any one	e day	mor	thly	average	
		(1) (1)			1			
		mg/kg (lb/ml produ	ced from	n bery	l ore (as Be	e)	3
4 77		_	1.00				01 400	
~Bei	y I I I UI	n	180	1.400			81.400	
*Com							33.000	
+0	nido	`	201				17 600	
*****			20 220			10	17.600	
* DJ			29,330			±Ζ,	378 000	
*****	loride					4, 2	510.000	
*T55)	Within			7 5 4 -	2, 10 ²		• • • • • • • • •
~рн		WICHIN	the ran	ige or	/.5 tC	, TO.C	at all	times
$\overline{(c)}$	Boryl	lium Carbonat	o Filtra		CDC			
(0)	Deryri				0.0			r 5
Poll	utant	or	Maximum	for	Max	imum	for	1
poll	utant	property	any one	e dav	mor	thlv	average	
E		E E 4	1	- 4		1		i
mg/	'kg (lk	o/million lbs) of ber	ylliu	m carbo	nate	produce	d (as Be
Bery	llium		175	5.900			79.370	
Chro	mium		.79	.370			32.180	
Copr	ber		274	1.600			130.800	
Cyar	ide		42	2.900			17.160	
Ammo	nia		28,590).000		12.	570.000	
Fluc	ride		7.508	3.000		4	269.000	
TSS			3.218	3.000		2.	574.000	•
υH		Within	the rar	nge of	7.5 to	, 10.0) at all	times
F				-9				

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NSPS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

(d) Beryllium Hydroxide Filtrate NSPS

Pollutant or	Maximum for M	laximum for	
pollutant property	any one day m	onthly average	
mg/kg (lb/million lbs	s) of beryllium hyd	roxide 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	7,969.600	
Fluoride	4,760.000	2,706.400	
TSS	2,040.000	1,632.000	
pH Within	the range of 7.5	to 10.0 at all times	
(e) <u>Beryllium</u> Oxide Ca	alcining <u>Furnace</u> We	t APC NSPS	
Pollutant or	Maximum for M	aximum for	
pollutant property	any one day m	onthly average	
mg/kg (lb/mill)	on lbs) of berylli	um oxide produced	
Beryllium	216.200	97.570	
Chromium	97.570	39.560	
Copper	337.500	160.900	
Cyanide	52.740	21.100	
Ammonia	35,150.000	15,450.000	
Fluoride	9,230.000	5,248.000	
TSS	3,956.000	3,164.000	
pH Withir	the range of 7.5	to 10.0 at all times	
(f) Beryllium Hydroxid	e Supernatant NSP	S	
Pollutant or	Maximum for M	aximum for	
pollutant property	any one day m	onthly average	
mg/kg (lb/mi produced f	llion lbs) of bery rom scrap and resi	llium hydroxide dues (as Be)	
Bervllium	188,600	85,100	
Chromium	85.100	34.500	
Copper	294.400	140.300	
Cyanide	46.000	18.400	
Ammonia	30,660.000	13,480.000	
Fluoride	160,300.000	71,200.000	
TSS	3,450.000	2,760.000	
pH Within	the range of 7.5	to 10.0 at all times	

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NSPS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

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

· · · · · · · · · · · · · · · · · · ·						
Pollutant	or	Maximum	for	Maximum	for	
pollutant	property	any [;] one	day	monthly	average	

mg/kg	(lb/million lbs) of	: beryllium	pebbles	produ	ced
Beryllium	143.3	300	64.	680	
Chromium	64.0	580	26.	220	`
Copper	223.	700	106.	600	
Cyanide	34.9	960	13.	980	:
Ammonia	23,300.0	000	10,240.	000	
Fluoride	6,118.0	000	3,479.	000	;
TSS	2,622.0	000	2,098.	000	
рH	Within the rang	je of 7.5 to	o 10.0 at	all a	times

(h) Fluoride Furnace Scrubber NSPS

	· · · · · · · · · · · · · · · · · · ·		
Pollutant or	Maximum for	Maximum for	;
pollutant property	any one day	monthly average	
mg/kg (lb/milli	on lbs) of beryl	lium pebbles produ	iced
Beryllium	0.000	0.000	times
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	
TSS	0.000	0.000	
pH Within	n the range of 7	0.000	

(i) Chip Treatment Wastewater NSPS

Pollutant o	or	Maximum	for	Maximum	for	
pollutant p	property	any one	day	monthly	average	
mg/kg	(lb/million	lbs) of	berylliu	um scrap	chips ti	ceated
Beryllium		6	.355		2.86 8	к. К
Chromium		2.	868		1.163	
Copper		. 9.	920		4.728	5 - F
Cyanide		1.	.550		.620	
Ammonia		1,033.	.000		454.200	
Fluoride		271.	300		154.200	
TSS		116.	.300		93.000	
рН	Within	the rang	ge of 7.5	5 to 10.(at all	times

NSPS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

(j) Beryllium Pebble Plant Area Vent Wet APC NSPS

pollutant or Maximum for Maximum for pollutant property any one day monthly average
mg/kg (lb/million lbs) of beryllium 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
TSS 0.000 0.000
pH Within the range of 7.5 to 10.0 at all times
(k) <u>Beryl Ore Gangue</u> <u>Dewatering</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 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
Total Suspended Solids 15.645 12.516
pH Within the range of 7.5 to 10.0 at all times
(1) <u>Bertrandite</u> Ore <u>Gangue</u> <u>Dewatering</u> NSPS
Pollutant or Maximum for Maximum for
pollutant property any one day monthly average
mg/kg (pounds per million 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
Total Suspended Solids 39.975 31.980
pH Within the range of 7.5 to 10.0 at all times

NSPS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

(m) Beryl Ore Processing NSPS

Pollutant or	Maximum for	Maximum for	- <u></u>
pollutant property	any one day	monthly average	i
			· · · ·
mg/kg (pounds per)	million pounds) of beryl ore proc	essed
Bervllium	5,988	2.702	1
Chromium (Total)	2 702	1 095	
Copper	0 3/8	1 155	
Cupper Cuppide (Motal)	1 461	4.4JJ 0 50/	
Cyanice (IOCAL)	1.401		
Allunonia (as N)	973.490	427.950	
	255.605	145.330	
Total Suspended Solids	109.545	8/.636	
pH Within	the range of	7.5 to 10.0 at all	times
(n) <u>Aluminum Iron Slud</u>	ge (AIS) Area	Wastewater NSPS	
Pollutant or	Maximum for	Maximum for	
pollutant property	anv one dav	monthly average	
polladane property			1
mg/kg (pounds per mil	lion pounds) o	f total bervllium o	arbonat
	produced (as	Be)	
Bervllium	383.760	173.160	
Chromium (Total)	173.160	70.200	
Copper	599.040	285,480	,
Cvanide (Total)	93,600	37,440	
Ammonia (as N)	62.384.400	27.424.800	•
Fluoride	16,380,000	9,313,200	
Total Suspended Solids		5 616 000	•
nu Within	the range of	75+0.100	timer
ph wichin	the range of	7.5 (U 10.0 at att	CIMES
(o) <u>Bertrandite</u> Ore Lea	aching Scrubbe	r NSPS	• . • .
Pollutant or	Maximum for	Maximum for	
pollutant property	any one day	monthly average	
	± 4	1 1 1 1 1 1 1 1	
mg/kg o	f bertrandite	ore processed	
Beryllium	1.239	0.559	
Chromium (Total)	0.559	0.227	
Copper	1,934	0.922	
Cvanide (Total)	0.302	0.121	3
Ammonia (as N)	201.416	88.545	۰.
Fluoride	52 885	30 060	
Total Sugnanded Colida	22.005	20.009 10120	
TOCAT PUSPENDED BOTTOS	22.000	10.132	times
PH WICHIN	the Lange OF	1.5 LO LU.V at all	¢ TW62

NSPS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

(p) $\frac{\text{Bertrandite Ore}}{(\text{CCD})} \frac{\text{Countercurrent}}{\text{NSPS}} = \frac{\text{And}}{\text{NSPS}}$

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
Total Suspended So	1ids 1.515	1.212
pH Wi	thin the range of 7.	5 to 10.0 at all times

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SECT - XII

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. pollutant is deemed to pass through the POTW when the average A 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
- Ammonia steam stripping and cyanide precipitation for selected waste streams
- o Chemical precipitation and sedimentation

OPTION C

- o Recycle of scrubber liquors
- 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 NSPS It includes ammonia steam stripping and cyanide and BAT. precipitation pretreatment for selected waste streams, followed and precipitation, sedimentation, multimedia bv 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. No additional flow reduction for new sources is feasible. Because PSNS does not include any additional costs compared to NSPS and BAT, we do not believe it will prevent entry of new plants. The 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 Stream	PSNS N <u>Dischar</u> 103 <u>1/kkg</u>	ormalized <u>ge Rate</u> <u>103 gal/ton</u>	Productin Normalized Parameter
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 furnad wet air pollution control	ce 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 ven	t 0		Beryllium pebbles produced

wet air pollution control

PRIMARY BERYLLIUM SUBCATEGORY SECT ΈĒ. IIX

PSNS WASTEWATER DISCHARGE RATES FOR THE PRIMARY BERYLLIUM SUBCATEGORY

Wastewater Stream	PSNS N <u>Dischar</u> 103 1/kkg	lormalized <u>ge Rate</u> <u>103 gal/ton</u>	Productin <u>Normalized</u> <u>Parameter</u>
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	0.101	0.024	Bertrandite ore processed

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SECT

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PRIMARY BERYLLIUM SUBCATEGORY

TABLE XII-2

PSNS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

(a) Solvent Extraction Raffinate from Bertrandite Ore PSES

Pollutant	or	Maximum for	Maximum for	
pollutant	property	any one day	monthly average	
	mg/kg (lb/n	aillion lbs) of b	beryllium carbonate	
	produce	ed from bertrand	ite 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		299,400.000	131,600.000	
Fluoride		78,610.000	44,700.000	
Pollutant	or	Maximum for	Maximum for	
pollutant	property	any ohe day	monthly average	
	mg/kg (lb/n	nillion lbs) of h	peryllium carbonate	
	prod	luced from beryl	ore (as Be)	
Beryllium		180.400	81,400	
Chromium		81.400	33.000	
Copper		281.600	134.200	
Cyanide		44.000	17.600	
Ammonia		29,330.000	12,890.000	
Fluoride		7,700.000	4,378.000	

(c) Beryllium Carbonate Filtrate PSES

Pollutant or pollutant property	Maximum for any one day	Maximum for monthly average	- <u></u> i
mg/kg (lb/million	lbs) of beryllium	carbonate produced	(as Be)
Beryllium	175.900	79.370	
Chromium	79.370	32,180	
Copper	274.600	130.800	
Cvanide	42.900	17.160	,
Ammonia	28,590.000	12,570.000	
Fluoride	7,508.000	4,269.000	

PSNS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

(d) <u>Beryllium</u> <u>Hydroxide</u> <u>Filtrate</u> PSES

Pollutant or pollutant property	Maximum for any one day	Maximum monthly	for average		_
mg/kg (lb/million lb	s) 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		
Fluoride	4,760.000	2,7	706.400	•	

(e) <u>Beryllium</u> Oxide Calcining Furnace Wet APC PSES

Pollutant	or	Maximum for	Maximum for
pollutant	property	any one day	monthly average
mg	/kg (lb/mill	lion lbs) of bery	llium oxide produced
Beryllium	· ·	216.200	97.570
Chromium		97.570	39.560
Copper		337.500	160.900
Cyanide		52.740	21.100
Ammonia		35,150.000	15,450.000
Fluoride		9,230.000	5,248.000

(f) Beryllium Hydroxide Supernatant PSES

Pollutant	or	Maximum for	Maximum for
pollutant	property	any one day	monthly average
	mg/kg (lb/mi	llion lbs) of	beryllium hydroxide
	produced f	rom scrap and	residues (as Be)
Beryllium		188.600	85.100
Chromium		85.100	34.500
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 XII-2 (Continued)

	P	SNS	FOR	\mathbf{THE}	PRIMARY	BERYLLIUM	SUBCATEGORY
(g)	Process	Wate	er I	PSES			

pollutant propertyany one daymonthly averagemg/kg (lb/million lbs) of beryllium pebbles producedBeryllium143.30064.680Chromium64.68026.220Copper223.700106.600Cyanide34.96013.980Ammonia23,300.00010,240.000Fluoride6,118.0003,479.000(h)Fluoride Furnace ScrubberPSESPollutant orMaximum for any one dayMaximum for monthly averagemg/kg (lb/million lbs) of beryllium pebbles producedBeryllium0.0000.000Copper0.0000.000Copper0.0000.000Copper0.0000.000Copper0.0000.000Chromium0.0000.000Copper0.0000.000Copper0.0000.000Copper0.0000.000Copper0.0000.000Copper0.0000.000Copper0.0000.000Copper0.0000.000Copper0.0000.000Copper0.0000.000Copper0.0000.000Copper0.0000.000Copper0.0000.000Copper0.0000.000Copper0.0000.000Copper0.0000.000Copper0.0000.000Copper0.0000.000Copper0.0000.000Copper0.0000.00	Pollutant	or	Maximum for	Maximum for	·····
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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 (h) Fluoride Furnace Scrubber PSES Pollutant or Maximum for monthly average Maximum for monthly average mg/kg (lb/million lbs) of beryllium pebbles produced Beryllium 0.000 0.000 Copper 0.000 0.000 Cyanide 0.000 0.000 Immonia 0.000 0.000 Fluoride 0.000 0.000 (i) Treatment Wastewater PSES Pollutant or Maximum for any one day Maximum for 	mg/l	kg (lb/milli	on lbs) of bery	llium pebbles produce	d
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Copper223.700106.600Cyanide34.96013.980Ammonia23,300.00010,240.000Fluoride6,118.0003,479.000(h) Fluoride Furnace ScrubberPSESPollutant orMaximum for monthly averagemg/kg (lb/million lbs) of beryllium pebbles producedBeryllium0.0000.000Copper0.0000.000Cyanide0.0000.000Ammonia0.0000.000Cyanide0.0000.000Cyanide0.0000.000Cyanide0.0000.000Cyanide0.0000.000Cyanide0.0000.000Cyanide0.0000.000Gibroride0.0000.000Cin Treatment WastewaterPSESPollutant or pollutant propertyMaximum for any one dayMaximum for pollutant propertyMaximum for any one dayMaximum for pollutant property2.868Beryllium6.3552.868Beryllium2.9691.162	Chromium		64.680	26.220	
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(h) Fluoride Furnace ScrubberPSESPollutant or pollutant propertyMaximum for any one dayMaximum for monthly averagemg/kg (lb/million lbs) of beryllium pebbles producedBeryllium Copper 0.0000.000 0.000Cyanide Ammonia0.000 0.0000.000 0.000Fluoride0.000 0.0000.000 0.000(i) Treatment Wastewater pollutant property any one dayMaximum for monthly averageMaximum for pollutant propertyMaximum for any one day monthly averageMg/kg (lb/million lbs) of beryllium scrap chips treatedBeryllium Beryllium6.355 2.868 2.868	Fluoride		6,118.000	3,479.000	
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mg/kg (lb/million lbs) of beryllium pebbles producedBeryllium0.0000.000Chromium0.0000.000Copper0.0000.000Cyanide0.0000.000Ammonia0.0000.000Fluoride0.0000.000(i) Treatment WastewaterPSESPollutant orMaximum for any one dayMaximum for monthly averagemg/kg (lb/million lbs) of beryllium scrap chips treatedBeryllium6.3552.868Chromitian0.20601.162	pollutant	property	any one day	monthly average	
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Ammonia0.0000.000Fluoride0.0000.000(i) Treatment WastewaterPSESPollutant orMaximum for any one dayMaximum for monthly averagemg/kg (lb/million lbs) of beryllium scrap chips treatedBeryllium6.3552.868 1.162	Cvanide		0.000	0.000	· .
Fluoride0.0000.000(i) Treatment WastewaterPSESPollutant orMaximum for any one dayMaximum for monthly averagemg/kg (lb/million lbs) of beryllium scrap chips treatedBeryllium6.3552.868 1.162	Ammonia		0.000	0.000	
<pre>(i) <u>Treatment Wastewater</u> PSES Pollutant or Maximum for Maximum for pollutant property any one day monthly average mg/kg (lb/million lbs) of beryllium scrap chips treated Beryllium 6.355 2.868 Characteristic 2.868</pre>	Fluoride		0.000	0.000	
Pollutant orMaximum for Maximum for any one dayMaximum for monthly averagemg/kg (lb/million lbs) of beryllium scrap chips treatedBeryllium6.3552.868Beryllium2.9691.162	(i) <u>Treatr</u>	nent Wastewa	ter PSES	· · · · · · · · · · · · · · · · · · ·	
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mg/kg (lb/million lbs) of beryllium scrap chips treated Beryllium 6.355 2.868	pollutant	property	any one day	monthly average	
Beryllium 6.355 2.868	mg/kg (lb/	million lbs) of beryllium :	scrap chips treated	
Characteristic 2,969 1,162	Beryllium		6.355	2.868	
	Chromium		2.868	1.163	
Copper 9.920 4.728	Copper	1	9.920	4.728	÷
Cvanide 1.550 .620	Cvanide		1.550	.620	1
Ammonia 1,033.000 454.200	Ammonia		1,033.000	454.200	
Fluoride 271.300 154.200	Fluoride		271.300	154.200	

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TABLE XII-2 (Continued)

PSNS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

(j) Beryllium Pebble Plant Area Vent Wet APC PSES

Pollutant or	Maximum for Ma	ximum for
pollutant property	any one day mo	nthly average
mg/kg (lb/million	lbs) of beryllium	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) <u>Ore Gangue</u> <u>Dewater</u>	ing PSES	

Pollutant or pollutant property	Maximum for any one day	Maximum monthly	for average
mg/kg (pounds per	million pounds)	of beryl	ore processed
Beryllium	0.855		0.386
Chromium (Motal)	0 286		0 156

CITORITUM (TOCAT)		0.100
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 Dewatering PSES

Pollutant	or	Maximum	for	Maximum	for	· · · ·
pollutant	property	any one	day	monthly	average	
		a ta a a l				

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	5 3. 034
· · · · · · · · · · · · · · · · · · ·		1

TABLE XII-2 (Continued)

PSNS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

(m) <u>Beryl</u> <u>Ore</u> <u>Processing</u> 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	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 PSES

Pollutant	or	Maximum	for
pollutant	property	any one	day

r Maximum for y 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 PSES

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
PRIMARY BERYLLIUM SUBCATEGORY SECT - XII

TABLE XII-2 (Continued)

PSNS FOR THE PRIMARY BERYLLIUM SUBCATEGORY

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

Pollutant or pollutant property	Maximum for any one day	Maximum for monthly average
mg/kg	of bertrandite of	ore processed
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

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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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NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY

DEVELOPMENT DOCUMENT SUPPLEMENT

for the

Primary Nickel and Cobalt Subcategory

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May 1989

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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 wastewaters, including toxic pollutants. As a result, of 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 <u>The Economic</u> <u>Impact Analysis of Effluent Limitations and Standards</u> for the <u>Nonferrous Metals Manufacturing Industry</u>.

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-ofpipe 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.

SECT - 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	• •	0.146	0.077
Nickel		0.148	0.098
Ammonia	(as N)	10.260	4.512
Cobalt	•	0.016	0.007
TSS		3.157	1.502
pH	Within the	range of 7.5 to	10.0 at all times
	2 C		

(b) Cobalt Reduction Decant BPT

the second s			
Pollutan Pollutant	nt or property	Maximum for Y Any One Day	Maximum for Monthly Average
<u></u>	mg/kg	(lb/million lbs)	of cobalt produced
Copper Nickel Ammonia (a: Cobalt TSS pH	s N) Within	40.660 41.080 2,852.000 4.494 877.300 the range of 7.5	21.400 27.180 1,254.000 1.926 417.300 to 10.0 at all times

(c) Nickel Reduction Decant BPT Maximum for Maximum for Pollutant or Any One Day Monthly Average Pollutant property mg/kg (lb/million lbs) of nickel produced 12.700 24.120 Copper 16.120 24.370 Nickel 743.900 1,692.000 Ammonia (as N) 1.143 2.666 Cobalt 247.600 520:500 TSS Within the range of 7.5 to 10.0 at all times pH (d) <u>Nickel Wash Water</u> BPT Maximum for Maximum for Pollutant or Any One Day Monthly Average Pollutant property mg/kg (lb/million lbs) of nickel powder washed 0.034 0.064 Copper 0.043 0.065 Nickel 1.985 4.515 Ammonia (as N) 0.003 0.007 Cobalt 0.660 1.389 TSS Within the range of 7.5 to 10.0 at all times Ηq BAT is promulgated based on the performance achievable by the application of chemical precipitation, sedimentation, and multimedia filtration (lime, settle, and filter) technology, preliminary treatment consisting of ammonia steam along with stripping for selected waste streams. The following BAT effluent limitations are promulgated: Raw Material Dust Control BAT (a) Maximum for Maximum for Pollutant property Any One Day Monthly Average Pollutant or mg/kg (lb/million lbs) of copper, nickel, and cobalt in the crushed raw material 0.047 0.099 Copper 0.028 0.042 Nickel 4.512 10.260 Ammonia (as N) 0.005 0.011 Cobalt

(b) <u>Cobalt Reduction</u> <u>Decant</u> BAT	
Pollutant or Maximum for Pollutant property Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) o	f cobalt produced
Copper 27.390 Nickel 11.770 Ammonia (as N) 2,852.000 Cobalt 2.996	13.050 7.917 1,254.000 1.498
(c) <u>Nickel</u> <u>Reduction</u> <u>Decant</u> BAT	
Pollutant or Maximum for Pollutant property Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) o	f nickel produced
Copper 16.250 Nickel 6.982 Ammonia (as N) 1,692.000 Cobalt 1.777	7.744 4.697 743.900 0.889
(d) <u>Nickel Wash Water</u> BAT	антанан каландан талар тала Талар талар тала
Pollutant or Maximum for Pollutant property Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of n	ickel powder washed
Copper 0.043 Nickel 0.019 Ammonia (as N) 4.515 Cobalt 0.005	0.021 0.013 1.985 0.002
NSPS are promulgated based on the peapplication of chemical precipita nultimedia filtration (lime, set along with preliminary treatment stripping for selected waste stream promulgated for new sources:	erformance achievable by ation, sedimentation, tle, and filter) technolo consisting of ammonia st ms. The following NSPS

i

(a) <u>Raw Material Dust Control</u> NSPS	
Pollutant or Maximum for Maximum for Pollutant property Any One Day Monthly Average	_
mg/kg (lb/million lbs) of copper, nickel, and cobalt the crushed raw material	in
Copper 0.099 0.047 Nickel 0.042 0.028 Ammonia (as N) 10.260 4.512 Cobalt 0.011 0.005 TSS 1.155 0.924 pH 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	
Copper27.39013.050Nickel11.7707.917Ammonia (as N)2,852.0001,254.000Cobalt2.9961.498TSS321.000256.800pHWithin the range of 7.5 to 10.0 at all times	
(c) Nickel Reduction Decant NSPS	
Pollutant or Maximum for Maximum for Pollutant property Any One Day Monthly Average	
mg/kg (lb/million lbs) of nickel produced	
Copper16.2507.744Nickel6.9824.697Ammonia (as N)1,692.000743.900Cobalt1.7770.889TSS190.400152.300pHWithin the range of 7.5 to 10.0 at all times	

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(d) <u>Nickel Wash</u> <u>Water</u> NSPS

Pollutant or Pollutant property		Maximum for Any One Day Mc	Maximum for onthly Average
Copper	mg/kg (lb/n	nillion lbs) of nickel	powder washed
Nickel	· · · ·	0.043	0.021
Ammonia Cobalt	(as N)	4.515	1.985
TSS		0.005	0.002
рн	Within t	the 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) <u>Raw Material Dust Control</u> PSNS

Pollutant and			•
FOILULANC OF	Maximum for	Maximum for	
Pollutant property	Amer 0	Han Hada LOL	
- offering brobercy	Any One Day	Monthly Average	
· , ,		1 e- uge	

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

Copper Nickel Ammonia Cobalt	(as	N)	0.099 0.042 10.260 0.011	0.047 0.028 4.512 0.005

(b) Cobalt Reduction Decant PSNS

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

.

(c) <u>Nickel</u> <u>Reduction</u> <u>Decant</u> PSNS

Pollutant or		Maximum for	Maximum for
Pollutant property		Any One Day	Monthly Average
<u></u>	mg/kg	(lb/million lbs) c	of nickel produced
Copper	5 N)	16.250	7.744
Nickel		6.982	4.697
Ammonia (as		1,692.000	743.900
Cobalt		1.777	0.889

(d) Nickel Wash Water PSNS

mg/kg (lb/million lbs) of nickel powder wash Copper 0.043 0.021 Nickel 0.019 0.013	Pollutant or Pollutant property		Maximum for Any One Day	Maximum for Monthly Average	
Ammonia (as N) 4.515 1.002	Copper Nickel Ammonia	mg/kg (lb/m: (as N)	illion lbs) of n 0.043 0.019 4.515	ickel powder washed 0.021 0.013 1.985	

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

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 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,
- 2. 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

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,
- 2. Cobalt reduction decant,
- 3. Nickel reduction decant, and
- 4. 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

\mathbf{PNP}

1.	Raw material dust control	copper, nickel, and cobalt the crushed raw material	in
2.	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. general, the samples were analyzed for three classes of In 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,

2. 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 two water use and wastewater discharge flow, ratios. are differentiated by the flow value used in calculation. Water use 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 (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 and cobalt 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, nickel powder wash 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, specific, daily operator-specific and These factors can include day-to-day differences in factors. 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 а 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

primary nickel and cobalt production involves al sources of wastewater and each has poter Since four potentially principal 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 NH_4^+) and sulfate (as 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 NH_4^+) and sulfate (as 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.

TABLE V-1

WATER USE AND DISCHAGRE RATES FOR

RAW MATERIAL DUST CONTROL

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

1

TABLE V-2

WATER USE AND DISCHAGRE RATES FOR

COBALT REDUCTION DECANT

(1/kkg of cobalt produced)

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

TABLE V-3

WATER USE AND DISCHAGRE RATES FOR

NICKEL REDUCTION DECANT

(l/kkg of nickel produced)

Plant Code	Percent Recycle or reuse	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1062	100	12695	0
TABLE V-4

WATER USE AND DISCHAGRE RATES FOR

NICKEL WASH WATER

(l/kkg of nickel powder washed)

Plant <u>Code</u>	Percent Recycle <u>or reuse</u>	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1062	0	33.87	33.87

Table V-5

PRIMARY NICKEL AND COBALT SUBCATEGORY COMBINED WASTEWATER - INFLUENT TO TREATMENT RAW WASTEWATER SAMPLING DATA

		RAW WASTEWATER	SAMPLING	DATA				PRI
	Pollutant	Stream Code	Sample Typet	Conce Source	entration Day 1	<u>ns (mg/l)</u> Day 2	Day 3	MARY N
Toxic	Pollutants							ICKI
1.	acenaphthene	367	6		ND			Ч. Ц. К
2.	acrolein	367	-1		ND			ND
3.	acrylonitrile	367			ND	· • • • • • • • • •	_ ·	COB
4.	benzene	367	1		*			ALT
5.	benzidine	367	6		ND			SUB
6	carbon tetrachloride	367	1		ND			CAT
· · ·	chlorobenzene	367	1		ND			EGOI
1.		367	6		ND			ХХ
8.	1,2,4-LIICHIOIODenzene	367	6		ND			ຎ
9.	hexachlorobenzene	367	1		ND			ECT
10.	1,2-dichloroethane	207	1		ND			ا م
11.	1,1,1-trichloroethane	367			ND			7
12.	hexachloroethane	367	0	· · · · - · · ·	ND		•····	••• ··•
13.	1.1-dichloroethane	367	1		ND			

PRIMARY NICKEL AND COBALT SUBCATEGORY COMBINED WASTEWATER - INFLUENT TO TREATMENT RAW WASTEWATER SAMPLING DATA

	Pollutant	Stream Code	Sample Typet	Conc	entrations	(mg/1)	PRIMA
Toxi	c Pollutants (Continued)		Typel	source	Day 1	Day 2	Day 3 R
14.	1,1,2-trichloroethane	367	1		ND		NICKE
15.	1,1,2,2-tetrachloroethane	367	1		ND	· ·	L A
-16.	chloroethane	367	1		ND		- U
17.	bis(chloromethyl)ether	367	1		ND		COBA
18.	bis(2-chloroethyl)ether	367	1		ND		H H
19.	2-chloroethyl vinyl ether	367	1		ND		SUB
20.	2-chloronaphthalene	367	6		ND	• •	CATE
21.	2,4,6-trichlorophenol	367	6		ND	- -	GOR
22.	p-chloro-m-cresol	367	6		ND	·	K
23.	chloroform	367	1				い 王
24.	2-chlorophenol	367			ND		C H
25.	1,2-dichlorobenzene	367	6	•	ND		- <
26.	1,3-dichlorobenzene	367	6		ND		
27.	1,4-dichlorobenzene	367	6		ND		

PRIMARY NICKEL AND COBALT SUBCATEGORY COMBINED WASTEWATER - INFLUENT TO TREATMENT RAW WASTEWATER SAMPLING DATA

	Pollutant	Stream Code	Sample Typet	Concer Source	<u>Day 1</u>	3 (mg/1) Day 2	Day 3
Toxic	Pollutants (Continued)						
28.	3,3'-dichlorobenzidine	367	6		ND		
29.	1.1-dichloroethylene	367	1		ND		
30	1 2-trans-dichloroethylene	367	. 1		ND		
21	2 A-dichlorophenol	367	6		ND		
21.	1. 2. dichloropropane	367	1		ND		
32.	1,2 dichloropropene	367	1	· .	ND		
33.	1, 5-dichioropropene	367	б		ND		
34.	2,4-dimetry iphenoi	367	6	· .	ND		•
35.	2,4-dinitrotoluene	367	6		ND		•
36.	2,6-dinitrotoluene	1.0C	· · · ·		ND		
37.	1,2-diphenylhydrazine	367	D		ND		
38.	ethylbenzene	367	1		ND		:
3.0	fluoranthene	367	6		ND		
	4 chlorophenyl phenyl ether	367	6		ND		
40.	4-CILTOLOPICHJ+ Promij-						

PRIMARY NICKEL AND COBALT SUBCATEGORY

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PRIMARY NICKEL AND COBALT SUBCATEGORY COMBINED WASTEWATER - INFLUENT TO TREATMENT RAW WASTEWATER SAMPLING DATA

· · · ·	Pollutant	Stream	Sample	Conce	entratior	is (mg/l)	н. Н	PRI
Toxic	Pollutants (Continued)		Typet	Source	Day 1	Day 2	Day 3	MARY
41.	4-bromophenyl phenyl ether	367	6		ND		- 	NIC
42.	bis(2-chloroisopropyl)ether	367	6		ND			XEL
43.	bis(2-choroethoxy)methane	367	6		ND	n na sana na s Na sana na sana	in a status	AND
44.	methylene chloride	367	1		ND			COL
45.	methyl chloride (chloromethane)	367	1		ND		· . ·	BALT
46.	methyl bromide (bromomethane)	367	1		ND			SUE
47.	bromoform (tribromomethane)	367	1		ND			3CAT
48.	dichlorobromomethane	367	1		ND			EGOF
49.	trichlorofluoromethane	367	1		ND			Ч
50.	dichlorodifluoromethane	367	1		ND	• • •		SE
51.	chlorodibromomethane	367	1	and and an and a second se Second second	ND		1	CH .
52.	hexachlorobutadiene	367	6		ND		14. 14.	<
53.	hexachlorocyclopentadiene	367	6		ND		н 1	
54.	isophorone	367	6		ND			

PRIMARY NICKEL AND COBALT SUBCATEGORY COMBINED WASTEWATER - INFLUENT TO TREATMENT RAW WASTEWATER SAMPLING DATA

		Stroam	Sample	Concentrations (mg/1)					
		Pollutant	Code	Typet	Source	Day 1	Day 2	<u>Day 3</u>	
Т	oxic	Pollutants (Continued)							
	55.	naphthalene	367	6		ND			
	56	nitrobenzene	367	6		ND			
	501	2 mitrophenol	367	6		ND			
	57.	z-mitrophenol	367	6		ND			
ີ 8 ເງ	58.	4-nitrophenoi		· .		מא			
ő.	59.	2,4-dinitrophenol	367	0		ND			
	60.	4,6-dinitro-o-cresol	367	6		ND			
	61.	N-nitrosodimethylamine	367	6		ND			
	6.0	Nnitrosodiphenvlamine	367	6		ND			
	02.	N-nitrosodi n propulamine	367	6		ND			
	63.	N-nitrosodi-n-propyramine		ſ		ND			
	64.	pentachlorophenol	367	D					
	65.	phenol	367	6		ND			
	66.	bis(2-ethylhexyl) phthalate	367	6		.010			
	67	butyl benzyl phthalate	367	6		ND			
	6.8	di-n-butyl phthalate	367	6	• •	ND	• • •••	er e k nome	

PRIMARY NICKEL AND COBALT SUBCATEGORY

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PRIMARY NICKEL AND COBALT SUBCATEGORY COMBINED WASTEWATER - INFLUENT TO TREATMENT RAW WASTEWATER SAMPLING DATA

· · · · · ·	Pollutant	Stream	Sample	Conce	entrations	(mg/	' 1) [°]		PRI
m • [.]		Lode	Typet	Source	Day 1	Day	2	Day	MAF
Toxic	Pollutants (Continued)								A2
69.	di-n-octyl phthalate	367	6		ND				NICK
70.	diethyl phthalate	367	6		ND	. *		- 	E
7,1.	dimethyl phthalate	367	6		ND				AND
72.	benzo(a)anthracene	367	6	•	ND				COB
73.	benzo(a)pyrene	367	6		ND				ALT
74.	benzo(b)fluoranthene	367	6		ND		· ·		SUE
75.	benzo(k)fluoranthane	367	6		ND				CAT.
76.	chrysene	367	6		ND				EGOF
77.	acenaphthylene	367	6		ND				ЪЗ
78.	anthracene	367	6		ND				SI
79.	benzo(ghi)perylene	367	6		ND				ECT
80.	fluorene	367	6		ND				। <
81.	phenanthrene	367	6		ND				
82.	dibenzo(a,h)anthracene	367	6		ND				

PRIMARY NICKEL AND COBALT SUBCATEGORY COMBINED WASTEWATER - INFLUENT TO TREATMENT RAW WASTEWATER SAMPLING DATA

		Stroam	Sample	Conc	entrations	(mg/1)	PRIM
	Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3R
Toxic	Pollutants (Continued)						NIC
83.	indeno (1,2,3-c,d)pyrene	367	6		ND		UK EL
84.	pyrene	367	6		ND		ANI
85.	tetrachloroethylene	367	1		ND		0
86.	toluene	367	1	·	*		BAL.
87.	trichloroethylene	367	- 1		ND		L L
88.	vinyl chloride (chloroethylene)	367	1		ND		IBCA
89.	aldrin	367	6		ND	· ·	TEGO
90.	dieldrin	367	6		ND)RY
91.	chlordane	367	6		ND		70
92.	4,4'-DDT	367	6		ND		SEC.I.
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	an an	

PRIMARY NICKEL AND COBALT SUBCATEGORY COMBINED WASTEWATER - INFLUENT TO TREATMENT RAW WASTEWATER SAMPLING DATA

Dollutar	Stream	Sample	Concentrations $(mg/1)$				
rollucant	Code	Typet	Source	Day 1	Day 2	Day 3	
Toxic Pollutants (Continued)						RY	
97. endosulfan sulfate	367	6	· .	ND		NICI	
98. endrin	367	6		ND	*	(EL	
99. endrin aldehyde	367	6	······································	ND		AND	
100. heptachlor	367	6		ND		COE	
101. heptachlor epoxide	367	6		ND)ALT	
102. alpha-BHC	367	6	a. Analos	ND	алан Алан	SUE	
103. beta-BHC	367	6		ND		3CAT	
104. gamma-BHC	367	6		ND	· · · ·	EGOF	
105. delta-BHC	367	6		ND		Y.	
106. PCB-1242 (b)	367	6		ND		IS	
107. PCB-1254 (b)	367	6		ND	• • •	CT	
108. PCB-1221 (b)	367	6		ND		۱ ۲	
109. PCB-1232 (c)	367	6		ND	* .		

PRIMARY NICKEL AND COBALT SUBCATEGORY COMBINED WASTEWATER - INFLUENT TO TREATMENT RAW WASTEWATER SAMPLING DATA

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		Stream	Sample	Conc	entrations	(mg/1)		Ĥ
	Pollutant	Code	Typet	Source	Day 1	<u>Day 2</u>	Day	<u>3</u>
Toxic	Pollutants (Continued)							N
110.	PCB-1248 (c)	367	6		ND			() 11 11
111.	PCB-1260 (c)	367	6		ND			1
112.	PCB-1016 (c)	367	6		ND			Ę
113.	toxaphene	367	. 6	, .	ND			
114.	antimony	367	6		0.019			1
115.	arsenic	367	6		<0.10			t
117.	beryllium	367	6		0.001			
118.	cadmium	367	6		0.007			
119.	chromium (total)	367	6		<0.05			
120.	copper	367	6		1.43			
122.	lead	367	6		<0.005			
123.	mercury	367	6		0.0002			
124.	nickel	367	б		40.0	di se		
125.	selenium	367	6		0.18	· · · · · · · ·		

PRIMARY NICKEL AND COBALT SUBCATEGORY COMBINED WASTEWATER - INFLUENT TO TREATMENT RAW WASTEWATER SAMPLING DATA

Pollutant	Stream	Sample	Conc	entration	s (mg/l)	
TOTICLAIL	Code	Typet	Source	Day 1	Day 2	Day
oxic Pollutants (Continued)						
26, silver	367	6		<0,001		
27. thallium	367	6		<0.05		
28. zinc	367	6	. <i></i>	0.377	· · · · · · · · · · · · · · · · · · ·	· · ·
onconventional Pollutants		ŕ				
mmonia Nitrogen	367	6		440		
hemical Oxygen Demand	367	6		69.0		
obalt	367	6		4.6		
hosphorus	367	6		<0.2		
conventional Pollutants		÷				
H (standard units)	367	6		7.6		
		. *				

(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	entrations	(mg/1)	
	Pollutant	Code	Typet	Source	Day I	<u>Day 2</u>	Day J.MAH
Toxic	<u>Pollutants</u>						N YI
- 1.	acenaphthene	364	6		ND		IICK
2.	acrolein	364	1		ND		EL
3.	acrylonitrile	364	1		ND		AND
4.	benzene	364	1	· • · · · · · · · · · · · · · · · · · ·	ND		
5.	benzidine	364	6		ND		ALT
6	carbon tetrachloride	364	1		ND		IUS
7	chlorobenzene	364	1	.*	N D		ЗСАТ
· ·	1.2.4-trichlorobenzene	364	6		ND		EGO
0.	1,2,4-trientoroben-ent	364	6		ND		RY
9.	hexachiorobenzene	264	1	· · ·	ND		
10.	1,2-dichloroethane	304	• • • •	· · · · · ·			SEO
11.	1,1,1-trichloroethane	364	1	•	ND		计
12.	hexachloroethane	364	6		ND		<
1-3.	1,1-dichloroethane	364	• • • 1 • •		ND		. . .
14.	1.1.2-trichloroethane	364	1		ND		

PRIMARY NICKEL AND COBALT SUBCATEGORY TREATED PLANT EFFLUENT

Pollutant	Stream	Sample	<u>Concentrations (mg/l)</u>				
Toxic Pollutanta (Continue)	Code	<u>Typet</u>	Source	Day 1	Day 2	Day 3	RIM
continued)				*		· · · · ·	ARY
19. 2-chloroethyl vinyl ether	364	1		ND	· · · · ·	· · ·	N
20. 2-chloronaphthalene	364	6		ND		· · ·	CKE
21. 2,4,6-trichlorophenol	364	6	······································	ND	، دیرون (چېدې چې د دېږون	· •··· -=	IL A
22. p-chloro-m-cresol	364	6		ND			ND
23. chloroform	364	· · · · · · · · · · · · · · · · · · ·		*			OBA
24. 2-chlorophenol	364	6		ND			
25. 1,2-dichlorobenzene	364	6		ND		n An Star An Star	SUBC
26. 1,3-dichlorobenzene	364	6		ND			ATEO
27. 1,4-dichlorobenzene	364	6		ND			ORY
28. 3,3'-dichlorobenzidine	364	6		ND			
29. 1,1-dichloroethylene	364	1		*		4 • •	SEC
30. 1,2-trans-dichloroethylene	364	1	: 	ND			HÎ H
31. 2,4-dichlorophenol	364	6		ND	· · · · ·		<
32. 1,2-dichloropropane	364	1		ND	· · · ·		

PRIMARY NICKEL AND COBALT SUBCATEGORY TREATED PLANT EFFLUENT

	Pollutant	Stream Code	Sample Typet	Conc Source	entration Day 1	<u>s (mg/1)</u> Day 2	Day 3
	<u>rollater</u> (Continued)						N.
<u>Toxic</u> 33.	1.3-dichloropropene	364	1		N D		ICKEI
34.	2,4-dimethylphenol	364	6		N D		, ANI
35.	2.4-dinitrotoluene	364	6		ND		. 0
36.	2,6-dinitrotoluene	364	6	.	ND		OBAL
27	1 2-dinhenvlhydrazine	364	6		ND		ы Б
38.	ethylbenzene	364	1		ND		UBCA
39.	fluoranthene	364	6		ŊD		TEG
40.	4-chlorophenyl phenyl ether	364	6		ND		DRY
41.	4-bromophenyl phenyl ether	364	6		ŊD		
42.	bis(2-chloroisopropyl)ether	364	6		ND		SECT
4	bis(2-choroethoxy)methane	364	6		ND		1
44.	methylene chloride	364	1		*		<
4.5	methyl chloride (chloromethane)	364	1		ND		
46.	methyl bromide (bromomethane)	364	1		ND		· ···•

PRIMARY NICKEL AND COBALT SUBCATEGORY TREATED PLANT EFFLUENT

Pollutant		Stream	Sample	Concentrations (mg/l)					
	TOTICEANE	Code	Typet	Source	Day 1	Day 2	Day 3		
Toxic	Pollutants (Continued)						ARY		
47.	bromoform (tribromomethane)	364	1		ND		NIC		
48.	dichlorobromomethane	364	1		ND		KEL		
49.	trichlorofluoromethane	364			ŅĎ	 	AND		
50.	dichlorodifluoromethane	364	1		ND		co		
51.	chlorodibromomethane	364	1	,	ND		ВАГЛ		
52.	hexachlorobutadiene	364	6		ND		US .		
53.	hexachlorocyclopentadiene	364	6		ND		BCA		
54.	isophorone	364	6		ND		FEGO		
55.	naphthalene	364	6		ND		RY		
56.	nitrobenzene	364	6		0.025	·	70		
57.	2-nitrophenol	364	6	•	ND		ECT		
58.	4-nitrophenol	364	6		ND				
59.	2,4-dinitrophenol	364	6		ND		4		
60.	4,6-dinitro-o-cresol	364	6		ND				

PRIMARY NICKEL AND COBALT SUBCATEGORY TREATED PLANT EFFLUENT

		Stream	Sample	Concentrations (mg/l)					
	Pollutant	Code	<u>Typet</u>	Source	<u>Day 1</u>	Day 2	Day	<mark>З</mark> [
Toxic	Pollutants (Continued)							RY .	
61.	N-nitrosodimethylamine	364	6		ND			NTCE	
62.	N-nitrosodiphenylamine	364	6		ND			L L L	
63.	N-nitrosodi-n-propylamine	364	6		ND			AND	
64.	pentachlorophenol	364	6		ND			CCL	
65.	phenol	364	6		N D			ЗАЦТ	
66.	bis(2-ethylhexyl) phthalate	364	6		ND			SOF	
67.	butyl benzyl phthalate	364	6		*			3CAT	
68.	di-n-butyl phthalate	364	6		ND			EGO	
69.	di-n-octyl phthalate	364	6		ND			КY	
70.	diethyl phthalate	364	6		ND			U.	
71.	dimethyl phthalate	364	6	•	ND			ECT	
72.	benzo(a)anthracene	364	6		ND			ו <	
73	benzo(a)pyrene	364	[`] 6	• • •	N D	•			
74.	benzo(b)fluoranthene	364	6	••• • •	ND		<u></u>		

PRIMARY NICKEL AND COBALT SUBCATEGORY TREATED PLANT EFFLUENT

_	Pollutant	Stream Code	Sample Typet	<u>Conce</u>	entrations Day 1	(mg/1) Day 2	Day 3
Toxic	Pollutants (Continued)			· · · · · · · · · · · · · · · · · · ·			
75.	benzo(k)fluoranthane	364	6		ND		
76.	chrysene	364	6		ND	1. N	
77.	acenaphthylene	364	6		ND		unin en
78.	anthracene	364	6	• •	ND		
79.	benzo(ghi)perylene	364	6		ND		Ì
80.	fluorene	364	6		ND		(
81.	phenanthrene	364	6	·	ND	•	
82.	dibenzo(a,h)anthracene	364	6	• •	ND		
83.	indeno (1,2,3-c,d)pyrene	364	6		ND		i i i i i i i i i i i i i i i i i i i
84.	pyrene	364	6		ND		Σ
85.	tetrachloroethylene	364	1		ND		(
86.	toluene	364	1		*	· · ·	<
87.	trichloroethylene	364	1		ND		
88.	vinyl chloride (chloroethylene)	364	1		ND	4	

PRIMARY NICKEL AND COBALT SUBCATEGORY TREATED PLANT EFFLUENT

	Pollutant	Stream Code	Sample Type†	Conc Source	entration Day 1	s (mg/l) Day 2	Day 3
Toxic	Pollutants (Continued)						I NI
89.	aldrin	364	6		**		CKE
90.	dieldrin	364	6		**		LAN
91.	chlordane	364	6		**		Ð
92.	4,4'-DDT	364	. 6		**		OBA
93.	4,4'-DDE	364	6		**		F H
94.	4.4'-DDD	364	6		* *		SUBC
95.	alpha-endosulfan	364	6		**		ATE
96.	beta-endosulfan	364	6		**		JORY
97.	endosulfan sulfate	364	6		**		
97.	endrin	364	6		**		SEC
00	endrin aldehvde	364	6		**		、日日
100	hoptachlor	364	6		**		4
101	heptachior opovide	364	6		**		
101.	alpha-BHC	364	6		**		

PRIMARY NICKEL AND COBALT SUBCATEGORY TREATED PLANT EFFLUENT

	<u>Pollutant</u>	Stream _Code	Sample Typet	Concentration Source Day 1	ns (mg/l) Day 2	Dav 3	1112
<u>Toxi</u>	c Pollutants (Continued)					ARY	j
103.	beta-BHC	364	6	**	:	NIC	i
104.	gamma-BHC	364	6	**		JKEL	
105.	delta-BHC	364	6	ана страната на селото селото на селото н На селото на селото селото на с		ANI	
106.	PCB-1242 (b)	364	6	**	e E		
107.	PCB-1254 (b)	364	б	* *		BAL	
108.	PCB-1221 (b)	364	6	**		r SU	
109.	PCB-1232 (c)	364	6	**		BCA	
110.	PCB-1248 (c)	364	6	**	r	TEGC	
111.	PCB-1260 (c)	364	6	**)RY	
112.	PCB-1016 (c)	364	6	**		70	
113.	toxaphene	364	6	**		SECT	
114.	antimony	364	6	<0.1	r	1	
115.	arsenic	364	6	<0.1		~	
117 .	beryllium	364	6	0.0018	·		

PRIMARY NICKEL AND COBALT SUBCATEGORY TREATED PLANT EFFLUENT

Pollutant	Stream Code	Sample Typet	Conc Source	entrations Day 1	(mg/1) Day 2	Day 3
Toxic Pollutants (Continued)						NIC
118. cadmium	364	6		<0.001)KEL
119. chromium (total)	364	6	· .	<0.05 6		ANI
120. copper	364	6		0.225		
122. lead	364	6		<0.005		OBAL
123 mercury	364	6		0.0033		ы Ц
124 nickel	364	6		5.60		UBC7
125 colonium	364	6		0.15		ATEG
126 gilver	364	6		<0.001		ORY
120. Silver	364	6		<0.05		
128. zinc	364	6	· ·	0.067		SECT
Nonconventional Pollutants					•	۱ ۲
Ammonia Nitrogen	364	б	· • • • • • • • •	500		· · ·
Chemical Oxygen Demand	364	6		56.0		•

PRIMARY NICKEL AND COBALT SUBCATEGORY TREATED PLANT EFFLUENT

<u>Pollutant</u>	Stream Code	Sample Type†		ntrations	(mg/1)	Dorr 2
Nonconventional Pollutants (Conti	nued)			Day	Day Z	Day 5
Cobalt	364	6		0.46		+ (
Phosphorus	364	6		<0.2		i i
Conventional Pollutants		1	· · · · · · · ·	·····	رود میرد امیام	
pH (standard units)	364	6		12.7		
			· · · ·			L F

SUBCATEGORY

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

*Less than 0.01 mg/l.

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**Less than 0.005 mg/l.



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SAMPLING SITES AT PRIMARY NICKEL AND COBALT PLANT A

PRIMARY NICKEL AND COBALT SUBCATEGORY

SECT

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 The basis for the regulation of toxic and other section. pollutants, along with a discussion of each pollutant selected potential limitation, is discussed in Section VI of Vol. for 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 further consideration if they are present in concentrations for 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

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 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.

Table VI-1

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

<u>Pollutant</u>	Analytical Quantification Concentration (Rg/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
2 poroloin	0.010	0.01	1	. I	1			
3. acrylonitrile	0.010	0.01	1	1	i			
4. benzene	0.010	0.01	1	i	i			
5. benzidine	0.010	0.01	1	i	•	1		
6. carbon tetrachlorido	0.010	0.01	1	i	1	1 .		
7. chlorobenzene	0.010	0.01	1	1	i			
8. 1.2.4-trichlorobenzene	0.010	0.01	1	1	i			
9. hexachlorobenzene	0.010	0.01	1	1	i	·		
10. 1,2-dichloroethane	0.010	0.01	1	1	i	e - e		
11. 1,1,1-trichloroethane	0.010	0.01	1	1	1			
12. hexachloroethane	0.010	0.01	1	1	1			
13. 1,1-dichloroethane	0.010	0.01	1	1	1			
14. 1,1,2-trichloroethane	0.010	0.01	1	1	1			
15. 1,1,2,2-tetrachloroethane	0.010	0.01	1	1	1			ч. - С
6. chloroethane	0.010	0.01		1	1			
7. bis(chloromethyl) ether	0.010	0.01		1	1			
8. bis(2-chloroethyl) ether	0.010	0.01	1	1	1			
9. 2-chloroethyl vinyl ether	0.010	0.01		1	1			
20. 2-chloronaphthalene	0.010	0.01	1	1	1			· .
1. 2,4,6-trichlorophenol	0.010	0.01	. I	1	1		2	
2. parachlorometa cresol	0.010	0.01		1	1	1		i.
3. chloroform	0.010	0.01		1	1			
4. 2-chlorophenol	0.010	0.01			1			
5. 1,2-dichlorobenzene	0.010	0.01		1	1			
6. 1,3-dichlorobenzene	0.010	0.01		1	1		1. Sec. 199	
7. 1,4-dichlorobenzene	0.010	0.01		1	1		÷	
8. 3,3'-dichlorobenzidine	0.010	0.01		I	1		·	
9. 1, 1-dichloroethylene	0.010	0.01	I I	1	1			
0. 1,2-trans-dichloroethylene	0.010	0.01	ļ	1	1			
1. 2,4-dichTorophenol	0.010	0.01		!	1	•		
2. 1,2-dichloropropane	0.010	0.01	ļ	I	11			
3. 1,3-dichloropropylene	0.010	0.01		1	1	1. C	*	
4. 2,4-dimethylphenol	0.010	0.01	1		1			

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

Pollutant	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	Above Treat- able Concen- tration	
at a / distrotaluese	0.010	0.01	1	1	1				
35. 2,4-dimitrotoluene	0.010	0.01	1	1	1				
30. 2,0-dinhenvibydrazine	0.010	0.01	. 1	1	1				
37. 1,2-dipiteny myor domo	0.010	0.01	1	1					,
30 fluoranthene	0.010	0.01	1						
40 A-chlorophenyl phenyl ether	0.010	0.01	1	1					
41 4-bromonhenvl phenvl ether	0.010	0.01	1	l					
42. bis(2-chloroisopropyl) ether	0.010	0.01		1					
43. bis(2-chloroethoxy) methane	0.010	0.01		1	1				
44. methylene chloride	0.010	0.01		1					
45. methyl chloride	0.010	0.01	1	1 .	1				
46. methyl bromide	0.010	0.01		1	i				
47. bromoform	0.010	0.01		i	i				
48. dichlorobromomethane	0.010	0.01	1	i	· · · i				
49. trichlorofluoromethane	0.010	0.01	1	1	i				
50. dichlorodifluoromethane	0.010	0.01	i	i	1				
51. chlorodibromomethane	0.010	0.01	1	i	1				
52. hexachlorobutadiene	0.010	0.01	i	i	1.				
53. hexachlorocyclopentadiene	0.010	0.01	j	i	1				
54. isophorone	0.010	0.01	i	1	1		•	1	
55. naphthalene	0.010	0.01	i	<u> </u>	1				
56. nitrobenzene	0.010	0.01	1	.1	1				
57. 2-nitrophenol	0.010	0.01	1	1	1				
58. 4-nitrophenol	0.010	0.01	1	1	1				
59. 2,4-dinicrophenol	0.010	0.01	1	1	1				
60. 4,6-dinitro-o-cresoi	0.010	0.01	1	1	1				
61. N-httrosodimetry lamine	0.010	0.01	1	1	1	*			
62. N-nitrosodi-n-propylamine	0.010	0.01	1 -	1	1				
03. N-IIIII03001-II-propheta	0.010	0.01	1	1					
65 shapel	0.010	0.01	1	ļ	1			1	
66 big(2-ethylbexyl) phthalate	0.010	0.01	1	ļ	•				
67 butyl benzyl ohthalate	0.010	0.01		· ·			t and the second se		
68 di-n-butyl phthalate	0.010	0.01	1	1					

SECT

- VI

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

•	··· · ·									11.11.1 1 1	DRTN
	<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	TARV NA
69	. di-n-octyl phthalate		0.010	0.01	1	. 1	1		· · · · · · · · · · · · · · · · · · ·	[3
- 70. - 71	. diethyl phthalate		0.010	0.01	- 1 -	1	i	- · · ·		с ц	J.
72	benzo(a)anthracene		0.010	0.01	1	1	1			_ E	-
73	. benzo(a)pyrene				1		1	ر. باید که در مراج	المناصلية أيمان الماردين	<u>}</u>	۲
74.	3,4-benzofluoranthene		0.010	0.01		1			. · · · · ·		4
- 75.	benzo(k)fluoranthene		0.010	0.01	i	1	i				
70.	acenaphthulono		0.010	0.01	1	1	i				S
78.	anthracene (c)		0.010	0.01	1	1	1	на страна страна 		, E	ð
79.	benzo(gni)perylene	·	0.010	0.01		1	1	1. N. K.	-	A	1
80.	fluorene		0.010	0.01	. 1	1			Т	Ĥ	E.
81.	phenanthrene (c)	•	0.010	0.01	i	1	1			Ţ,	ò
82. 83	dibenzo(a,h)anthracene		0.010	0.01	i	i	1			Ŭ	-
84.	Dyrene		0.010	0.01	1	1	i		•	н на С))
85.	tetrachloroethylene		0.010	0.01			1			A	
86.	toluene		0.010	0.01	1 .		1			E E	
87.	trichloroethylene		0.010	0.01	1	1	1			i i i i i i i i i i i i i i i i i i i	i i
88.	vinyl chloride		0.010	0.01	i	i	1			U R) 1
90	dieldrin		0.005	- 0.01	1	1	- i * -			A A	4 4
91.	chlordane		0.005	0,01	1	1	1		and a state of the second s		
92.	4, 4'-DUC		0.005	0.01	·] 1 · · ·		1		- 		
93.	4,4'-DDE		0.005	0.01		· · ·				ົ	ł
94,	4,4'-DDD		0.005	0.01	i	1	-			E	1
95. 06	alpha-endosultan		0.005	0.01	i	i i	í.			C C H	1
90. Q7	endogul fan gul fato		0.005	0.01	1	1	i			· · · · ·	
98.	endrin		0.005	0.01	5 1	1.	1	•			
99.	endrin aldehyde		0.005	0.01	1 .	E.	ł			<	
00.	heptachlor		0.005	0.01	1					н	
01.	heptachlor epoxide		0.005	0.01	1	1	1			· · · ·	
02.	alpha-BIIC		0.005	0.01		i	i	1			
03.	beta-BIK		0.005	0.01	i i	i	i				

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

Pollutant	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	0.005 0.005 0.005	0.01 0.01 0.01	1 1 1	1 1 1	1 1 1			
106. PCB-1242 (d) 107. PCB-1254 (d) 108. PCB-1221 (d)	0.005	0.01 0.01	1	1 1 1	1			
109. PCB-1232 (e) 110. PCB-1248 (e) 111. PCB-1260 (e)	0.005 0.005 0.005	0.01 0.01	1	1	1			
112. PCB-1016 (e) 113. toxaphene	0.005 0.005 0.100	0.01 0.47	1 I I I I I I I I I I I I I I I I I I I	- I 1 1	1	1		• • •
115. arsenic 116. asbestos	0.010 10 MFL	0.34 10 MFL 0.20	1 0 1	1		1		
117. beryllium 118. cadmium 119. chronium	0.002 0.005	0.049 0.07		1 1 -		1	1	1
120. copper 121. cyanide 122. lead	0.009 0.02 0.020	0.047 0.08	0	1		1	1	
123. mercury 124. nickel	0.0001 0.005 0.01	0.036 0.22 0.20	1 1 1	1 1 1			1	1
125. selenium 126. silver 127. thallium	0.02	0.07 0.34	1	1 1 1		1		1
128. zinc 129. 2,3,7,8-tetrachlorodibenzo- p-dioxin (TCDD)	0.050	0.23	Ö	•		· · · -	a a a	

(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.

۱ IV

TABLE VI-2

TOXIC POLLUTANTS NEVER DETECTED

1.	acenaphthene
2.	acrolein
3.	acrvlonitrile
5.	benzidine
6.	Carbon tetrachlorido (totrachloremetheme)
7.	chlorobenzene
8.	1.2 A-trichlorobonnone
q.	hevachlorohonzene
10	l 2-dichloroothour
10.	
10	1,1,1-tricnioroetnane
12.	
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-dichlorobengono
26	1.3-dichlorobenzene
20.	1,5 dichlorobenzene
22	2 2 - dichlorobenzene
20.	l l-dichlenesthala
29.	1,1-dichioroetnyiene
20.	2. A dishlara alloroethylene
J⊥.	2,4-dichiorophenol
32.	1,2-dichloropropane
33.	1,2-dichloropropylene (1,3-dichloropropene)
34.	2,4-dimethylphenol
35.	2,4-dinitrotoluene
36.	2,6-dinitrotoluene
37.	l,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 (dichloromethano)
45.	methyl chloride (chloromothane)
46.	methyl bromide (bromomethane)
47	bromoform (tribromomothere)
48	dichlorohromomothane)
10.	trichlorofluonenthane (1.1.4.1)
	(1)

TABLE VI-2 (Continued)

TOXIC POLLUTANTS NEVER DETECTED

50. dichlorodifluoromethane (deleted)

- 51. chlorodibromomethane
- 52. hexachlorobutadiene
- 53. hexachlorocyclopentadiene
- 54. isophorone
- 55. naphthalene
- 56. nitrobenzene
- 57. 2-nitrophenol
- 58. 4-nitrophenol
- 59. 2,6-dinitrophenol
- 60. 4,6-dinitro-o-cresol
- 61. N-nitrosodimethylamine
- 62. N-nitrosodiphenylamine
- 63. N.nitrosodi-n-propylamine
- 64. pentachlorophenol
- 65. phenol
- 67. butyl benzyl phthalate
- 68. di-n-butyl phthalate
- 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)fluoranthane (11,12-benzofluoranthene)
- 76. chrysene
- 77. acenaphthylene
- 78. anthracene
- 79. benzo(ghi)perylene (1,11-benzoperylene)
- 80. fluorene
- 81. phenanthrene
- 82. dibenzo (a,h)anthracene (1,2,5,6-dibenzanthracene)
- 83. indeno (1,2,3-cd)pyrene (w,e,-o-phenylenepyrene)
- 84. pyrene
- 85. tetrachloroethylene
- 87. trichloroethylene
- 88. vinyl chloride (chloroethylene)
- 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. Alpha-endosulfan
- 96. Beta-endosulfan
- 97. endosulfan sulfate
- 98. endrin
- 99. endrin aldehyde

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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 metal is 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 are at treatable 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 economies 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 byproduct 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 а 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 applicable to the primary nickel that are 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 Specifically, lime or some other alkaline compound technology. 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
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 Rather, ammonia enters the treatment system streams. 367) through spills in the influent (sample number process areas. Consequently, these two process streams do not require ammonia steam stripping.

Revised direct discharge compliance cost estimates for this 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 metals а 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 the 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 lime.) 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 @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.

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.

Table VIII-1

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

(March, 1982 Dollars)

	Proposa	l Costs	Promulgation Costs		
Option	<u>Capital Cost</u>	<u>Annual Cost</u>	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 and facilities involved, the manufacturing processes used, nonwater quality environmental impacts (including energy requirements), and other factors the Administrator considers appropriate. Ιn 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 it will be capable of achieving the prescribed effluent that 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 were sampled and the wastewaters analyzed. In making technical assessments of data, reviewing manufacturing processes, and assessing wastewater treatment technology options, both indirect direct dischargers have been considered as a single group. and 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 direct or nickel and cobalt subcategory has been subdivided into four potential wastewater sources. Since the water use, discharge and pollutant characteristics of each of rates, these 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 technology's performance on nonferrous of this metals wastewater because manufacturing category 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.

Table IX-1

BPT WASTEWATER DISCHARGE RATES FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

Ľ	lagtewater Stream	BPT Norm Discharg	alized ge Rate	Production
· ·		<u>1/KKg</u>	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

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XI

PRIMARY NICKEL AND COBALT SUBCATEGORY

1

TABLE IX-2

BPT MASS LIMITATIONS FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

(a) Raw Material Dust Control BPT

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

*Copper	0.146				0.07	7
*Nickel	0.148				0.09	8
Zinc	0.112				0.04	7
*Ammonia	10.260				4.51	.2
*Cobalt	0.016				0.00	7
*TSS	3.157				1.50	2
*pH	Within the range of 7.	5 to	10.0	at	all	times

(b) Cobalt Reduction Decant BPT

Pollutant	or	Maximum for	Maximum for
pollutant	property	any one day	monthly average
	mg/kg (1	.b/million lbs) of	cobalt produced
*Copper	Withi	40.660	21.400
*Nickel		41.080	27.180
Zinc		31.240	13.050
*Ammonia		2,852.000	1,254.000
*Cobalt		4.494	1.926
*TSS		877.300	417.300
*pH		in the range of 7.5	5 to 10.0 at all times

*Regulated Pollutant

TABLE IX-2 (Continued)

BPT MASS LIMITATIONS FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

(c) Nickel Reduction Decant BPT

Pollutant pollutant	or property	Maximum for any one day	Maximum for monthly average	-
	mg/kg	(lb/million lbs) of	nickel produced	
*Copper		24 1 20		

*Nickal	and the second		12./00
NICVET		24.370	16,120
Zinc		18.530	7 7 1 1
*Ammonia		1-692 000	7.744
*Cobal+		±,052.000	743.900
*	and the second	2.006	1.143
100		520.500	247,600
~рн	Within the	range of 7.5 +	0 10 0 at all times
·		j / • J · C	o roto at att times

(d) Nickel Wash Water BPT

Pollutan pollutan	t or t prop	erty	Max any	imum for one day	Maximum for monthly a	or verage
	mg/kg	(lb/mi	llion	lbs) of nic	kel powder	washed
*Copper *Nickel Zinc *Ammonia *Cobalt *TSS *pH		Within	the r	0.064 0.065 0.050 4.515 0.007 1.389 ange of 7.5	to 10.0 at	0.034 0.043 0.021 1.985 0.003 0.660 all times

*Regulated Pollutant

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BPT TREATMENT SCHEME FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

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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 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:

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

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

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

- 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 estimated the 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 the major waste streams considered for regulation. At each sampled 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 was used 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 wastewater. 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 comparing the actual discharge to the regulatory flow. by 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 (mq/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-1 (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 and operating costs are determined by what treatment it has in place and by its individual process wastewater discharge flow. As discussed above, this flow is either the actual or the BAT regulatory flow, whichever is lesser. The final step was to annualize the capital costs, and to sum the annualized capital costs, and the operating and maintenance costs for each plant, yielding the cost of compliance for the subcategory (see Table 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 nonpreferentially.

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

<u>Pollutant</u>	Raw Waste <u>(kg/yr)</u>	Option A Discharge (kg/yr)	Option A Removed (kg/yr)	Option C Discharge (kg/yr)	Option C Removed <u>(kg/yr)</u>	
Antimony Arsenic Cadmium Chromium (Total)	0.11 0 0.04 0	0.11 0 0.04 0	0 0 0 0	0.11 0 0.04 0	0 0 0 0	
Copper Cyanide (Total) Lead Mercury	8.58 0 0 0	3.47 0 0 0	5.11 0 0 0	2.34 0 0 0	6.24 0 0 0	\$
Nickei Selenium Silver Thallium	239.96 1.08 0 0	4,43 1.08 0 0	235.53 0 0 0	1.32 1.08 0	238.64 0 0	•
Zinc TOTAL PRIORITY POLLUTANTS	2.26 252.04	1.98 11.12	0.29 240.92	1.38 6.27	0.88 245.77	•
Ammonia Cobalt TOTAL NONCONVENTIONALS	2,639.55 27.60	2,635.23 0.30	4.32 27.30	2,635.23 0.20	4.32 27.39	
TSS	71.98	71.87	0.11	2,635.43	31.71 56.41	
TOTAL CONVENTIONALS	71.98 2,991.16	71.87 2,718.51	0.11 272.65	15.57 2,657.27	56.41 333.89	

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POLLUTANT REMOVAL ESTIMATES FOR DIRECT DISCHARGERS PRIMARY NICKEL AND COBALT SUBCATEGORY

Option A - Ammonia steam stripping, chemical precipitation, and sedimentation Option C - Ammonia steam stripping, chemical precipitation, sedimentation, and filtration PRIMARY NICKEL AND COBALT SUBCATEGORY

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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	<u>Annual Cost</u>
A	31,075	20,053	71,400	27,200
C	31,075	27,844	86,500	31,800

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Table X-3

BAT WASTEWATER DISCHARGE RATES FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

T		BAT Norm Discharg	nalized <u>se Rate</u>	Production	
<u>v</u>	vastewater Stream	L/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	

PRIMARY NICKEL AND COBALT SUBCATEGORY

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TABLE X-4

BAT MASS LIMITATIONS FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

(a) Raw Material Dust Control BAT

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

*Copper	0.099	0.047
*Nickel	0.042	0.029
Zinc	0.079	0.032
*Ammonia	10.260	4.512
*Cobalt	0.011	0.005
*Cobalt	0.011	0.005

(b) Cobalt Reduction Decant BAT

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Pollutant	or	Maximum	for	Maximum	for
pollutant	property	any one	day	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
*Cobalt	21330	

*Regulated Pollutant

TABLE X-4 (Continued)

BAT MASS LIMITATIONS FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

(c) <u>Nickel</u> <u>Reduction</u> <u>Decant</u> BAT

Pollutant or	Maximum for	Maximum for
pollutant property	any one day	monthly average
mg/kg (lb/r	million lbs) of	nickel produced
*Copper	16.250	7.744
*Nickel	6.982	4.697
Zinc	12.950	5.332
*Ammonia	1,692.000	743.900
*Cobalt	1.777	0.889
(d) <u>Nickel Wash Water</u>	BAT	
Pollutant or	Maximum for	Maximum for
pollutant property	any one day	monthly average
mg/kg (lb/mil	lion lbs) of nic	ckel powder washed
*Copper	0.043	0.021
*Nickel	0.019	0.013
Zinc	0.035	0.014
*Ammonia	4.515	1.985
*Cobalt	0.005	0.002

*Regulated Pollutant



BAT TREATMENT SCHEME FOR OPTION A

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BAT TREATMENT SCHEME FOR OPTION C

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PRIMARY NICKEL AND COBALT SUBCATEGORY

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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)
- o Chemical precipitation and sedimentation

OPTION C

- 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/1) and the production normalized wastewater discharge flows (l/kkg). The results of these calculations are the productionbased 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

PRIMARY NICKEL

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COBALT

SUBCATEGORY

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Wastewater Stream		NSPS Norn Discharg <u>1/kkg</u>	nalized ge Rate gal/ton	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

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Table XI-2

NSPS FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

(a) Raw Material Dust Control NSPS

Pollutant	or	Maximum	for	Maximum	for	<i>.</i> .
pollutant	property	any one	day	шопспту	average	

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

.

*Copper *Nickel Zinc *Ammonia *Cobalt *TSS *pH	Within t	the	0.099 0.042 0.079 10.260 0.011 1.155 range of 7.5	to	10.0	at	0.047 0.029 0.032 4.512 0.005 0.924 all times
*pH	Within t	tne	range of 7.5	ιU	T0.0	ac	uii dimes

(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	Within	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
*TSS		321.000	256.800
*pH		the range of 7.5	5 to 10.0 at all times

*Regulated Pollutant

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TABLE XI-2 (Continued)

NSPS FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

(c) <u>Nickel Reduction Decant</u> NSPS

Pollutant	or	Maximum for	Maximum for
pollutant	property	any one day	monthly average
	mg/kg	(lb/million lbs) of	nickel produced
*Copper	Wit	16.250	7.744
*Nickel		6.982	4.697
Zinc		12.950	5.332
*Ammonia		1,692.000	743.900
*Cobalt		1.777	0.889
*TSS		190.400	152.300
*pH		hin the range of 7.5	5 to 10.0 at all times

(d) Nickel Wash Water NSPS

Pollutan	t or	Maximum for	Maximum for
pollutan	t property	any one day	monthly average
	mg/kg (lb/n	nillion lbs) of r	nickel powder washed
*Copper	With	0.043	0.021
*Nickel		0.019	0.013
Zinc		0.035	0.014
*Ammonia		4.515	1.985
*Cobalt		0.005	0.002
*TSS		0.508	0.406
*pH		in the range of 7	7.5 to 10.0 at all times

*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

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

OPTION C

- 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 passthrough 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 and the discharge rates determined in Sections X and XI for C), and NSPS, respectively. A mass of pollutant per mass of BAT (mg/kg) allocation is given for each subdivision within product the subcategory. This pollutant allocation is based on the product of the treatable concentration from the promulgated (mg/1) and the production normalized wastewater treatment discharge rate (1/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

		PSNS Normalized Discharge Rate		Production
W	astewater Stream	1/kkg	gal/ton	Normarizing rarameter
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	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		0.047
*Nickel	· · ·	0.042		0.029
Zinc		0.079		0.032
*Ammonia		10.260	•	4.512
*Cobalt		0.011	10 A	0.005

(b) Cobalt Reduction Decant PSNS

Pollutant	or	Maximum for	Maximum for
pollutant	property	any one day	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

*Regulated Pollutant

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TABLE XII-2 (Continued)

PSNS FOR THE PRIMARY NICKEL AND COBALT SUBCATEGORY

(c) <u>Nickel Reduction</u> <u>Decant</u> PSNS

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Pollutant or	Maximum for	Maximum for
pollutant propert	y any one day	monthly average
mg/kg	(lb/million lbs) o	f nickel produced
*Copper	16.250	7.744
*Nickel	6.982	4.697
Zinc	12.950	5.332
*Ammonia	1,692.000	743.900
*Cobalt	1.777	0.889
(d) <u>Nickel Wash W</u>	ater PSNS	
Pollutant or	Maximum for	Maximum for
pollutant propert	y any one day	monthly average
mg/kg (]	.b/million lbs) of r	nickel powder washed
*Copper	0.043	0.021
*Nickel	0.019	0.013
Zinc	0.035	0.014
*Ammonia	4.515	1.985
*Cobalt	0.005	0.002
*Regulated Pollu	tant	

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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NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY

DEVELOPMENT DOCUMENT SUPPLEMENT

for the

Secondary Nickel Subcategory

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May 1989

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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 Chemical sedimentation technology. precipitation and precipitation and sedimentation technology represents the best meet the in this subcategory. To technology existina 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

Pollutant Pollutant Property		Maximum Any One	Maximum For Any One Day		Maximum For Monthly Average		
mg/kg	(lb/millio	n lbs) of	slag	input	to re	claim	process
Chromium (Copper Nickel TSS pH	total) Within the :	5.65 24.4 24.6 526.80 range of	53 10 70 00 7.5 to	10.0	2. 12. 16. 250. at al	313 850 320 500 1 time	es.

(b) Acid Reclaim Leaching Filtrate NSPS

Pollutant Pollutant Property		Maximum For Any One Day		Maximum For Monthly Average		
mg/kg (lb/r	nillion	lbs) of	acid	reclaim	nickel	produced
Chromium (total) Copper Nickel		2.1 9.4 9.5	98 91 90		0.089 4.995 6.344	
TSS pH Within	n the ra	214.8 ange of	00 7.5 ta	0 10.0 at	87.400 t all t	imes

(C) Acid Reclaim Leaching Belt Filter Backwash NSPS

Pollu Pollutant	tant Property	2	Maxi Any	mum One	For Day	M Mon	aximum ithly Ave	For erage
mg/k	g (lb/mi	Llion	lbs)	of	acid	reclai	m nicke	l produced
Chromium Copper	(total)			0.52	28 78		0.21	5
Nickel TSS			4	2.30 9.16)2 50		1.52 23.38	3
pH	Within	the r	ange	of	7.5	to 10.0	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 Pollutant Property		Maximum For Any One Day		Maximum For Monthly Average			
							ge
mg/kg	(lb/million	lbs) of	slag	input	to re	eclaim	process
Chromium (t	cotal)	5.6	53		2	.313	
Copper		24.4	LO		12.	.850	
Nickel		24.6	70		16	320	

(b) Acid Reclaim Leaching Filtrate PSES

Pollutant Pollutant Property		Maximum For Any One Day		Maximum For Monthly Average		
mg/kg	(lb/million	lbs) of	acid	reclaim	nickel	produced
Chromium (t	otal)	2.19	98		0.899	
Copper		9.49) 1	-	4.995	
Nickel		9.59	€0		6.344	

Maximum For Any One Day n 1bs) of acid 0.528 2.278 2.302 d based on the al precipitatic ing pretreatmen	Maximum For Monthly Average reclaim nickel produced 0.216 1.199 1.523 e performance achievable on and sedimentation (lime at standards for new sou	e by e and ırces
Any One Day n 1bs) of acid 0.528 2.278 2.302 d based on the al precipitatic ing pretreatmen	Monthly Average reclaim nickel produced 0.216 1.199 1.523 e performance achievable on and sedimentation (lime at standards for new sou	e by ≥ and ırces
n lbs) of acid 0.528 2.278 2.302 d based on the al precipitatic ing pretreatmen	reclaim nickel produced 0.216 1.199 1.523 e performance achievable on and sedimentation (lime at standards for new sou	e by ≥ and ırces
0.528 2.278 2.302 d based on the al precipitatio ing pretreatmen	0.216 1.199 1.523 e performance achievable on and sedimentation (lime at standards for new sou	e by e and irces
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linge DENG		
TTURP LOND		÷
Maximum For	Maximum For	
Any One Day	Monthly Average	
n lbs) of slag	input to reclaim process	
5.653	2.313	
24.410	12.850	
24.670	16.320	
ching Filtrate	PSNS	
Maximum For	Maximum For	
Any One Day	Monthly Average	
n lbs) of acid	reclaim nickel produced	-
2.198	0.899	
9.491	4.995	
9.590	6.344	
ching Belt Filt	er Backwash PSNS	
Maximum For	Maximum For	· .
Any One Day	Monthly Average	
) of acid recla	im nickel produced	
0.528	0.216	
2.278	1.199	
2.302	1.523	
	lings PSNS Maximum For Any One Day n 1bs) of slag 5.653 24.410 24.670 ching Filtrate Maximum For Any One Day n 1bs) of acid 2.198 9.491 9.590 ching Belt Filt Maximum For Any One Day) of acid recla 0.528 2.302	lingsPSNSMaximum For Any One DayMaximum For Monthly Averagen lbs) of slag input to reclaim process5.6532.31324.41012.85024.67016.320ching FiltratePSNSMaximum For Any One DayMaximum For Monthly Averagen lbs) of acid reclaim nickel produced2.1980.8999.4914.9959.5906.344Ching Belt Filter BackwashPSNSMaximum For Any One DayMonthly Average0 of acid reclaim nickel produced0.5280.2162.2781.1992.3021.523

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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 Slag reclamation is a wet mechanical granulation reclamation. scrap operation. Acid reclamation and reclamation are hydrometallurgical refining processes. One plant in the U.S. reclaims nickel from slag and pickling acids, and a second plant. nickel from scrap. Secondary nickel reclaims 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_2CO_3) 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 а 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:

- 1. 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

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 <u>(15-35)</u>	1945- 1926 (35-55)	1925- 1906 (55-75)	Total
Direct	0	0	0	0	0
	0	0	0	l	1
Indirect	U			0	1
Zero	1	• O	U		
Total	l	0	. 0	1	2

TABLE III-2

PRODUCTION RANGES FOR THE SECONDARY NICKEL SUBCATEGORY

Production Ranges for 1982 (Tons/Year)a

Number of Plants

1

0

1

2

0 - 5050 - 100 500 - 1,000

Total

(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 <u>Wastewater</u> *
Slag Reclaim	1	
Slag Reclaim Tailings	1	1
Acid Reclaim	1	
Acid Reclaim Leaching Filtrate	· · · · · · · · · · · · · · · · · · ·	·····
Acid Reclaim Belt Filter Backwash	. 1	1
Scrap Reclaim	1	

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







iii) Scrap Reclaim



Figure III-1

SECONDARY NICKEL MANUFACTURING PROCESSES



GEOGRAPHIC LOCATIONS OF SECONDARY NICKEL SUBCATEGORY PLANTS

3954

SECONDARY NICKEL SUBCATEGORY SECT T TTT

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 in order to precipitate nickel as nickel carbonate. ash 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

SECT - IV

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

\mathbf{PNP}

Slag reclaim tailings

slag input to reclaim process

2. Acid reclaim leaching filtrate

acid reclaim nickel produced

produced

3. Acid reclaim leaching belt filter acid reclaim nickel backwash

At proposal the production normalizing parameter for slag 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 and production information which allowed EPA to recalculate the production normalized flow. Based on the new information, EPA 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. Α 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 the pollutants deemed appropriate. Because the analytical standard for TCDD was judged to be too hazardous to be made generally available, samples were never analyzed for this pollutant. samples were also not analyzed for asbestos. There is no reason to expect that TCDD or asbestos would be present in nonferrous metals manufacturing wastewater. 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 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 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 subcategory has been divided into three subdivisions, nickel so promulgated regulation contains mass that the discharge limitations and standards for three unit processes discharging wastewater. Differences process 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. The two water flow, use and wastewater discharge ratios, are differentiated by the flow value used in calculation. Water use defined as the volume of water required for a given process is 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, and 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 flow is related to acid reclaim nickel production. As such, the 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
in their effluent. The responses for the toxic metals are summarized below.

Poll	utant	an a	Known	Present	Believed	Present
Antimony Arsenic Beryllium Cadmium Chromium Copper Lead Mercury				0 0 0 1 1 0 0		0 0 0 1 1 0 0
Selenium Silver Thallium Zinc				1 0 0 0 1		1 0 0 0 1

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, equipmentspecific, 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 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.

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 Water Use Flow	Production Normalized Discharge Flow
1169	0	}	12,848	12,848
				r

3962

TABLE V-2

WATER USE AND DISCHARGE RATES FOR ACID RECLAIM LEACHING FILTRATE

(1/kkg of acid reclaim nickel produced)

Plant <u>Code</u>	Percer <u>or</u>	nt Recyc <u>Reuse</u>	cle	Production Normalized Water Use Flow	Production Normalized <u>Discharge</u> 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 <u>Reuse</u>	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1169	0	1,199	1,199

Table V-4

SECONDARY NICKEL SAMPLING DATA SLAG RECLAIM TAILINGS POND INFLUENT RAW WASTEWATER SAMPLING DATA

	ר ד ד		Stream	Sample	Con	centrations	(mg/l)	E C
	Pollutant		Code	Typet	Source	Day 1	Day 2	Day
Toxic	e Pollutants	•	1			·		АКх
114.	antimony		986	1	<0.002	<0.002	- - -	NTC
115.	arsenic		986	1	<0.005	0.93		К EL
117.	beryllium		986	1	<0.01	<0.02		
118.	cadmium		986	1	<0.05	<0.027		CATI
119.	chromium (total)		986	1	<0.10	5.35		GOR
120.	copper		986	1	0.170	0.59	-	ĸ
121.	cyanide (total)	× .	986	1	<0.02	<0.02		о Б
122.	lead		986	1	<0.10	<0.2		ĊŢ
123.	mercury		986	1	<0.002	<0.002		
124.	nickel		986	1	0.20	7.5		- - - -
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		

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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 Pollulants			
acidity .	986	I	
alkalinity	986	1	61 9,000 E
chloride	986	1	12 550
	986	1	0.43 22
fluoride	760		
sulfate	986	. 1	130 42
total solids (TS)	986	1	330 16,000
Conventional Pollutants			
oil and grease	986	1	<1 10
total suspended solids (TSS)	986	1	22 16,000
pH (standard units)	986	1	6.64 11.38

tSample Type Code: 1 - One-time grab

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Table V-5

SECONDARY NICKEL SAMPLING DATA SLAG RECLAIM TAILINGS POND EFFLUENT RAW WASTEWATER SAMPLING DATA

<u>Pollutant</u>	Stream Code	Sample Typet	<u>Con</u> Source	<u>centration</u> Day 1	<u>s (mg/l)</u> Day 2	Day 3 N
Toxic Pollutants						DAR
114. antimony	987	1	<0.002	<0.002		NI NI
115. arsenic	987	1	<0.005	-0.290	اری اور	CKEI
117. beryllium	987	1	<0.01	<0.02		US 1
118. cadmium	987	1	<0.05	<0.02		ВСАЛ
119. chromium (total)	987	1	<0.10	0.170		EGO
120. copper	987	1	0.170	27.0		RY
121. cyanide (total)	987	, 1	<0.02	<0.02		N N
122. lead	987	1	<0.10	<0.20		ECT
123. mercury	987	1	<0.002	<0.002		ו <
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	1	<0.05	<0.02		

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Table V-5 (Continued)

SECONDARY NICKEL SAMPLING DATA SLAG RECLAIM TAILINGS POND EFFLUENT RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Typet	Con Source	centrations Day 1	(mg/1) Day 2	Day 3 ONDA
Nonconventional Pollutants						RY
acidity	987	1	<1	<1		NIC
alkalinity	987	1	61	088		KEL
chloride	987	. 1	12	25	,	EDS.
fluoride	987	1	0.43	0.41		CAT
sulfate	987	1	130	18		EGOR
total solids (TS)	987	1	330 1	1,800		×
Conventional Pollutants						U D
oil and grease	987	1	<1	12		(F
total suspended solids (TSS)	987	1	22	670		<
pH (standard units)	987	1	6.64	11.01		

tSample Type Code: 1 - One-time grab

3968

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Table V-6

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SECONDARY NICKEL SAMPLING DATA ACID RECLAIM LEACHING FILTRATE RAW WASTEWATER SAMPLING DATA

		Stream	Sample	Conc	entration	18 (me/l)	SEC
	Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3 Z
Toxic	e Pollutants	• • • •					JARY
114.	antimony	004	. 1 .	<0.002	<0.002	:	NIC
115.	arsenic	004	1	<0.005	0.029)KEL
117.	beryllium	004	1	<0.01	<0.020	· · · · · · · · · · · · · · · · · · ·	SUE
118.	cadmium	004	1	<0.05	<0.02	· · · ·	3CAT
119.	chromium (total)	004	1	<0.10	3.40	•	EGOF
120.	copper	004	1	0.170	38.0		NA NA
121.	cyanide (total)	004	1	<0,02	<0.02	*	IS
122.	lead	004	1	<0.10	<0.2		CT
123.	mercury	004	× 1 :	<0.002	<0.002		ן ב
124.	nickel	004		0.20	49.0		a Aliana Aliana
125.	selenium	004	на. 11 майты	<0.01	<0.01		
126.	silver	004	1	<0.002	0.008		
127.	thallium	004	·· 1	<0.005	<0.002	· · ·	
128.	zinc	004	1	<0.05	0.26	· · ·	•

Table V-6 (Continued)

SECONDARY NICKEL SAMPLING DATA ACID RECLAIM LEACHING FILTRATE RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Typet	Co Source	ncentrations Day 1	3 (mg/1) Day 2	Day 3
Nonconventional Pollutants				•		I XX
acidity	004	1	<1	<1		NICI
alkalinity	004	1	61	52		XEL L
chloride	004	1	12	68	· · · · · · · · · · · · · · · · · · ·	SUB
fluoride	004	1	0.43	1.7	•	CATE
sulfate	004	1	130	1,000		GORY
total solids (TS)	004	1	330	2,800		
Conventional Pollutants					- :	N M M
oil and grease	004	м. 1 .,	<1	10	•	Η H
total suspended solids (TSS)	004	1	22	350		<
pH (standard units)	004	1	6.64	7.39		-

tSample Type Code: 1 - One-time grab

3970

Table V-7

SECONDARY NICKEL SAMPLING DATA ACID RECLAIM LEACHING BELT FILTER BACKWASH RAW WASTEWATER SAMPLING DATA

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<u>Pollutant</u>	Stream _Code	Sample Typet	<u>Con</u> Source	centrations Day 1	(mg/1) Day 2	Day 3 N
<u>Toxic Pollutants</u>						DARY
114. antimony	005		<0.002	0.004		NIC
115. arsenic	005		<0.005	0.013	 	
117. beryllium	005	1	<0.01	<0.02		SUE
118. cadmium	005	1	<0.05	<0.02		°CATI
119. chromium (total)	005	1	<0.10	0.88		EGOR
120. copper	005	1	0.170	60.0		Ä
121. cyanide (total)	005	1	<0.02	<0.02		N H
122. lead	005	1	<0.10	<0.2		ĊĦ
123. mercury	005	1	<0.002	<0.002		۲ ح
124. nickel	005	1	0.20	96.0		
125. selenium	005	1	<0.01	<0.01	· .	
126. silver	005	Ĩ	<0.002	0.008		
127. thallium	005	1	<0.005	<0.002		
128. zinc	005	1	<0.05	0.12		•

Table V-7 (Continued)

SECONDARY NICKEL SAMPLING DATA ACID RECLAIM LEACHING BELT FILTER BACKWASH RAW WASTEWATER SAMPLING DATA

Pollutant Nonconventional Pollutants	Stream Code	Sample Typet	Co Source	ncentrations Day 1	(mg/1) Day 2	Day 3
acidity	005	1	<1	<1		LN Y
alkalinity	005	1	61	51		LCKEL
chloride	005	1	12	22	·	SUI
fluoride	005	1	0.43	1.7		ЗСАТ
sulfate	005	· 1	130	98	,	」 王 G O
total solids (TS)	005	1	330	3,760		RY
Conventional Pollutants				· · · ·		SH
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

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SAMPLING SITES AT SECONDARY NICKEL PLANT A

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SECONDARY NICKEL SUBCATEGORY

SECT - V

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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 the technologies used to remove toxic metals do so by of 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. Eff

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

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

Pollutant	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentration (mg/l)(b)	Number of Streams Analyzed	Number of Samples Analyzed	Not Detected	Detected Below Quantification Concentration	Detected Below Treatable <u>Concentration</u>	Detected Above Treatable Concentration H
 114. antimony 115. arsenic 117. beryllium 118. cadalum 119. chromium 120. copper 121. cyanide (c) 122. lead 123. mercury 124. nickel 125. selenium 126. silver 127. thallium 128. zinc oil and grease total suspended solids (TSS) 	0, 100 0, 010 0, 002 0, 002 0, 005 0, 009 0, 020 0, 020 0, 020 0, 005 0, 005 0, 01 0, 02 0, 01 0, 02 0, 100 0, 050 5, 0 1, 0	0. 47 0. 34 0. 20 0. 049 0. 07 0. 39 0. 047 0. 08 0. 036 0. 22 0. 20 0. 07 0. 34 0. 23 10. 0 2. 6	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	· · · · · · · · · · · · · · · · · · ·	3 0 3 0 0 3 3 3 0 3 3 0 3 3 0 3 3 0 0 3 3 0	0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	OLOSSOCATEGORY SEC

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

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(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, Mirch 1979.

TABLE VI-2

TOXIC POLLUTANTS NEVER DETECTED

1. 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

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dichlorodifluoromethane (deleted)*
50.
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- 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-endosulfan* 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 in 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 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 to of different alkalinity to reduce treatment combine streams chemical requirements. The one discharging plant in this subcategory currently has a combined wastewater treatment system treating nickel forming and acid reclaim wastewater, consisting lime precipitation and sedimentation. Two options have been of 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 is used to remove suspended solids filtration 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 filters or pressure filters would perform satisfactorily. sand 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 proposal and the revised costs for the final regulation are for 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 the recommended technology of lime precipitation on and By the addition of a small excess of lime during filtration. 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 will similarly not be EP toxic if the recommended sludges 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 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, as amended at 45 FR 86973 (December 31, 1980)]. 1980), The 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 FR 31, Finally, RCRA regulations establish standards 1980)]. for hazardous waste treatment, storage, and disposal facilities allowed to receive such wastes. See 40 CFR Part 464 [46 FR 2802 (January 12, 1981), 47 FR 32274 (July 26, 1982)].

Even if these wastes are not identified as hazardous, they still must be disposed of in compliance with the Subtitle D open dumping standards, implementing 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

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)

	Proposa	l Costs	Promulgation Costs		
<u>Option</u>	Capital Cost	Annual Cost	Capital Cost	Annual Cost	
Α	286,137	119,339	320,100	161,200	
С	341,274	147,750	387,300	196,200	
	(286,549)*	(119,616)*	(320,500)*	(161,500)*	

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SECTION IX

BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE

The plants within the secondary nickel subcategory were studied as to their wastewater disposal practices and it was determined that BPT and BAT are not applicable to this subcategory. This is because there are no direct dischargers of process wastewater. The secondary nickel subcategory is regulated under New Source Performance Standards in Section XI and Pretreatment Standards in Section XII.

SECONDARY NICKEL SUBCATEGORY SECT - X

SECTION X

BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE

As described in Section IX, BAT is not applicable to the secondary nickel subcategory because none of the plants in the subcategory directly discharge any wastewater to surface waters. Regulation of the secondary nickel subcategory is covered in Section XI under New Source Performance Standards and Section XII under Pretreatment Standards.

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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 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 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 Therefore, EPA has considered existing plant. 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 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

Therefore, a unit of production variability from plant to plant. 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 (l/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 <u>Federal Register</u> 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 (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 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 the 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 operation mass of pollutant generated per mass of protured). This value, referred to as the raw waste, product (i.e., manufactured). was used to estimate the mass of toxic pollutants generated within secondary nickel subcategory. pollutant the The 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.

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 multiplying the achievable concentration values attainable by with the option (mg/1) 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 nickel subcategory have been revised since proposal secondary 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 associated with installation and operation of wastewater treatment technologies to plant process wastewater, discharge. EPA applied the model to each plant. The plant's investment and operating costs are determined by what treatment it has in place its individual process wastewater discharge flow. and by As discussed above, this flow is either the actual or the NSPS regulatory flow, whichever is lesser. The final step was to annualize the capital costs, and to sum the annualized capital and the operating and maintenance costs for each plant, costs yielding the cost of compliance for the subcategory. Ä 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 The toxic pollutants arsenic and zinc were and pH. 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 they will be effectively controlled when the regulated because 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 $12,848 \ 1/kkg \ (3,079 \ gal/ton)$ 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 l/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

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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

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

	NSPS No Discha	rmalized rge Rate	Production Normalizing
Building Block	<u>(1/kkg)</u>	<u>(gal/ton)</u>	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) <u>Slag Reclaim Tailings</u> NSPS

Pollutant	or	Maximum	for	Max	cimum	for
pollutant	property	any one	day	mor	nthly	average
mg/kg	(lb/million	lbs) of	slag	input	to re	claim proces
Arsenic		2(5.850		. "	11.950
*Chromium			5.653			2.313
*Copper		24	4.410	·. ·.	*	12.850
*Nickel		24	4.670	1		16.320
Zinc	4 82	18	8.760			7.837
*TSS		52	5.800			250,500
*pH	Within the	range of	7.5 t	to 10.0) at a	ll times

(b) Acid Reclaim Leaching Filtrate NSPS

Pollutant pollutant	or property	Maximum for any one day	Maximum for monthly average
mg/kg	g (lb/million	lbs) of acid	reclaim nickel produced
Arsenic		10.440	4.645
*Chromium		2.198	0.899
*Copper		9.491	4.995
*Nickel		9.590	6.344
Zinc		7.293	3.047
*TSS		204.800	97.400
*pH	Within the	range of 7.5 t	to 10.0 at all times

(c) Acid Reclaim Leaching Belt Filter Backwash NSPS

Pollutant pollutant	or property	Maxi any	mum for one day	Maxim month	um for ly average
mg/kg	(1b/million	lbs)	of acid	reclaim	nickel produce
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
*TSS	,		49.160		23.380
*pH	Within the	range	of 7.5 t	o 10.0 a	t all times

*Regulated Pollutant





NSPS TREATMENT SCHEME FOR OPTION A

4002

SECONDARY NICKEL SUBCATEGORY SECT

XI





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Figure XI-3

NSPS TREATMENT SCHEME FOR OPTION C WITHOUT FILTRATION FOR SLAG RECLAIM TAILINGS

SECONDARY NICKEL SUBCATEGORY SECT

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SECONDARY NICKEL SUBCATEGORY

SECT - XII

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, to interfere with, or are otherwise incompatible with the operation publicly owned treatment works (POTW). The Clean Water of 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 opportunity to incorporate the best available demonstrated nologies, including process changes, in-plant controls, and the technologies, end-of-pipe treatment technologies, and to use plant site selection to ensure adequate treatment system installation. Pretreatment standards are to be technology based, analogous to the best available 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 sludge disposal practices. In determining chosen 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

industry cost and pollutant removal estimates of The 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 Table XII-1 (Page 4009) shows the revised pollutant comments. 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-ofpipe 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 this subcategory because it would not remove much additional pollutant beyond that removed with lime and settle treatment. The 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 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. We are promulgating PSES to prevent passof chromium, copper, and nickel. through 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 for each subdivision within the subcategory. This pollutant allocation is based on the product of the concentration achievable from the model treatment (mg/l) and the production normalized wastewater discharge rate (l/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

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Poilutant	Total Raw Discharge <u>(kg/yr)</u>	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) Lead	0 16.90 0 12.20 1,606.38 0 0	0 16.90 0 4.95 34.18 0 0	0 0 7.25 1,572.20 0 0	0 16.90 0 4.13 22.98 0 0	0 0 8.07 1,583.40 0	0 16.90 0 4.94 34.03 0	0 0 7.26 1,572.35 0	
Nickel Selenium Silver Thallium Zinc	0 51.68 0 0 0 0.19	0 6.41 0 0 0 0.19	0 45.27 0 0 0 0	0 6.00 0 0 0 0.17	0 45.68 0 0 0 0 0.02	0 6.00 0 0 0 0.17	0 45.68 0 0 0 0	
TOTAL PRIORITY POLLUTA	NTS 1,687.35	62.63	1,624.72	50.18	1,637.17	62.04	1,625.31	
Ammonia Cobalt Fluoride TOTAL NONCONVENTIONALS	0 0 23.89	0 0 23.89		0 0 23.89	0 0 0	0 0 23.89	0 0 0	
Tee	۲۵۰۲	23.89	. U	23.89	0	23.89	Ú ·	
	932,833.74 699.12	581.35	932,126.65	153.20 581.35	932,680.54	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 POLLUTANTS	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

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SECONDARY NICKEL SUBCATEGORY SEC

SECT - XII

Table XII-2

COST OF COMPLIANCE FOR THE SECONDARY NICKEL SUBCATEGORY INDIRECT DISCHARGERS

(March, 1982 Dollars)

	Proposa	l Costs	Promulgati	on Costs
<u>Option</u>	Capital Cost	Annual Cost	Capital Cost	<u>Annual Cost</u>
А	286,137	119,339	320,100	161,200
С	341,274	147,750	387,300	196,200
· · · · · · · · · · · · · · · · · · ·	(286,549)*	(119,616)*	(320,500)*	(161,500)*

*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

<u>Wastewater</u> Stream	PSES an Norma Dischan <u>(l/kkg)</u>	nd PSNS alized rge Rate <u>(gal/ton)</u>	Production Normalizing <u>Parameter</u>
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) <u>Slag Reclaim Tailings</u> PSES

Pollutant or	Maximum for	Maximum for
pollutant property	any one day	monthly average
mg/kg (lb/million	lbs) of slag	input to reclaim process
Arsenic	26.850	11.950
*Chromium	5.653	2.313
*Copper	24.410	12.850
*Nickel	24.670	16.320
Zinc	18.760	7.837

(b) Acid Reclaim Leaching Filtrate PSES

Pollutant or pollutant prope	Maximum for rty any one day	Maximum for monthly average
mg/kg (lb/	million 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	Maximum for	Maximum for
pollutant property	any one day	monthly average
mg/kg (lb/mill	ion 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

*Regulated Pollutant

TABLE XII-5

PSNS FOR THE SECONDARY NICKEL SUBCATEGORY

(a) Slag Reclaim Tailings PSNS

Pollutant c pollutant p	property	Maxi any	mum fone d	lor lay	Max: mont	imun chly	l for average	3
mg/kg	(lb/million	lbs)	of s	lag	input	to	reclaim	process
Arsenic *Chromium *Copper *Nickel Zinc			26. 5. 24. 24. 18.	850 653 410 670 760		-	11.9 2.3 12.8 16.3 7.8	950 313 350 320 337

(b) Acid Reclaim Leaching Filtrate PSNS

Maximum for any one day	Maximum for monthly average
lbs) of acid	reclaim nickel produced
10.440	4.645
2.198 9.491	4.995
9.590	6.344 3.047
-	Maximum for any one day lbs) of acid l0.440 2.198 9.491 9.590 7.293

(c) Acid Reclaim Leaching Belt Filter Backwash PSNS

Pollutant or pollutant property		Maximum for any one day		Maximum for monthly average	
mg/kg	(lb/million	lbs) of	acid	reclaim nickel produced	
Arsenic *Chromium			2.506	1.115	
*Copper *Nickel			2.278	1.199	
Zinc	·		1.751	0.731	

*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

William K. Reilly Administrator

We will be a series of the series of the

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May 1989

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

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SECONDARY TIN SUBCATEGORY SECT - I

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.

first studied the secondary tin subcategory to determine EPA whether differences in raw materials, final products, manufacturing processes, equipment, age and size of plants, or water usage, required the development of separate effluent standards for different segments of the limitations and 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 been identified for this subcategory that have 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.

SECONDARY TIN SUBCATEGORY SECT - I

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.

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SECONDARY TIN SUBCATEGORY SECT - 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> SO₂ Scrubber BPT

Pollutant or Pollutant Pro	operty	Maximum f Any One D	or l ay Mo	Maximum f nthly Ave	or erage
mg/kg	(lb/mill	ion lbs) o	f crude	tapped t	in produced
Arsenic		19.220	an a	8.5	54
Lead	÷	3.863	· · · ·	1.8	40
Iron		11.040		5.6	11
Tin		3.495		2.0	24
ISS	·	377.100		179.4	00
pH	Within	the range	of 7.5	to 10.0	at all times
· · · · ·					-

SECONDARY TIN SUBCATEGORY SECT - II

(b) <u>Dealuminizing</u> R	inse BPT							
Pollutant or	Maximum for	Maximum for						
Pollutant Property	Any One Day	Monthly Average						
mg/kg (lb/mill	ion lbs) of dea	luminized scrap produ	ced					
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 Withi	n the range of	7.5 to 10.0 at all ti	mes					
(c) <u>Tin Mud Acid Ne</u>	utralization Fi	<u>ltrate</u> BPT						
Pollutant or	Maximum for	Maximum for	<u>`</u>					
Pollutant Property	Any One Day	Monthly Average						
mg/kg (lb/million lb	s) of neutraliz	ed dewatered tin mud	produ					
Tread	2 120	1.009						
Cvanide (total)	1 464	0.606						
Fluoride	176,600	100.400						
Tin	1,918	1,110						
TSS	206,900	98.420						
pH Within	the range of 7	.5 to 10.0 at all tim	es					
(d) Tin Hydroxide W	ash BPT		_ <u></u>					
			•					
Pollutant or	Maximum for	Maximum for						
Pollutant Property	Any Óne Day	Monthly Average						
		, -	*					
mg/kg (lb/m	illion lbs) of	tin hydroxide washed						
Lead	5.020	2.391	Ŧ					
Cyanide (total)	3.466	1.434						
Fluoride	418.400	237.900						
Tin	4.542	2.630						
TSS	490.100	233.100						
pH Within	the range of 7	.5 to 10.0 at all tim	es					
			·					
					1 A	· ·	1. A. 1	
------------------	---------------------------------------	---------------------------------------	-------------	---------------------------------------	------------------	-----------------------------------	---	--------------------
(e) [°]	<u>Spent</u> El	Lectrowin	ning S	olution	from New	<u>Scrap</u>	BPT	÷.,
2011	itant or		Maxin	um for	Maxim	um for	· · · · · · · · · · · · · · · · · · ·	
Pollu	itant Pro	perty	Anv C	ne Dav	Monthly	Averac	re	
		-11	· · · · · ·		_		, -	
	ma/k	a (lb/mi	llion	lbs) of	cathode	tin pro	duced	
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vani	ide (tota	, 1)		872		2.016		,
	rido	· · /	ភន ន		3	34 300	1. A.	
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E) '	Spent El	lectrowin	ning E	olution	<u>rrom</u> Mun	icipal	Solid	
	<u>Waste</u> E	3PT					1. A.	· ·
							·	· ·
ollı	itant or		Maxin	um for	Maxim	um for		
0111	itant Pro	operty	Any C	ne Day	Monthly	Averaç	je	
		· · · · · · · · · · · · · · · · · · ·	1 <u>)</u>			_	· · · · · · · · · · · · · · · · · · ·	
n	ng/kg (lt	o/million	lbs)	of MSW	scrap used	d as ra	w materi	al
								,
ead			. 0	.050	•	0.024		
yani	ide (tota	1)	0	.035		0.014		
luor	ide		- 4	.165		2.368		
in			0	.045		0.026		
SS			4	.879		2.321		
H		Within	the r	ange of	7.5 to 10	0.0 at	all time	s
	2 S						· · · · · · · · · · · · · · · · · · ·	-
a) .	Tin Hydr	oxide Su	pernat	antfro	m Scrap	3.Du		
97	<u></u>	ONIGE DU	permue		<u>berup</u>	51 1		· .
011	itant or		Mavin	um for	Mavim	im for	·····	I
	tant Or	nortu			Monthly			
ΟΙΙ	Itani Pic	percy	Any C	me Day	MONUNLY	Averag	le	
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yani	.de (tota	ι ⊥)	16	.140	i de la compañía	6.677		
luor	ide		1,947	.000	1,10	00.07.000	· · ·	
in	4 ¹		21	.140		L2.240	74 .	
SS			2,281	.000	1,08	35.000		
H		Within	the r	ange of	7.5 to 10).0 at	all time	s
•			· · ·			an an general An an an general	· · · · · · · · · · · ·	
i	· · · · · · · · · · · · · · · · · · ·		· · · · ·					

(h) <u>Tin Hydroxide</u> Solutions and	<u>Supernatant</u> <u>from</u> <u>Sludges</u> BPT	Plating	
Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for	· · ·
forfacane fropercy	Any one bay	Monthly Average	
mg/kg (lb/mi	llion lbs) of tir	n metal recovered	from
Ę	lating solutions	and sludges	
Lead	48.300	23.000	
Cyanide (total)	33.350	13.800	i -
Fluoride	4,025.000	2,289.000	
Tin	43.700	25.300	
TSS	4,715.000	2,243.000	
pH Withi	n the range of 7.	5 to 10.0 at all	times
Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average	
mg/kg (lb	/million lbs) of	tin metal produce	ed
Lead	10.520	5.009	-
Cyanide (total)	7.263	3.005	
Fluoride	876.500	498.400	
Tin	9.517	5.510	
TSS	1,027.000	488.400	
pH Withi	n the range of 7.	5 to 10.0 at all	times
BAT is promulgate application of	d based on the pe chemical precip	erformance achieva Ditation, sedimer	able by ntation,

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:

the

(a) <u>Tin Smelter</u> SO₂ Scrubber BAT

Pollutant or	Max	ximum fo	r Maximum fo	r
Pollutant Pro	operty Any	y One Da	y Monthly Aver	age
mg/kg	(lb/million	lbs) of	crude tapped ti	n produced
Arsenic		12.790	5.70	3
Lead		2.575	1.19	6
Iron		11.040	5.61	1
Tin		3.495	2.02	4

(b) <u>Dealuminizing</u> <u>Ri</u>	nse BAT	
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/mill	ion lbs) of de	aluminized scrap produced
Lead	0.010	0.005
Cyanide (total)	0.007	0.0028
Fluoride	1.225	0.697
Tin	0.013	0.008
(c) Tin Mud Acid Ne	utralization <u>F</u>	<u>iltrate</u> BAT
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/mil	lion lbs) of n mud prod	eutralized dewatered tin uced
T.ead	1 413	0.656
Cvanide (total)	1 009	0.404
Fluoride	176 600	100.400
Tin .	1 918	1,110
* * • •		1.110
(d) <u>Tin</u> <u>Hydroxide</u> W	ash BAT	
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/m	illion lbs) of	tin hydroxide washed
Lead	3.347	1.554
Cvanide (total)	2.391	0.956
Fluoride	418.400	237.900
Tin	4.542	2.630
		·····
(e) <u>Spent</u> <u>Electrowi</u>	nning Solution	from <u>New</u> Scrap BAT
Pollutant or	Maximum for	Maximum for
Pollutant Property	Any One Day	Monthly Average
mg/kg (lb/m	illion lbs) of	cathode tin produced
Lead	4.704	2,184
Cvanide (total)	3.360	1.344
Fluoride	588.000	334.300
Fin	6.384	3.696
· •		

SECONDARY TIN SUBCATEGORY

SECT - II

(f)	<u>Spent</u> Waste	Electrowing BAT	ning	Solu	ution	from	<u>Municipal</u>	Solid	Ĺ
Poll Poll	utant d utant 1	or Property	Max: Any	imum One	for Day	Ma Mont	aximum for hly Averag	ſe	
	mg/kg	(lb/million	lbs) of	MSW	scrap	used as ra	w mat	erial
Lead Cyan Fluo Tin	ide (to ride	otal)		0.03 0.03 4.10 0.04	33 24 65 45	٤	0.015 0.010 2.368 0.026		
(g)	<u>Tin Hy</u>	ydroxide Sup	perna	itan	t fro	<u>m</u> <u>Scra</u>	i <u>p</u> BAT		
Poll Poll	utant d utant 1	or Property	Max: Any	lmum One	for Day	Ma Mont	ximum for hly Averag	le	· ,
9,	mg/kg	(lb/million	lbs) of	tin	metal	recovered	from	scrap
Lead Cyan Fluo Tin	ide (to ride	otal)	1,9	L5.54 L1.13 47.00 21.14	80 30 00 40		7.233 4.451 1,107.000 12.240	•	
(h)	<u>Tin Hy</u> Solut	vdroxide Sup ions and Sit	perna idges	atan 5 Bl	t <u>fro</u> AT	m <u>Plat</u>	ing		'.
Poll Poll	utant d utant 1	or Property	Max: Any	lmum One	for Day	Ma Mont	aximum for thly Averag	Je	
	mg/l	kg (lb/milli plat	lon I ting	lbs) solı	of t ution	in met s and	al recover sludges	ed fr	OM
Lead Cyan Fluo Tin	ide (to ride	otal)	4, 0	32.20 23.00 25.00 43.70	00 00 00 00		14.950 9.200 2,289.000 25.300		
(i)	<u>Tin H</u>	ydroxide Fil	ltrai	<u>e</u> 1	BAT		x	Γ.	
Poll Poll	utant d utant 1	or Property	Max: Any	lmum One	for Day	Ma Mont	ximum for hly Averag	Je	
	Ĩ	ng/kg (lb/m	illia	on 11	os) o	f tin	metal prod	luced	
Lead Cyan Fluo Tin	ide (to ride	otal)	87	7.0 5.00 76.50 9.5	12 09 00 17		3.256 2.004 498.400 5.510		· · ·
			:						

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 SO₂ Scrubber NSPS

Pollutant or	Maximum	for	Maximum	for	· · · ·
Pollutant Property	Any One	Day Mo	nthly Av	erage	
mg/kg (lb/mill	ion ips)	of crude	tapped	tin prod	uced
Arsenic	12.79) 0	5.	703	
Lead	2.57	75	1.	196	
Iron	11.04	10	5.0	611	
Tin	3.49	95	2.0	024	
TSS	138.00)0	110.	400	
pH Within	the range	e of 7.5	to 10.0 a	at all t	imes
(b) Dealuminizing Ri	NGO NODO	2			· · · ·
(b) <u>beataminizing</u> <u>Ri</u>	<u>inse</u> nore				
Pollutant or	Maximum	for	Maximum 1	for	
Pollutant Property	Any One	Day Mo	nthly Ave	erage	
	-			5	
mg/kg (lb/milli	on 1bs) c	of dealum	inized so	crap pro	duced
				2 - 2 ¹	
Lead	0.01	.0	0.0	005	
Cyanide (total)	0.00)7	0.0	003	
Fluoride	1.22	25	0.6	597	
Tin	0.01	.3	0.0	008	
	0.52	25 	0.4	420	
ph Within	the rang	je or /.5	to 10.0	at all	times
			· · · ·		· · · · · · · · · · · · · · · · · · ·
(c) <u>Tin Mud Acid Neu</u>	tralizati	on Filtr	ate NSPS	5	
Dellertert	Nasimum	<u> </u>		G	
Pollutant or		LOL NO	Maximum i		
Pollucanc Propercy	Any One	рау мо	nunity Ave	erage	
mg/kg (lb/mill	ion lbs)	of neutr	alized de	ewatered	tin
······································	mud	produced			
		L			
Lead	1.41	.3	0.6	556	
Cyanide (total)	1.00	9	0.4	104	
Fluoride	176.60	0 · · · · · ·	100.4	400	
Tin	1.91	.8	1.1	L10	
TSS	75.71	.0	60.5	560	
pH Within	the range	of 7.5	to 10.0 a	at all t	imes

(d) Tin Hydroxide Wash NSPS Pollutant or Maximum for Maximum for Pollutant Property Any One Day Monthly Average mg/kg (lb/million lbs) of tin hydroxide washed Lead 3.347 1.554 Cyanide (total) 2.391 0.956 Fluoride 418.400 237.900 Tin 4.542 2.630 TSS 179.300 143.400 Within the range of 7.5 to 10.0 at all times pH Spent Electrowinning Solution from New Scrap NSPS (e) Maximum for Maximum for Pollutant or Pollutant Property Any One Day Monthly Average mg/kg (lb/million lbs) of cathode tin produced Lead 4.704 2.184 1.344 Cyanide (total) 3.360 334.300 Fluoride 588.000 Tin 6.384 3.696 TSS 252.000 201.600 pH Within the range of 7.5 to 10.0 at all times Spent Electrowinning Solution from Municipal Solid (f) Waste NSPS Pollutant or Maximum for Maximum for Pollutant Property Any One Day Monthly Average mg/kg (lb/million lbs) of MSW scrap used as raw material 0.033 0.015 Lead 0.001 Cyanide (total) 0.024 Fluoride 4.165 2.368 Tin 0.045 0.026 TSS 1.785 1.428 Within the range of 7.5 to 10.0 at all times pH

(g)	<u>Tin</u>	Hydro	xide	Superi	natant	fron	n <u>Sc</u> ı	ap	NSPS	5		
Po] 11	tan+	or		Mar	cimum	for	N	laxin	num f	or		
Pollu	tant	Prop	erty	Any	y One	Day	Mor	thly	7 Ave	erag	e	
m	g/kg	(1b/	milli	on 1bs	s) of	tin r	netal	rec	cover	ed	fro	m scra
Lead					15.58	0	3		7.2	233		
Cyani	de (total	.)		11.13	0			4.4	151		· ,
Fluor	ide			1,9	947.00	0.		1,1	107.0	00		
Tin					21.14	0			12.2	240		
TSS				3	334.60	0		. 6	567.7	00		
рН			Withi	n the	range	of 7	7.5 t	:0 10).0 ā	it a	11	times
(h) '	Tin	Hydro	xide	Superi	natant	fro		ntinc				
()	$\frac{1}{501}$ u	tions	and	Sludge	s NS	PS		C I II C	2			
	<u> </u>			<u></u>								
Pollu	tant	or		Max	cimum	for	M	laxin	um f	or		
Pollu	tant	Prop	erty	Any	7 One	Day	Mor	thly	v Ave	erag	е	· -
	ma	/ka (lb/mi	llion	lbs)	of ti	n me	tal	reco	ver	ed :	Erom
	J		p	lating	g solu	tions	and	lslu	ldges	• • • • •	· ,	
Lead				÷	32.20	0			14.9	50		
Cvani	de (total) '		23.00	0			9.2	00		
Fluor	ide`			4,0	25.00	0		2,2	.89.0	00		
Tin	_				43.70	0			25.3	00		
TSS			· · .	1.7	725.00	õ		1.3	80.0	00		
рН			Withi	n the	range	of 7	7.5 t	:0 10	.0 a	ita	11 (times
(i) <u>'</u>	Tin	Hydro	xide	Filtra	ate N	SPS	·····		-			···· ·
<u></u>				<u>.</u>							•	
POLLUI	tant	or		мах	imum	IOT	M	laxin	ium r	or		
POLLU	tant	Prop	erty	Any	v One	Day	Mon	ithiy	' Ave	rag	e	1
		mg/k	g (1b	/milli	on 1b	s) of	tin	met	al p	rod	uceo	1
Lead					7.01	2			3.2	56		
Cyanic	de (total)	-	5.00	9			2.0	04		
Fluori	ide`		•	8	376.50	0	· · ·	4	98.4	00		
Tin					9.51	7 .		•	5.5	10		
TSS		•		-	375.70	0	٠.	3	00.5	00		
рH	•		With	in the	rang	e of	7.5	to 1	0.0	at	al 1	times
						<u></u>		<u> </u>				

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) Tin Smelter SO₂ Scrubber PSES Maximum for Pollutant or Maximum for Pollutant Property Any One Day Monthly Average mg/kg (lb/million lbs) of crude tapped tin produced Arsenic 12.790 5.703 Lead 2.575 1.196 5.611 Iron 11.040 Tin 2.024 3.495 (b) Dealuminizing Rinse PSES Pollutant or Maximum for Maximum for Pollutant Property Any One Day Monthly Average mg/kg (lb/million 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 (c) Tin Mud Acid Neutralization Filtrate PSES Pollutant or Maximum for Maximum for Pollutant Property Any One Day Monthly Average mg/kg (lb/million lbs) of neutralized dewatered tin mud produced Lead 1.413 0.656 Cyanide (total) 1.009 0.404 Fluoride 100.400 176.600 Tin 1.918 1.110 (d) Tin Hydroxide Wash PSES Pollutant or Maximum for Maximum for Monthly Average Pollutant Property Any One Day mg/kg (lb/million lbs) of tin hydroxide washed 3.347 1.554 Lead Cyanide (total) 2.391 0.956

237.900

2.630

418.400

4.542

Fluoride

Tin

(e) <u>Spent</u> <u>Electro</u>	winning	Solut	<u>ion f</u>	rom Ne	ew Scrap	PSES	
Pollutant or	Max	imum f	or	Max	Lmum for		
Pollutant Property	Any	One D	ay	Month	ly Averag	e	
mg/kg (lb	/million	n lbs)	of c	athode	e tin pro	duced	
Lead		4.704			2.184		
Cyanide (total)		3.360			1.344		
Fluoride	58	38.000		1	334.300		· .
Tin		6.384	ж. 1919 г.		3.696		
(f) <u>Spent</u> <u>Electro</u> <u>Waste</u> PSES	winning	<u>Solut</u>	ion f	rom Mu	inicipal	Solid	
Pollutant or	Maxi	imum f	or	Max	Lmum for		<u> </u>
Pollutant Property	Any	One D	ay	Month	Ly Averag	e	
mg/kg (lb/mill	ion lbs)) of M	SW sc	rap us	sed as ra	w mater	ial
Lead		0.033	-	· •	0.015		
Cvanide (total)		0.024			0.010		
Fluoride	•	4.165			2.368		• •
Tin	,	0.045			0.026		
(g) <u>Tin</u> <u>Hydroxide</u>	Superna	atant	from	Scrap	PSES		·
Pollutant or	Maxi	Lmum f	or	Maxi	mum for		
Pollutant Property	Any	One D	ay	Month	ly Averag	e .	
mg/kg (lb/mill	ion lbs)	of t	in me	tal re	ecovered	from sc	rap
Lead]	L5.580			7.233		
Cyanide (total)]	1.130			4.451		. *
Fluoride	1,94	17.000		1,	107.000		
Tin	2	21.140			12.240		
				······	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	1. J.	
(h) <u>Tin Hydroxide</u> Solutions and	Superna Sludges	atant <u>s</u> PSE	from S	Platir	īđ		
Pollutant or	Maxi	, mum f	or	Maxi	mum for		
Pollutant Property	Any	One D	ay	Month	y Average	8	•
mg/kg (lb/m	illion 1 plating	lbs) o solut	f tin ions	metal and sl	recover udges	ed from	
Lead	3	32.200	•		14.950		
Cyanide (total)	2	23.000			9.200		
Fluoride	4,02	25.000		2,	289.000		
Tin	4	13.700	• * *		25.300		
			· · ·				

SECONDARY TIN SUBCATEGORY

SECT - II

(i) <u>Tin Hydroxide</u> Filtrate PSES

Pollutant or	Maximum for	Maximum for
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 Pollutant	or Pro	operty	Ma: Ang	ximum y One	for Day	r I y Moi	Maximum nthly Av	for vera	ge
mg	/kg	(lb/mill	ion	lbs)	of	crude	tapped	tin	produced
Arsenic Lead				12.7	90 75	5	5	.703 .196	
Iron Tin			-	11.0 3.4	40 95		5 2	.611 .024	

(b) Dealuminizing Rinse PSNS

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

mg/kg (lb/million 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

(c) <u>Tin Mud Acid Ne</u>	utralization Fi	LITIATE PSNS	
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
mg/kg (lb/mil	lion lbs) of ne	eutralized dewatered ti	n
		ICEU	
Lead	1 113	0 656	
Cvanide (total)	1 009	0 404	
Fluoride	176 600		
Tin	1 918		
d) <u>Tin Hydroxide</u> Wa	sh PSNS		
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
mg/kg (lb/m	illion 1bs) of	tin hydroxide washed	<u> </u>
Load	2 217	1 664	
Leau Cuanida (total)	2 201		
Cyanitue (Local)	419 400		
Fluorido	410.400		
Fluoride		207.500	
Fluoride Tin	4.542	2.630	
Fluoride Tin e) <u>Spent Electrowin</u> Pollutant or Pollutant Property	4.542 ning Solution f Maximum for Any One Day	2.630 <u>rom New Scrap</u> PSNS <u>Maximum for</u> Monthly Average	
Fluoride Tin e) <u>Spent Electrowin</u> Pollutant or Pollutant Property	4.542 <u>ning Solution f</u> <u>Maximum for</u> Any One Day	2.630 <u>rom New Scrap</u> PSNS <u>Maximum for</u> Monthly Average	· · · · ·
Fluoride Tin e) <u>Spent Electrowin</u> Pollutant or Pollutant Property mg/kg (lb/m	4.542 <u>ning Solution f</u> <u>Maximum for</u> Any One Day illion lbs) of	2.630 <u>From New Scrap</u> PSNS Maximum for Monthly Average cathode tin produced	· · · · · · · · · · · · · · · · · · ·
Fluoride Tin e) <u>Spent Electrowin</u> Pollutant or Pollutant Property mg/kg (lb/m	4.542 <u>ning Solution f</u> <u>Maximum for</u> Any One Day illion lbs) of 4.704	2.630 <u>From New Scrap</u> PSNS Maximum for Monthly Average Cathode tin produced 2.184	
Fluoride Tin e) <u>Spent Electrowin</u> Pollutant or Pollutant Property mg/kg (lb/m Lead Cvanide (total)	4.542 <u>ning Solution f</u> <u>Maximum for</u> Any One Day illion lbs) of 4.704 3.360	2.630 <u>From New Scrap</u> PSNS Maximum for Monthly Average Cathode tin produced 2.184 1.344	
Fluoride Tin e) <u>Spent Electrowin</u> Pollutant or Pollutant Property mg/kg (lb/m Lead Cyanide (total) Fluoride	4.542 <u>ning Solution f</u> <u>Maximum for</u> Any One Day illion lbs) of 4.704 3.360 588 000	2.630 <u>From New Scrap</u> PSNS Maximum for Monthly Average Cathode tin produced 2.184 1.344 334 300	
Fluoride Tin e) <u>Spent Electrowin</u> Pollutant or Pollutant Property <u>mg/kg (lb/m</u> Lead Cyanide (total) Fluoride Tin	4.542 <u>ning Solution f</u> <u>Maximum for</u> Any One Day illion lbs) of 4.704 3.360 588.000 6.384	2.630 <u>From New Scrap</u> PSNS <u>Maximum for</u> Monthly Average cathode tin produced 2.184 1.344 334.300 3.696	
Fluoride Tin e) <u>Spent Electrowin</u> Pollutant or Pollutant Property mg/kg (lb/m Lead Cyanide (total) Fluoride Tin	4.542 <u>ning Solution f</u> <u>Maximum for</u> Any One Day illion lbs) of 4.704 3.360 588.000 6.384	2.630 <u>Erom New Scrap</u> PSNS <u>Maximum for</u> Monthly Average cathode tin produced 2.184 1.344 334.300 3.696	
Fluoride Tin e) <u>Spent Electrowin</u> Pollutant or Pollutant Property mg/kg (lb/m Lead Cyanide (total) Fluoride Tin f) <u>Spent Electrowin</u>	4.542 <u>ning Solution f</u> <u>Maximum for</u> Any One Day illion lbs) of 4.704 3.360 588.000 6.384 <u>ning Solution f</u>	2.630 <u>Erom New Scrap</u> PSNS <u>Maximum for</u> Monthly Average cathode tin produced 2.184 1.344 334.300 3.696 <u>rom Municipal Solid</u>	
Fluoride Tin e) <u>Spent Electrowin</u> Pollutant or Pollutant Property mg/kg (lb/m Lead Cyanide (total) Fluoride Tin f) <u>Spent Electrowin</u> <u>Waste</u> PSNS	4.542 <u>ning Solution f</u> <u>Maximum for</u> Any One Day illion lbs) of 4.704 3.360 588.000 6.384 <u>ning Solution f</u>	2.630 <u>Erom New Scrap</u> PSNS <u>Maximum for</u> Monthly Average cathode tin produced 2.184 1.344 334.300 3.696 <u>rom Municipal Solid</u>	
Fluoride Tin e) <u>Spent Electrowin</u> Pollutant or Pollutant Property mg/kg (lb/m Lead Cyanide (total) Fluoride Tin f) <u>Spent Electrowin</u> <u>Waste</u> PSNS Pollutant or	4.542 <u>ning Solution f</u> <u>Maximum for</u> Any One Day illion lbs) of 4.704 3.360 588.000 6.384 <u>ning Solution f</u> <u>Maximum for</u>	2.630 <u>Erom New Scrap</u> PSNS <u>Maximum for</u> Monthly Average cathode tin produced 2.184 1.344 334.300 3.696 <u>rom Municipal Solid</u> <u>Maximum for</u>	
Fluoride Tin e) <u>Spent Electrowin</u> Pollutant or Pollutant Property mg/kg (lb/m Lead Cyanide (total) Fluoride Tin f) <u>Spent Electrowin</u> <u>Waste</u> PSNS Pollutant or Pollutant Property	4.542 <u>ning Solution f</u> <u>Maximum for</u> Any One Day illion lbs) of 4.704 3.360 588.000 6.384 <u>ning Solution f</u> <u>Maximum for</u> Any One Day	2.630 <u>Erom New Scrap</u> PSNS <u>Maximum for</u> Monthly Average cathode tin produced 2.184 1.344 334.300 3.696 <u>rom Municipal Solid</u> <u>Maximum for</u> Monthly Average	
Fluoride Tin e) <u>Spent Electrowin</u> Pollutant or Pollutant Property mg/kg (lb/m Lead Cyanide (total) Fluoride Tin f) <u>Spent Electrowin</u> <u>Waste</u> PSNS Pollutant or Pollutant Property mg/kg (lb	4.542 <u>ning Solution f</u> <u>Maximum for</u> Any One Day illion lbs) of 4.704 3.360 588.000 6.384 <u>Maximum for</u> Any One Day <u>Maximum for</u> Any One Day	2.630 <u>Erom New Scrap</u> PSNS <u>Maximum for</u> Monthly Average cathode tin produced 2.184 1.344 334.300 3.696 <u>rom Municipal Solid</u> <u>Maximum for</u> Monthly Average <u>f MSW scrap used as</u> ial	
Fluoride Tin e) <u>Spent Electrowin</u> Pollutant or Pollutant Property mg/kg (lb/m Lead Cyanide (total) Fluoride Tin f) <u>Spent Electrowin</u> <u>Waste</u> PSNS Pollutant or Pollutant property mg/kg (lb	4.542 <u>ning Solution f</u> <u>Maximum for</u> Any One Day illion lbs) of 4.704 3.360 588.000 6.384 <u>ning Solution f</u> <u>Maximum for</u> Any One Day /million lbs) o raw mater 0.033	2.630 <u>Erom New Scrap</u> PSNS <u>Maximum for</u> Monthly Average cathode tin produced 2.184 1.344 334.300 3.696 <u>rom Municipal Solid</u> <u>Maximum for</u> Monthly Average <u>f MSW scrap used as</u> ial	
Fluoride Tin e) <u>Spent Electrowin</u> Pollutant or Pollutant Property mg/kg (lb/m Lead Cyanide (total) Fluoride Tin f) <u>Spent Electrowin</u> Waste PSNS Pollutant or Pollutant or Pollutant Property mg/kg (lb	4.542 <u>ning Solution f</u> <u>Maximum for</u> Any One Day illion lbs) of 4.704 3.360 588.000 6.384 <u>ning Solution f</u> <u>Maximum for</u> Any One Day <u>/million lbs) o</u> raw mater 0.033 0.024	2.630 <u>Erom New Scrap</u> PSNS <u>Maximum for</u> Monthly Average cathode tin produced 2.184 1.344 334.300 3.696 <u>From Municipal Solid</u> <u>Maximum for</u> Monthly Average <u>f MSW scrap used as</u> ial 0.015 0.010	
Fluoride Tin e) <u>Spent Electrowin</u> Pollutant or Pollutant Property mg/kg (lb/m Lead Cyanide (total) Fluoride Tin f) <u>Spent Electrowin</u> <u>Waste</u> PSNS Pollutant or Pollutant or Pollutant Property mg/kg (lb Lead Cyanide (total) Fluoride	4.542 <u>ning Solution f</u> <u>Maximum for</u> Any One Day illion lbs) of 4.704 3.360 588.000 6.384 <u>ning Solution f</u> <u>Maximum for</u> Any One Day <u>/million lbs) o</u> raw mater 0.033 0.024 4.165	2.630 <u>From New Scrap</u> PSNS Maximum for Monthly Average Cathode tin produced 2.184 1.344 334.300 3.696 <u>From Municipal Solid</u> Maximum for Monthly Average <u>F MSW scrap used as</u> ial 0.015 0.010 2.368	
Fluoride Tin e) <u>Spent Electrowin</u> Pollutant or Pollutant Property mg/kg (lb/m Lead Cyanide (total) Fluoride Tin f) <u>Spent Electrowin</u> Waste PSNS Pollutant or Pollutant or Pollutant Property mg/kg (lb Lead Cyanide (total) Fluoride Tin	4.542 <u>ning Solution f</u> <u>Maximum for</u> Any One Day illion lbs) of 4.704 3.360 588.000 6.384 <u>ning Solution f</u> <u>Maximum for</u> Any One Day <u>/million lbs) o</u> raw mater 0.033 0.024 4.165 0.045	2.630 2.630 <u>irom New Scrap</u> PSNS Maximum for Monthly Average cathode tin produced 2.184 1.344 334.300 3.696 <u>irom Municipal Solid</u> <u>Maximum for</u> Monthly Average <u>f MSW scrap used as</u> ial 0.015 0.010 2.368 0.026	

(g) <u>Tin</u> <u>Hydroxide</u>	Supernatant from	Scrap PSNS	
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
mg/kg (lb/milli	on lbs) of tin m	etal 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	
(h) <u>Tin Hydroxide</u> Solutions and	Supernatant from Sludges PSNS	Plating	
Pollutant or	Maximum for	Maximum for	
Pollutant Property	Any One Day	Monthly Average	
mg/kg (lb/mi	llion lbs) of ti	n metal recovered fr	om
P	lating solutions	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	
(i) <u>Tin Hydroxide</u>	Filtrate PSNS		······································
Pollutant or	Maximum for	Maximum for	
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	
EPA is not promulga this time.	ting BCT for the	secondary tin subca	tegory a
			· · ·

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 $(232^{\circ}C)$ 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 steel production operations. These plated secondary tin production operations can be divided into four major operations: alkaline detinning, electrowinning, tin hydroxide precipitation, reduction to tin metal. These operations and 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. Tin 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, Na₂SnO₃. The chemical reaction is as follows:

 $9Sn + 6NaNO_3 + 12NaOH + 9H_2O ---->$

 $9Na_2SnO_3 \cdot H_2O + 2NH_3 + 2N_2 + 3H_2O$

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, Na₂S 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 а The tin hydroxide is first washed with raw material. water then dissolved in a solution of sodium hydroxide. and The resultant sodium stannate solution is then purified and added to sodium stannate solution from alkaline the detinning and combined solution enters the electrowinning tanks. the

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

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 the There secondary tin subcategory. These streams may include noncontact cooling water, stormwater runoff, and maintenance and cleanup These wastewater streams are not considered as а water. EPA believes that the flows and of this rulemaking. part are these streams with loadings associated pollutant insignificant relative to the wastewater streams selected and are best handled by the appropriate permit authority on case-by-case basis under authority of Section 403 of the а Clean Water Act.

AGE, PRODUCTION, AND PROCESS PROFILE

III-1 (page 4049) shows the relative age and discharge Table status of the secondary tin plants. The average age is between 16 and 25 years. All of the plants have plant been 1940. Table III-2 (page 4050) shows the 1982 since built secondary tin. Eleven of the 12 secondary production for 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.

Table III-1

Discharge Type	Initial Operating 1982- 1972- 1973 1968 (0-10) (11-15)	<u>Year (Range)</u> 1967- 1958 <u>(16-25)</u>	(Plant Age 1957- 1948 (26-35)	in Years) 1947- 1938 <u>(36-45)</u>	Total
Direct	0 0	1	1	1	3
Indirect	0 0	1	0	0	. 1
Zero	<u>2</u>		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	8
TOTAL	2 1	5	2	2	<u> </u>

SECONDARY TIN SUBCATEGORY

SECT -

III

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

TABLE III-2

PRODUCTION RANGES FOR SECONDARY TIN PLANTS FOR 1982

Discharge <u>Type</u>	Product: 0-100	ion Range <u>100-1000</u>	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

1

* 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	_	Num Plan Pro Wast	ber of ts With cess or e Stream		Numbe of Plant Reportin Generat: of Wastewa	r ts ng ion ater*
Tin Smelting			1		• •	1
- Smelter SO ₂ scrubber			1		1	
Alkaline Detinning			10			۲ ۵ دور ۱
 Dealuminizing rinse Tin mud acid neutralization filtrate 		· .	1 3 ¹ 1 1		· · · · · · · · · · · · · · · · · · ·	
Electrowinning	•		8			
 Tin hydroxide wash Spent electrowinning solution from new scrap Spent electrowinning solution from municipal solid waste 		- · · · · · · · · · · · · · · · · · · ·	1 8 1	•	1 7 1	
Tin Hydroxide Precipitation			2	en a a a La constante	an an an an Arrain An an Arrain	F
 Supernatant from scrap Supernatant from plating solutions and sludges Tin hydroxide filtrate 			1 2 1		1	F
Reduction to Tin Metal			1			
						- -
*Through reuse or evaporation practices, a plant may " particular process but not discharge it.	gener	rate"	wastewat	er f	from a	

.







V Wastewater

Figure III-2

OTHER TIN PRODUCTION PROCESSES





GEOGRAPHIC LOCATIONS OF THE PRIMARY AND SECONDARY TIN SUBCATEGORY PLANTS SECONDARY TIN SUBCATEGORY SECT - III

SECTION IV

SUBCATEGORIZATION

This 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 for in 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 of the 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 а 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:

- (a) Tin smelter SO_2 scrubber,
- (b) Dealuminizing rinse,
- (c) Tin mud acid neutralization filtrate,
- (d) Tin hydroxide wash,
- (e) Spent electrowinning solution from new scrap,
- (f) Spent electrowinning solution from municipal solid waste,
- (g) Tin hydroxide supernatant from scrap,
- (h) Tin hydroxide supernatant from 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 wastewater spent electrowinning solution. The partially depleted sodium stannate solution is recycled to the detinning tanks where additional tin is taken into solution. A bleed stream is required, however, in order to control the buildup of impurities, particularly aluminum and carbonates, in the solution. This bleed stream comprises a wastewater stream associated with the electrowinning operation.

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

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

The flow rates and characteristics of the tin hydroxide supernatant stream vary significantly depending on the raw materials used. Because of this, separate subdivisions have been identified for tin hydroxide supernatant from each of 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

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

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 SO₂ scrubber produced

kkg of crude tapped tin

 Dealuminizing rinse produced

kkg of dealuminized scrap

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

- 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

9. Tin hydroxide filtrate

kkg of tin metal produced

The PNP for subdivision 1, tin smelter SO₂ 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 the techniques used in sampling and laboratory analyses are included in Section V of the General Development Document. Samples were analyzed for 124 of the 126 priority pollutants and other pollutants deemed appropriate. Because theanalytical standard for TCDD was judged to be too hazardous to be made 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 be is present in wastewater in the secondary tin subcategory. In 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 secondary tin subcategory, which is contained the 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 Using an evaporation system, plant 1014 changed from proposal. 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 secondary As subcategory has been divided into 9 subdivisions tin or wastewater sources, SO that the promulgated regulation contains mass discharge limitations and standards for unit processes discharging process wastewater. Differences - 9 in the wastewater characteristics associated with these subdivisions are to be expected. For this reason, wastewater corresponding to each subdivision are streams addressed separately in the discussions that follow. These wastewater sources are:

- (a) Tin smelter SO_2 scrubber,
- (b) Dealuminizing rinse,
- (c) Tin mud acid neutralization filtrate,
- (d) Tin hydroxide wash,
- (e) Spent electrowinning solution from new scrap,
- (f) Spent electrowinning solution from municipal solid waste,
- (g) Tin hydroxide supernatant from scrap,
- (h) Tin hydroxide supernatant from 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, The two ratios are were calculated for each stream. " differentiated by the flow value used in the calculation. Water use is defined as the volume of water or other fluid required for a given process per mass of tin product and is therefore based on the sum of recycle and make-up flows to a given process to further treatment, disposal, or discharge per mass of tin

produced. Differences between the water use and wastewater flows associated with a given stream result from recycle, evaporation, and 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_2 scrubber water flow is to the production of crude tapped tin. related As such, the discharge rate is expressed in liters of scrubber water per ton of crude tapped tin metric (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 and discharge rates. These variations are discussed later in this section by subdivision. A similar analysis of factors affecting the wastewater flows is presented in Sections X, XI, and XII where representative BAT, NSPS, and pretreatment flows are selected for use in calculating the effluent limitations.

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

WASTEWATER CHARACTERISTICS DATA

Data used to characterize the various wastewaters associated with 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	1	2	
arsenic	$(\mathbf{u}_{1}, \mathbf{u}_{2}, u$. 0	· · ·
cadmium	1	0	-
chromium	1	• • 0	14 - E
copper	$1^{(1)}$ is a set of 1 ^{(1)} is a set	1	i se
cyanide	1 ,	0	
lead	1	, 1	
mercury	0	1. 1 .	$f_{1} \rightarrow f_{2}$
nickel	2	0	
selenium	0	1	
silver	1	0	
zinc	1	1	. •

FIELD SAMPLING DATA

In order to quantify the concentrations of pollutants present in wastewater from 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 quantifiable. not The base-neutral extractable, acid extractable, and volatile organics generally are considered not quantifiable at concentrations equal to or less than 0.010 mg/1. 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 laboratoryequipment-specific, 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 donsidered not quantifiable. For data considered as detected but below quantifiable concentrations, of value Priority zero is used for averaging. organic, nonconventional, and conventional pollutant data "less | than" considered with reported а sign are as detected, but not further quantifiable. A value of zero is also If one of these pollutants for averaging. used is as not detected, it is assigned a value of zero in reported the average. Finally, priority metal calculating values reported as less than a certain value were considered as below consequently were assigned a value of quantification, and

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 SO_{2s} emissions in the smelter flue gas. The scrubber recirculating alkaline solution. A portion of the must be discharged in order to maintain effective oval. The water use and wastewater discharge rates for uses a solution SO2 removal. are shown in liters per metric ton of this stream 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 percent recycle. The blowdown is directly 90 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, and suspended solids. tin,

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

(page 4082) summarizes the raw wastewater sampling Table V-11 priority selected conventional data for the and 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 discharge rates for this stream are shown in Table V-6 and (page 4069) in liters per metric ton of MSW scrap used as raw This flow rate is estimated using a procedure material. described in Section IX of this document.

facility reporting this extra discharge The of spent electrowinning solution is a direct discharger after treatment consisting of chlorination, neutralization acid and The characteristics of this wastewater are sedimentation. 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, Na₂SnO₃. 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. Tin hydroxide is then precipitated from the resultant solution. The 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, and 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 uses both plating solutions and tin sludge solids as raw materials spent to tin hydroxide precipitation operations. It can be seen priority treatable concentrations of metals are that particularly antimony which was detected at present, а concentration of 3.1 mg/l.Cyanide is also maximum maximum observed concentration of present with a 16 mq/l. Very high concentrations of fluoride are present in this with concentrations from 12,000 15,000 wastewater to mg/l. from This fluoride originates tin fluoroborate and fluoroboric acid which are used in the tin plating baths. рН This wastewater has nearly-neutral and treatable а 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

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.

TABLE V-1

WATER USE AND DISCHARGE RATES TIN SMELTER SO₂ SCRUBBER

(1/kkg of crude tapped tin produced)

Plant Code	Percent Recycle	Production Normalized Water <u>Use</u>	Production Normalized Discharge Rate
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 <u>Use</u>	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)

Percent Plant Code Recycle		Production Normalized Water Use	Production Normalized Discharge Rate	
1046	0	l.	5047	5047
SECONDARY TIN SUBCATEGORY SECT - V

TABLE V-4

WATER USE AND DISCHARGE RATES TIN HYDROXIDE WASH

(1/kkg of tin hydroxide washed)

<u>Plant</u> Code	Percent Recycle	Production Normalized Water Use			Production Normalized Discharge Rate		
1049	0		11953	· · ·	11953		

TABLE V-5

WATER USE AND DISCHARGE RATES SPENT ELECTROWINNING SOLUTION FROM NEW SCRAP

(1/kkg of cathode tin produced)

Percent Plant Code <u>Recycle</u>	Production Normalized <u>Water</u> <u>Use</u>	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	NB

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)

<u>Plant</u> Code	Percent Recycle	Pr oduc tion Normalized <u>Water</u> <u>Use</u>	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

(l/kkg of tin metal recovered from scrap)

Plant <u>Code</u>	Percent Recycle	Production Normalized <u>Water</u> <u>Use</u>	Production Normalized Discharge Rate
1036	0	55640	55640
		;	

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)

<u>Plant</u> Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Rate
1036	0	115000	115000

TABLE V-9

WATER USE AND DISCHARGE RATES TIN HYDROXIDE FILTRATE

(1/kkg of tin metal produced)

<u>Plant</u> <u>Code</u> 1118	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 Code	Sample Type†	Con Source	icentration Day 1	ns (mg/l) Day 2	Day 3 0
Toxic Pollutants						CO
1. acenaphthene	895	6	ND	ND ND	• • •	NDARY
5. benzidine	895	6	ND	ND ND	• •	TIN
8. 1,2,4-trichlorobenzene	895	6	ND	ND ND		SUBCAT
9. hexachlorobenzene	895	6	ND	ND ND		EGORY
12. hexachloroethane	895	6	ND	ND ND		Ŋ
18. bis(2-chloroethyl)ether	895	6	ND	ND ND		E C T I
20. 2-chloronaphthalene	895	6	ND	ND ND		4
21. 2,4,6-trichlorophenol	895	6	ND	ND ND		н 19 19
22. p-chloro-m-cresol	895	6	ND	ND ND		
24. 2-chlorophenol	895	6	ND	ND ND		

SCRUBBER BLOWDOWN RAW WASTEWATER SAMPLING DATA

	Stream	tream Sample		Concentrations (mg/l)				
Pollutant	Code	Typet	Source	Day 1	Day 2	<u>Day 3</u>		
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	··	·. <u>.</u> · · · ·		
39. fluoranthene	895	6	ND	ND ND	-	• .		

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SECONDARY TIN SUBCATEGORY

SECT -

SCRUBBER BLOWDOWN RAW WASTEWATER SAMPLING DATA

	Pollutant	Stream _Code	Sample Typet	C Sourc	oncentrations e Day 1	(mg/1) Day 2	Dav 3	SE(
Toxic	Pollutants (Continued)		• .				<u>24)</u> J	
40.	4-chlorophenyl phenyl ether	895	6	ND	ND ND		. 194	DARY I
41.	4-bromophenyl phenyl ether	895	6	ND	ND -ND		، ، ، ، ، ، ، ، ، ، ، ، ، ، ، ، ، ، ،	US NT
42.	bis(2-chloroisopropyl)ether	895	6	ND	N D N D			IBCATE
43.	bis(2-chloroethoxy)methane	895	6	ND	ND ND			GORY
52.	hexachlorobutadiene	895	6	ND	ND ND			SEC
53.	hexachlorocyclopentadiene	895	6	ND	ND ND		· ·	
54.	isophorone	895	6	ND	ND ND		· • · ·	Y
55.	naphthalene	895	6 - 	ND	ND ND		т	
56.	nitrobenzene	895	6	ND	N D N D	•		

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SCRUBBER BLOWDOWN RAW WASTEWATER SAMPLING DATA

	Stream	Sample	Concentrations (mg/1)			
Pollutant	Code	Typet	Source	Day 1	Day 2	$\underline{\text{Day 3}}$
Toxic Pollutants (Continued)						
57. 2-nitrophenol	895	6	ND	ND ND		•
58. 4-nitrophenol	895	6	ND	ND ND		
59. 2,4-dinitrophenol	895	6	ND	ND ND		
60. 4,6-dinitro-o-cresol	895	6	ND	ND ND		
61. N-nitrosodimethylamine	895	6	ND	ND ND		
62. N-nitrosodiphenylamine	895	6	ND	ND ND		
63. N-nitrosodi-n-propylamine	895	6	ND	ND ND		
64. pentachlorophenol	895	6	ND	ND ND		
65. phenol	895	6	ND	ND ND		

SCRUBBER BLOWDOWN RAW WASTEWATER SAMPLING DATA

Pollutant		Stream	Sample	Concentrations (mg/l)			ч.
		Code	Typet	Source	Day 1	Day 2	Day 3
To	xic Pollutants (Continued)						
6	6. bis(2-ethylhexyl) phthalate	895	6	ND	ND ND	· · · · ·	
6	7. butyl benzyl phthalate	895	6	ND	ND		n North North
6	8. di-n-butyl phthalate	895	6	ND	ND ND ND		
6	9. di-n-octyl phthalate	895	6	ND	ND ND		an the second
7(). diethyl phthalate	895	6	ND	ND ND		
71	. dimethyl phthalate	895	6	ND	ND ND	1	
72	benzo(a)anthracene	895	6	ND	ND ND		
73	 benzo(a)pyrene 	895	6	ND	ND ND		
74	<pre>. benzo(b)fluoranthene</pre>	895	6	ND	ND ND		,

SCRUBBER BLOWDOWN RAW WASTEWATER SAMPLING DATA

	Stream	Sample	Concentrations (mg/1)				ע ב
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	
Toxic Pollutants (Continued)							DAR
75. benzo(k)fluoranthane	895	6	ND	ND ND			NT.T. 7
76. chrysene	895	6	ND	ND ND	- · ·		
77. acenaphthylene	895	6	ND	N D N D			ATEGU
78. anthracene (a)	895	6	ND	ND ND			X I
79. benzo(ghi)perylene	895	6	ND	ND ND			UBC L
80. fluorene	895	6	ND	N D N D			 <
81. phenanthrene (a)	895	6	ND	N D N D	•		
82. dibenzo(a,h)anthracene	895	6	ND	ND ND			
83. indeno (1,2,3-c,d)pyrene	895	6	ND	ND ND			

SCRUBBER BLOWDOWN RAW WASTEWATER SAMPLING DATA

. :	Pollutant	Stream	Sample	Cor	ncentrati	ons (mg/l) · · · · · · · · · · · · · · · · · · ·
	Torracant	_code_	Typer	Source	Day 1	Day 2	Day 3
Toxic	Pollutants (Continued)						
84.	pyrene	895	6	ND	ND ND		
114.	antimony	895	6	0.0013	0.047	0.078	0.048
.1.1.5.	arsenic	895	6	0.007	3.20 4.50	4.50	2.10
117.	beryllium	895	6	<0.010	<0.010 <0.010	<0.010	<0.010
118.	cadmium	895	6	<0.030	0.30 0.30	0.30	0.30
119.	chromium	895	6	<0.030	0.10 0.084	0.12	0.99
120.	copper	895	6	<0.030	0.35 0.37	0.28	0.60
121.	cyanide (total)	895	1	<0.01	<0.01 <0.01	<0.01	<0.01
122.	lead	895	6	0.054	3.00 3.70	3.70	2.80
123.	mercury	895	6	0.0149	0.0129 0.005	0.013	0.0094

SCRUBBER BLOWDOWN RAW WASTEWATER SAMPLING DATA

	Stream	Sample	Con	centratio	ns (mg/1)		2
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	_ <u>0</u>
Toxic Pollutants (Continued)						~	NDAE
124. nickel	895	6	0.052	<0.25 0.15	0.18	0.16	NLL AN
125. selenium	895	6	<0.001	0.33 0.44	0.55	0.40	SUB
126. silver	895	6	0.0014	0.0045	0.0042	0.0059	CATEGO
127. thallium	895	6	<0.001	0.0026 0.0037	0.0031	0.0030) DRY
128. zinc	895	6	0.030	0.14 2.30	2.20	2.10	SECT
Nonconventional Pollutants				i	,		Т
Acidity	895	6	10	60 180	50	61	4
Alkalinity	895	6	160	<1	. 99	80	
Aluminum	895	6	2.80	5.50 6.00	7.80	7.50	

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SCRUBBER BLOWDOWN RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Typet	<u>Co</u> Source	oncentrat:	ions (mg/l	L)	ы. М
Nonconventional Pollutants (Continued	 1)			- <u></u>	<u>.</u> <u>Day</u> 2	- Day J	CON
Ammonia Nitrogen	895	6	0.04	2.2 2.4	1.9	1.8	DARY T
Barium	895	6	0.12	0.18 0.43	0.21	0.27	IN SU
Boron	895	6	0.17	26.00 40.00	36.00	5.90	BCATE
Calcium	895	6	0.067 2	3.40 ,700	4.20	3.00	GORY
Chloride	895	6	155 >19 >19	,000 ,000	780	380	SH(
Cobalt	895	6	<0.030	0.081	0.13	0.60	
Fluoride	895	6	0.40	9.3 7.5	7.4	7.0	7
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	

SCRUBBER BLOWDOWN RAW WASTEWATER SAMPLING DATA

	Stream	Sample	C	loncentrat	ions (mg/	1) <u>v</u>
Pollutant	Code	Typet	Sourc	e Day	1 Day	<u>2 Day 3 5</u>
Nonconventional Pollutants (Continued)						NUAL
Molybdenum	895	6	<0.030	<0.030 <0.030	<0.030	0.40 ^ƙ
Germanium			<0.50	<0.50 <0.50	<0.50	<0.50 v
Indium	895	6	<0.50	<0.50 <0.50	<0.50	<0.50 H
Sodium	895	6	0.12	0.19 80	0.20	0.19
Sulfate	895	6	46	1,200 1,100	1,100	1,100 v
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	510	4,000 3,900	4,600	4,200
Total Organic Carbon (TOC)	895	6	13	16 13	22	45

SCRUBBER BLOWDOWN RAW WASTEWATER SAMPLING DATA

Pollintort			Stream	Sample		Concentratio	ons (mg/1)	
Pollulant			Code	 Typet	Sour	ce Day 1	Day 2	Day 3
Total Solids (TS)		· · · · · ·	895	6	650	6,400 35, 9,300	000 1,	800
Vanadium			895	6	<0.030	0.048 <0.030	0.067	0.070
Yttrium			895	 6	<0.25	<0.25	-< 0. 25	<u> </u>
			·	•	• *.	<0.25	(0125	(0.25
Conventional Pollutants	-		M K	·.	- 		· · ·	
Oil and Grease		•	895	1	<1	<1 <1	1	4
Total Suspended Solids	(TSS)		895	6	5	5,400 26, 9,900	000 10,	000
pH (standard units)	н - С		895		7.20	6.25 6.25	6.20	6.60

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

Table V-11

SPENT ELECTROWINNING SOLUTION RAW WASTEWATER SAMPLING DATA

		Stream	Sample	Conc	entration	s (mg/1)		ທ
	Pollutant	Code	Typet	Source	Day 1	<u>Day 2</u>	<u>Day 3</u>	ECC
<u>Toxic</u>	Pollutants							NDA
1.	acenaphthene	455 843 856	1 1 1	ND ND ND	ND ND ND			RY TIN
2.	acrolein	455	1	ND ND	ND NH			T SUB
		843	1	ND	ND			CATI
3.	acrylonitrile	455 843 856	1 1 1	ND ND ND	ND ND ND			EGORY
4.	benzene	455 843	1	0.013 ND	0.051 0.047 0.003		·	SECI
5.	benzidine	455 843 856	1 1 1	ND ND	ND ND	· ·	:	ר - V
6.	carbon tetrachloride	455 843 856	• 1 1 1	ND ND ND	ND ND ND			
7.	chlorobenzene	455 843 856	1 1 1 1	ND ND ND	N D N D N D		т н н н	-

. . .

SPENT ELECTROWINNING SOLUTION RAW WASTEWATER SAMPLING DATA

	Pollutant		Stream	Sample	Conc	entrations	(mg/1)	N,	IS
	Torratant		Code	<u>Type</u> t	Source	Day 1	Day 2	Day 3	រស្តី
Toxic	Pollutants (Continued)								
	1 0	Ч.,							DAF
8.	1,2,4-trichlorobenzene		455	1	ND	ND			۲Ŷ.
			843	1.	ND	ND			E
			856	1	ND	ND	1. A. A.		
9.	acenaphthene		455	1	N D	ND	алар (1997) 1997 - Алар (1997) 1997 - Алар (1997)	н. 1	S
- • • • • • •	······································		843	1	ND	ND -			ВС
			856	1 -	ND	ND			AI
10.	acrolein								Ë
			455	1	ND	ND			, R
			856	1	ND	ND		ł	Ř
1. 1				•	ND	ND			
ſI.	acrylonitrile		455	1	ND	0.066			Ω.
			843	· . 1	ND	ND			Ë
	-		856	1	ND	ND			Η,
12.	benzene		455	1	ND				I È
			843	1			1°		۲,
			856	1	ND				
13	1 1 44			•		nD	•	· · · ·	
1.3.	i, i-dichioroethane		455	1	ND	ND	· .		• •
			843	1	ND	ND			
		•.	020	l III. Na 2011 - Angeler Angel	ND	ND			
14.	1,1,2-trichloroethane	·	455		N(I)	N D			
	,		843	1	ND	ND	•		
			856	1 - 1	ND	ND			

SPENT ELECTROWINNING SOLUTION RAW WASTEWATER SAMPLING DATA

Stream	Sample	Conc	entration	<u>s (mg/l)</u>	
Code	Typet	Source	Day 1	Day 2	Day 3
455 843 856	1 1 1	ND ND ND	ND ND ND		+ + 5
455 843	1	ND ND	N D ND		
856 455 843	1	ND ND ND	ND ND ND		
455 843 856	1 1 1	ND ND ND	N D ND ND		0 10 11 11 11 11 11 11 11 11 11 11 11 11
455 843 856	1 1 1	ND ND ND	ND ND ND		•
455 843 856	, 1 1 1	ND ND ND	N D ND ND		· · · · ·
455 843 856	1 1 1	ND ND ND	N D ND ND	• .	
	Stream Code 455 843 856 455 843 856 455 843 856 455 843 856 455 843 856 455 843 856 455 843 856 455 843 856	Stream Code Sample Typet 455 1 843 1 856 1 455 1 455 1 843 1 856 1 455 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	Stream Sample Conc Code Typet Source 455 1 ND 843 1 ND 856 1 ND 455 1 ND 455 1 ND 455 1 ND 455 1 ND 843 1 ND 856 1 ND 455 1 ND 843 1 ND 843 1 ND 856 1 ND 843 1 ND 856 1 ND 843 1 ND 856 1 ND 856 1 ND 856 1 ND 843 1 ND 843 1 ND 843 1 ND 856 1 ND 856 1	Stream Sample Concentration Code Typet Source Day 1 455 1 ND ND 843 1 ND ND 856 1 ND ND 455 1 ND ND 455 1 ND ND 455 1 ND ND 455 1 ND ND 856 1 ND ND 455 1 ND ND 856 1 ND ND 455 1 ND ND 843 1 ND ND 856 1 ND ND 455 1 ND ND 843 1 ND ND 856 1 ND ND 455 1 ND ND 856 1 ND ND 856 1	Stream Sample Concentrations (mg/1) Code Typet Source Day 1 Day 2 455 1 ND ND ND 843 1 ND ND 856 1 ND ND 455 1 ND ND 856 1 ND ND

SPENT ELECTROWINNING SOLUTION RAW WASTEWATER SAMPLING DATA

.

<u>Pollutant</u>	Stream <u>Code</u>	Sample Typet	<u>Conce</u> Source	ntrations Day 1	<u>s (mg/1)</u> Day 2	Dav 3
Toxic Pollutants (Continued)		· . · .				
22. p-chloro-m-cresol	455	1	ND	ND		JARY
	843 856	1	ND ND			11.1
23. chloroform	455		0.038		•	្ត្រ ខ្ម
	843 856	1	ND 0.037	ND ND		JBCA
24. 2-chlorophenol	455	1	ND	ND		TEGC
	843 856	1	ND ND		•	URY
25. 1,2-dichlorobenzene	455	1	ND	ND-		70
	843. 856	1	ND ND			SECT
26. 1,3-dichlorobenzene	455	1	ŇD	ND		
	843 856	1	ND ND	ND ND		
27. 1,4-dichlorobenzene	455	· 1.	ND		9	
	843 856	1		ND		
28. 3,3'-dichlorobenzidine	455	· · · · · · · · · · · · · · · · · · ·	NI)		- -	
	843 856	1		ND ND		

SPENT ELECTROWINNING SOLUTION RAW WASTEWATER SAMPLING DATA

		Stream	Sample	Conc	entration	s (mg/l)		ល
	Pollutant	Code	Typet	Source	<u>Day 1</u>	<u>Day 2</u>	<u>Day 3</u>	3CO
Toxic	Pollutants (Continued)			v				NDAI
29.	1.1-dichloroethylene	455	1	ND	ND			Ϋ́Υ
	·,· ,	843 856	1	ND ND	ND ND			PHN
			1	ND	ND			DS
30.	1,2- <u>trans</u> -dichloroethylene	400	····· 1····	ND	ND	• • • • •		<u>В</u> С
		856	1	ND	ND			ATE
31	2 4-dichlorophenol	455	1	ND	ND			GOF
51.	2,4 dienzorophene -	843	1	ND	ND			Ř
		856	1	ND	ND [,]			
32.	1,2-dichloropropane	455	1	ND	ND			SE
	,	843	1	ND				0 H
		856	1	ND	ND		·	1
22	1 3 dichloropropene	455	1	ND	ND			<
22.	1,5-dichioropropene	843	1	ND	ND			
		856	1	ND	ND			
34	2 4-dimethylphenol	455	1	ND	0.009			
J4.	2,4 dimeenjiphenoi	843	1	ND	ND			
	· · · · · · · · · · · · · ·	856	1	ND	ND			
35	2.4-dinitrotoluene	455	· 1	ND	ND	i.		
• د د	2, 1 2111220002201-	843	1	ND	ND			
		856	1	ND	ND			

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SUBCATEGORY SECT

SPENT ELECTROWINNING SOLUTION RAW WASTEWATER SAMPLING DATA

Pollutant	Stream	Sample	Conc	entration	s (mg/1)	
	Code	Typet	Source	Day 1	Day 2	Dav 3
Toxic Pollutants			•			
			ĩ			, 1
50. 2,0-dinitrotoluene	455	1	ND	ND		ĥ
	843	1	ND	ND		1
	856	· 1.	ND	ND		
37. 1.2-diphenvlhydraging				-	1	
,		· ····································	ND	• • N Đ • • •		
	843	. 1	ND	ND		, Ç
	806 ·	1	ND	ND		
38. ethylbenzene				*.		
	400	1	ND	ND	.*	ç
	843	1	ND	ND		Ŕ
	826		ND .	ND		÷.,
39. fluoranthene	455	· •				· · · ·
	4JJ 0/2	1	ND	ND	· .	S
	043	; 	- ND	0.004		Q
	010	a de	ND	ND		
40. 4-chlorophenyl phenyl ether	455	. 1				1
	843	1	ND	ND		<
	856	1	ND	ND		~
	0.20		ND	ND		· · ·
41. 4-bromophenyl phenyl ether	455	1	NED	ND	• .	* 1 a
	843	1		ND		· · · ·
	856	1		ND		· .
	0.00	•	ND	ND		
42. bis(2-chloroisopropyl)ether	455	1	ND			
	843	1		ND		-
	856	1		ND		
-		I	ND	ND	-	

SPENT ELECTROWINNING SOLUTION RAW WASTEWATER SAMPLING DATA

	Stream	Sample	Conc	entration	<u>s (mg/l)</u>	
Pollutant	Code	Typet	Source	Day 1	<u>Day_2</u>	Day 3
Toxic Pollutants (Continued)						
43. bis(2-chloroethoxy)methane	455 843	1 1 1	ND ND	ND ND ND		
44. methylene chloride	455	1	0.019	0.031		
	856	1	0.021	0.025		
45. methyl chloride (chloromethane)	455 843 856	1 1 1	ND ND ND	N D ND ND		
46. methyl bromide (bromomethane)	455 843 856	1 1 1	ND ND ND	N D ND ND		
47. bromoform (tribromomethane)	455 843 856	1 1 1	ND ND ND	N D ND ND		
48. dichlorobromomethane	455 843 856	1 1 1	ND ND ND	N D N D N D		
49. trichlorofluoromethane	455 843 856	1 1 1	ND ND ND	ND ND ND		

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SECT 1

SPENT ELECTROWINNING SOLUTION RAW WASTEWATER SAMPLING DATA

	Stream	Sample	Concentrations (mg/l)				
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	
Toxic Pollutants (Continued)	• • • • •			117 117			
50. dichlorodifluoromethane	455	1	ND	ND			
	843	1	ND			1995 - 1905 - 19	
	856	1	ND	ND		,	
51 oblogediterrate		- -				1994 - Ale	
Ji. Chlorodibromomethane		the grade the second	0.002		and the second		
	843 954	1	ND	ND	*	· · · · · · · · · · · · · · · · · · ·	
	0.0		ND	ND			
52. hexachlorobutadiene	455	1	ND	ND		,	
	843	1	ND		1		
	856	1	ND	ND	. · · ·		
					е. 1. т. – е		
55. nexachlorocyclopentadiene	455	1	ND	ND			
	843	1	ND	ND			
	856	. 1	ND	ND			
54. isophorone	455	· · · 1		ND.	· .		
	843	· 1					
	856	1	ND				
			ND				
55. naphthalene	455	11 c. 1 c. c.	ND	ND		•	
	843	1 .	ND	ND		• •	
	856	1	ND	ND			
56. nitrobenzene	455	1	ND			а 1 - р. –	
	8/3	1	ND	ND		1	
•	856	1	UN D			· · · ·	
	0.00	- · · · · · ·	ND .	ทย			

SPENT ELECTROWINNING SOLUTION RAW WASTEWATER SAMPLING DATA

	Stream	Sample	Concentrations (mg/1)				
Pollutant	Code	Typet	Source	Day 1	<u>Day 2</u>	Day 3	
Toxic Pollutants (Continued)	•		•				
	455	1	ND	ND			
57. 2-nitrophenol	843	i	ND	0.060			
	856	1	ND	ND			
				41D			
58. 4-nitrophenol	455	1	DM ND	ND			
	843	1	• • • • • • • • • • • • • • • • • • •	ND			
	856	1	ND	ND			
	, , , ,	1	ND	ND			
59. 2,4-dinitrophenol	4JJ 8/3	1	ND	ND			
	856	1	ND	ND			
	010	•	 *.	-!			
(0, 1, 6, distroportion)	455	1 -	ND	ND			
60.4,0-amelio-b-clesor	843	1	ND	ND			
	856	1	ND	ND			
				ND			
61. N-nitrosodimethylamine	455	1	ND	ND			
	843	1	ND				
	856	1	ND	ND	•••		
, 		1	ND	ND	:		
62. N-nitrosodiphenylamine	477	1	ND	ND			
	04J 856	1	ND	ND			
and a second	0.00	· • • • • • •		-			
() Naturopodi n propulamine	455	- 2 1 - ₹	ND	N D			
63. N-nitrosour-n-propyramine	843	1	ND	ND			
•	856	1	ND	ND			
· · · · · ·						-	

SPENT ELECTROWINNING SOLUTION RAW WASTEWATER SAMPLING DATA

	Stream	Sample	Conc	entrations	(mg/1)	ŗ
Pollutant	Code	<u>Typet</u>	Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
64. pentachlorophenol	455	1	ND	ND		у Н
	856	1	ND ND	ND ND		NT T
65. phenol	455		,	θ.017		ע בי
	843 856	1 1	ND ND	0.130 0.020		5CA1
66. bis(2-ethylhexyl) phthalate	455 843	1	0.006	N D ND		EGORY
	856	: 1	0.004	ND		
67. butyl benzyl phthalate	455 843	1				N E
	856	1	ND	ND		, C
68. di-n-butyl phthalate	455 843	1	ND ND	N D ND		- ح
	856	1	ND	ND		•
69. di-n-octyl phthalate	455 843	1				4 i i i i i i i i i i i i i i i i i i i
	856	1	ND	ND		
70. diethyl phthalate	455	1	ND	ND	· .	
	856	1	ND ND	ND ND		

SPENT ELECTROWINNING SOLUTION RAW WASTEWATER SAMPLING DATA

		Stream	Sample	Conceptrations (mg/l)				
	Pollutant	Code	Typet	Source	Day 1	Day_2	Day 3	ECO
Toxic	Pollutants (Continued)							NDA
								R
71.	dimethyl phthalate	455	1	ND	ND			
	· ·	843	1	ND	ND			TT T
		856	1	ND	ND			Z
_		/	1	ND	ND			S S
72.	benzo(a)anthracene	400	ا د مند م الم			- ····		<u> </u>
		843	1					A D A
		856	I	ND	ND S			TE
. *			1	ND	ND			ភ្ន
73.	benzo(a)pyrene	400	1					R
		843	1		ND .			К
		006	ан — Б	ND	ND			
- ,		455	1	מא	ND			żo
/4.	benzo(b)fluorantnene	455 873	1	ND	ND			Ĕ
		945	1	ND	ND			- H
		0.00	I					1
75	hanna (k) fluoranthana	455	1	ND	ND			· /
/3.	Denzo(k) Liuoranthene	843	1	ND	ND			7
		856	1	ND	ND			
		050	.•					
76	abrita an a	455	1	ND	ND	100 - 100		
/0.	chrysene	843	1	ND	ND			
		856	1	ND	ND			
							··· ·	
77	acenaphthylene	455	· · · 1 · · ·	ND	N D			
//•	acenapticity tene	843	. 1	ND	ND	н. Т		
		856	¥° 1 ·	ND	ND			
							•	ŀ

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SPENT ELECTROWINNING SOLUTION RAW WASTEWATER SAMPLING DATA

	Pollutant	Stream <u>Code</u>	Sample Typet	<u>Conc</u> Source	entration Day 1	s (mg/1) Day 2	Day 3
Toxic	Pollutants (Continued)		. *			· · · · · · · · · · · · · · · · · · ·	
70							E E
/8.	anthracene (a)	455	1	NÐ	ND		R .
		843	1	ND	ND		L L
		856	1	ND	ND		2
- 79.	benzo(ghi)perylene		1		ND		
	· · ·	843	1	ND	ND		
		856	1	ND	N.D		АТЕ
80.	fluorene	455	1	ND	ND		GO O
		843	1	ND		· · ·	RY
· .		856	1	ND	ND		
81.	phenanthrene (a)	455	1	ALD.	ND		ťo
• •		843	1	ND		• •	E C
		856	1	NĐ		• •	H H
0.0			ь. 	and the second sec		е — н	1
82.	dibenzo(a,h)anthracene	455	- 1	ND	ND		4
		843	1	ND	ND		
		856	1	ND	ND		
83.	indeno (1,2,3-c,d)pyrene	455	1	ND	ND		
		843	1	ND	ND	· ,	-
		856	1	ND	ND	n an	1
84.	pyrene	455	1	ND	NÐ		
	· · ·	843	1	ND	0.003	· · · ·	
		856	1	ND	0.063	·	•

SPENT ELECTROWINNING SOLUTION RAW WASTEWATER SAMPLING DATA

			Sample	<u>Concentrations (mg/1)</u>				
	Pollutant	Code	Typet	Source	Day 1	<u>Day 2</u>	<u>Day 3</u>	
<u>Toxic</u>	Pollutants (Continued)							
85.	tetrachloroethylene	455	1	ND	ND .			
	, , , , , , , , , , , , , , , , , , ,	843	1	ND	ND			
		856	. 1	ND	0.399			
86.	toluene	455	1	0.001	0.018			
		843	1	0.093	0.017		· · · · · · · ·	
		856	1	0.005	0.005			
87.	trichloroethvlene	455	1	ND	ND			
07.	07. erientorocenyrene	843	1	ND	ND			
		856	1	0.007	0:009			
88.	vinvl chloride (chloroethvlene)	455	1	ND	ND			
00.	viny1 0.101100 (0.1010000)10000,	843	1	ND	ND			
		856	1	ND	ND			
89.	aldrin	455	1	ND	ND			
07.		843	1	ND	ND			
		856	<u> </u>	ND	ND			
90	dieldrin	455	1	ND	ND	•		
<i>y</i> 0 .	dieldtin	843	1	ND	ND			
	and the second	856	1	ND	ND		p	
Q1	chlordane	455	1	ND	ND			
21•	Childrand	843	1	ND	ND			
		856	1	ND	ND			

SECONDARY TIN SUBCATEGORY SECT -

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SPENT ELECTROWINNING SOLUTION RAW WASTEWATER SAMPLING DATA

Pollutant	Stream	Sample	Concentrations (mg/l)				
TOTICEAIL	Code	<u>Typet</u>	Source	Day 1 Day 2	Day 3 C		
Toxic Pollutants (Continued)	5 g.				ON		
					DA:		
92. 4,4 -DDT	455	1	ND	ND	RY		
	843	1	ND	ND	н		
	856	· · · 1	ND	ND	HN		
93. 4,4'-DDE	455	1 . ¹			ຎ		
	843	1.			ВU		
	856	i .	ND		ĊĄ		
94 4 41-000				ND	н Н		
· ····································	455	1	ND	ND	G		
	843	1	ND	ND	RY		
	000		ND	ND			
95. alpha-endosulfan	455	. 1	ND	ND			
	843	1	ND		U U U U		
	856	1	ND	ND	<u> </u>		
96. beta-endosulfan	155				1		
	400		ND	ND	Š		
	856	1		ND			
			ND	ND			
97. endosulfan sulfate	455	1	ND	ND · · · · ·			
	843	1	ND	ND			
	856	1	ND	ND			
98. endrin	455	1	ND				
	843	1					
	856	1	ND				

SPENT ELECTROWINNING SOLUTION RAW WASTEWATER SAMPLING DATA

	Stream	Sample	Concentrations (mg/1)				Ц С
Dellutent	Code	Typet	Source	Day 1	Day 2	Day 3	Ĩ
Forfulanc							Ĭ
Toxic Pollutants (Continued)		•					DAR
	455	1	ND	ND			К
99. endrin aldehyde	843	1	ND	ND			H
	856	1	ND	ND			Z
	455	1	ND	ND			SUE
100. heptachlor			ND-	- • • • • • • • • • • •			<u>õ</u>
	856	1	ND	ND			ATE
	455	1	ND	ND		-	- GOF
101. heptachior epoxide	843	1	ND	ND			Ř
	856	1	ND	ND			
	455	1	ND	ND			ß
102. alpha-BHC	843	1	ND	ND			- C
	856	1	ND	ND			H I
	455	1	ND	ND			<
103. beta-BhC	843	1	ND	ND			
	856	1	ND	ND	• . •		
NUC	455	1	ND	ND			
104. gamma-BHC	843	1	ND	ND			
	856	1	ND	ND			
	455	11	ND	ND			
105. delta-BHC	843	1	ND	ND			
	856	2010 1 .	ND	ND			
· ·				· ·			
ter en					14		

SPENT ELECTROWINNING SOLUTION RAW WASTEWATER SAMPLING DATA

Pollutant				Stream Stream		Sample	Concentrations (mg/l)				
					coue	турет	Source	Day 1	<u>Day 2</u>	Day 3	<u>}</u>
Toxic	c Pollutants	(Conti	nued)			· ·					TAT
104	DOD 10/0				-						JAC
100.	PUB-1242	(b)			455	1	ND	ND			Ĥ
	н н				843	1	ND	ND			E.
1. P			*		8.5.6	1	ND	ND			
107.	PCB-1254	(b)			455		NID	ND			U.
	- · · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	n na seanna seann seann	· · · · · · · ·	843	1		ND -		/	
					856	1	ND				CA
100	DOD 1001							ΠD	1		ΠE
1:00.	PCB-1221	('b')			455	1	ND	ND			С О
				• • •	843	1	ND	ND			RY
•		·			826		ND	ND	- -		·
109.	PCB-1232	(c)			455	1	ND	AL IN			
· · · · · · · · · · · ·	,				843	1		ND ND		с ¹ .	E N
				1. S. S.	856	्य भ	ND	ND ND	х.		ថ្មី
110	DOD 10/0				• • • • •						
110.	PCB~1248	(c)		с.	455	1	ND	ND			4
					843	1	ND	ND			7
					020	1 *	ND	ND			
111.	PCB-1260	(.c.)			455	'1	NIN				
			1. S.		843	1		ND ND	1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 -		. 7
1			•		856	1	ND		ан Алтан (1996)		
110	BCD 1014	· / \									
·· II.∡	FCB-1016	(c)			455	194 1 - 1947 - 1	ND	N.D			
				· · · ·	843	1	ND	ND			
				E Starte	856	1 1 1 1 1 1	ND	ND			

SPENT ELECTROWINNING SOLUTION RAW WASTEWATER SAMPLING DATA

	Stream	Sample	Concentrations (mg/1)			
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3
oxic Pollutants (Continued)						
10 towark on a	455	1	ND	ND		
13. toxapnene	843	1	ND	ND		
	856	1	ND	ND		
	/ 5 5	1	0.001	5.0	•	
14. antimony	400	· · · · · · · · · · · · · · · · · · ·		0.9	· · · · · · ·	
	843	1		0.41		
	820	I		0.41		
	455	1	0.002	2.0		
15. arsenic	400	1	0.008	1.9		
	040	1	0 007	6.6		
	800	l	0.007	0.0		
	455	1	<0.001	0.08		
17. beryllium	477	1	<0.001	0.005		
	956	1	<0.001	0.20		
	0.00	•				
· · · · · ·	455	1	0.020	0.42		
18. cadmium	873	1	<0.001	0.34		
	040	1	0.001	0.29		
	000	•	0.001	·		
	455	1	0.003	0.94	i	
19. chromium (total)	477	1	0.003	0.30		
	04J 956	1	0.004	0.56		
		. • _				
	455	1	0.008	0.50		
20. copper	873	1	0.14	0.30		
	04J Q56	1	0.016	0.41		
	0.0	I '	0.0.0			

SPENT ELECTROWINNING SOLUTION RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Typet	<u>Con</u> Source	centratio Day 1	<u>ns (mg/1)</u> Day 2	Dav 3
Toxic Pollutants (Continued)						
121. cyanide (total)	455	1	0 002	3 6		
	843 856	1	ND	ND		l l
122. lead	455	1	0.010	24		۲ ک
	843 856	1	0.001	1.0 9.0		
123. mercury	455 843 856	1 1 1	<0.002 <0.002 0.007	<0.002 <0.002 0.026		EGOK X
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 1	0.033 3.1 <0.005	0.040 32 <0.005	4	ו ע
126. silver	455 843 856	1 1 1	<0.001 0.02 <0.001	0.40 0.35 0.30		
127. thallium	455 843 856	1 1 1	0.14 <0.001 0.005	3.1 2.0 2.0		

SPENT ELECTROWINNING SOLUTION RAW WASTEWATER SAMPLING DATA

	Stream	Sample	Concentrations (mg/1)				
Pollutant	<u>Code</u>	Typet	Source	Day 1	Day 2	Day 3	
Toxic Pollutants (Continued)			• .				IDAR
128. zinc	455 843	1 1	0.08 0.06	29 1.1			TI TI
	856	1	0.24	0.24	- -		א מ
Nonconventional Pollutants				• ,			UBC.
alkalinity	455	1	60	220,000			ATE
aluminum	455	1	1.90	13,000			BORY
ammonia nitrogen	843 856	1 1	1.5	20 92		· ·	το
calcium	455	1	11	<0.1			ECT
chemical oxygen demand (COD)	455	1	4.0	3,600		•	_ I ≺
fluoride	455	1	1.2	0.5			
magnesium	455	····· 1	5.5	0.04	F		-
phenolics	455 843 856	1 1 1 1	0.011 0.002 0.001	1.4 0.00 0.11)6		

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SPENT ELECTROWINNING SOLUTION RAW WASTEWATER SAMPLING DATA

	Stream Code	Sample	Concentrations (mg/1)			
<u>Pollutant</u>		Typet	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		
<u>Conventional_Pollutants</u>	· · ·		***** ********************************			۰ ۱۰ - ۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۱۰ - ۲۰۰۰ ۲۰۰۰ ۲۰۰۰
total suspended solids (TSS)	455 843 856	.1 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		
	843 856	1 1	6.5 7	12.5		

tSample Type Code: 1 - One-time grab
(a), (b), (c) Reported together.

Table V-12

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

	Pollutant	Stream Code	Sample Typet	Conc Source	entration: Day_1	s (mg/1) <u>Day 2</u>	Day 3	SECO
Toxic	Pollutants							NDAF
1.	acenaphthene	395	1	ND	ND			L Al
2.	acrolein	395	1	ND	ND			IN
3.	acrylonitrile	395	1	ND	ND.			SUBC
4.	benzene	395	1	ND	ND			ATE
5.	benzidine	395	1	ND	ND			30RY
6.	carbon tetrachloride	395	1	ND	ND			
7.	chlorobenzene	395	1	ND	ND			SEC
8.	1,2,4-trichlorobenzene	395	1	ND	ND			日
9.	hexachlorobenzene	395	1	ND	ND			4
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		ND	ND			
14.	1,1,2-trichloroethane	395	1 · ·	ND	ND			

Della		Stream	Sample	Conc				
	Pollutant	_Code_	Typet	Source	Day 1	Day 2	Day 3	C E
Toxi	c Pollutants (Continued)	· ·		A the second sec	4 ¹			CON.
15.	1,1,2,2-tetrachloroethane	395	· 1	ND	ND			DARY
16.	chloroethane	395	1	ND	ND		н н н	Î Î Î
17.	bis(chloromethyl)ether	395	· · · · · · · · · · · · · · · · · · ·		ND	ء رابيد مرد الميده		N ST
18.	bis(2-chloroethyl)ether	395	1	ND	ND		•	JBCA
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	•		S H C
23.	chloroform	395	1	ND	ND			а І,
24.	2-chlorophenol	395	1	ND	ND	•		4
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			

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

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

	Pollutant	Stream _Code	Sample Typet	Cond Source	<u>Day 1</u>	(mg/1) Day 2	Day 3	SECO
Toxic	Pollutants (Continued)							NDAR
29.	1,1-dichloroethylene	395	1	<0.01	<0.01			Я Н
30.	1,2- <u>trans</u> -dichloroethylene	395	1	ND	ND			IN
31.	2,4-dichlorophenol	39.5	1	ND	ND			
32.	1,2-dichloropropane	395	1	ND	N D			ATE
33.	1.3-dichloropropene	395	1	ND	ND			GORY
34.	2,4-dimethylphenol	395	1	ND	ND			
35.	2.4-dinitrotoluene	395	1	ND	ND			SE
36.	2.6-dinitrotoluene	395	1	ND	ND			- C
37.	1.2-diphenylhydrazine	395	1	ND	<0.01			<
38.	ethvlbenzene	395	1	ND	0.011			*
30.	fluoranthene	395	1	ND	ND			-
- <u>/</u> /0	-chlorophenyl phenyl ether	395	1	ND	ND			
40.	4-bromonbenyl nhenyl ether	395	1	ND	ND			
41.	bis(2-chloroisopropyl)ether	395	1	ND	N D			
TIN HYDROXIDE PRECIPITATION SUPERNATANT (FROM SCRAP) RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Typet	<u>Con</u> Source	centration Day 1	<u>ls (mg/1)</u> Day 2	Day 3	SE
Toxic Pollutants (Continued)				<u> </u>	<u></u>	<u>Day</u> J	COND
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				IUS
46. methyl bromide (bromomethane)	395	1	ND	ND			3CAT
47. bromoform (tribromomethane)	395	1	ND	ND			EGOI
48. dichlorobromomethane	395	1	ND	ND		м.,	RY
49. trichlorofluoromethane	395	1	ND	ND			Ŋ
50. dichlorodifluoromethane	395	1	ND	ND			ECT
51. chlorodibromomethane	395	1	ND	ND			י ע
52. hexachlorobutadiene	395	. 1	ND	ND			
53. hexachlorocyclopentadiene	395	1	ND	ND		· ` ^ ·	
54. isophorone	395	1	ND	N D			
55. naphthalene	395	1	ND	ND			
56. nitrobenzene	395	.1	ND	NÐ			•

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

		Stream	Sample	Conc	entration	s (mg/l)		<u> </u>
	Pollutant	Code	Typet	Source	Day 1	<u>Day 2</u>	Day 3	
<u>Toxic</u>	Pollutants (Continued)							NUAt
57.	2-nitrophenol	395	1	ND	0.031			н ХХ
58.	4-nitrophenol	395	1	<0.01	0.026			NT
59.	2,4-dinitrophenol	395		ND	0.086		·'	
60.	4,6-dinitro-o-cresol	395	1	ND	N D			CATE
61.	N-nitrosodimethylamine	395	1	ND	ND			NO5
62.	N-nitrosodiphenylamine	395	1	ND	ND			ĸ
63.	N-nitrosodi-n-propylamine	395	1	ND	ND			۲ تا
64.	pentachlorophenol	395	1	ND	<0.01			C I
65.	phenol	395	1	ND	ND			ו <
66	bis(2-ethylhexyl) phthalate	395	1	<0.01	<0.01			
67	butul benzul nhthalate	395	1	ND	ND			
07.	di a hutul abthalata	395	. 1	ND	N D		•	
68.	di-n-bulyi philiatale	205	1	ND	ND			
69.	di-n-octyl phthalate	222	I					
70.	diethyl phthalate	395	1	ND	ND			

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	D 11	Stream	Sample	Conc		N N		
	Pollutant	Code	Typet	Source	Day 1	Day 2	Day	<u>3</u> 8
Toxic	Pollutants (Continued)							NDA
71.	dimethyl phthalate	395	1	ND	ND	• .		RY 1
72.	benzo(a)anthracene	395	1	ND	ND			CIN
73.	benzo(a)pyrene	395	1	ND	ND			SUB
74.	benzo(b)fluoranthene	395	1.	ND	ND			CATE
75.	benzo(k)fluoranthane	395	1	ND	ND	•	· .	IGOR
76.	chrysene	395	1	ND	ND	• •		ĸ
77.	acenaphthylene	395	1	ND	ND	· • ·		N H
78.	anthracene (a)	395	1	ND	ND			CT
79.	benzo(ghi)perylene	395	1	ND	N D	* . *		
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			e a
84.	pyrene	395	1	ND	ND			

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

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

		Stream	•Sample	Conc	<u> </u>		
	Pollutant	<u>Code</u>	Typet	Source	Day 1	Day 2	Day 3
<u>Toxic</u>	Pollutants (Continued)						
85.	tetrachloroethylene	395	1	ND	ND		
86.	toluene	395	1	ND	ND		
87.	trichloroethylene	395	1	ND	<0.01		
88.	vinyl chloride (chloroethylene)	395	1	ND	0.036		
89.	aldrin	395	. 1	ND	ND		
90.	dieldrin	395	1	ND	ND		
91.	chlordane	395	1	ND	ND		
92.	4,4'-DDT	395	1	ND	ND		
93.	4,4'-DDE	395	1	ND	N D		
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		
	1						

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

Polluta	ant	Stream Code	Sample Type†	<u>Conce</u> Source	ntrations Day 1	(mg/l) Day 2 Day	SEC
<u>Toxic Pollutants</u> ((Continued)	н. А.					
99. endrin aldeh	yde	395	. 1	ND	ND		ARY
100. heptachlor		395	1	ND	ND		TIN
101. heptachlor e	poxide	. 395.	1,	······································	ND	n ng	DS'
102. alpha-BHC		395	1	ND	ND	e Alexandre alexandre a	BCA
103. beta-BHC		395	1	ND	ND		TEGO
104. gamma-BHC		395	1	ND	ND		DRY
105. delta-BHC		395	1	ND	ND		
106. PCB-1242	(b)	395	1	ND			SECI
107. PCB-1254	(b)	395	1	ND			1
108. PCB-1221	(b)	395	1.	ND			4
109. PCB-1232	(c)	395	1	ND			
110. PCB-1248	(c)	395	1				
111. РСВ-1260	(c)	305	1	ND			
112. PCB-1016) () ()		ND	ND		
		395	1 ·	ND	ND		

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

	Stream	Sample	Concentrations (mg/l)				
Pollutant	Code	<u>Typet</u>	Source	Day I	Day 2	Day	
Toxic Pollutants (Continued)							
113. toxaphene	395	1	ND	ND			
114. antimony	395	1	0.006	4.4			
115. arsenic	395	1	<0.001	0.135	······		
117. beryllium	39.5	. 1	<0.0005	0.001			
118. cadmium	395	1	<0.001	0.140			
119. chromium (total)	395	1	0.032	0.068			
120. copper	395	1	0.031	0.11	· ·		
121. cyanide (total)	395	1	0.040	0.48			
122. lead	395	1	0.12	0.30			
123. mercury	395	1	<0.0002	<0.0002			
124. nickel	395	1	<0.025	0.540			
125 selenium	395	1	<0.008	<0.008			
126 silver	395	. 1	0.001	0.065	·		
127 thallium	395	1	<0.001	0.590			
14/. LHALILUM							

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

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

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

	Stream	Sample	Conc	entrations	(mg/1)	
Pollutant	Code	Typet	Source	Day 1	Day 2	<u>pay 3</u>
Conventional Pollutants (Continued)						T VIEN
total suspended solids (TSS)	395	1	9	25		+ +
pH (standard units)	395	1	7.3	8.3		t C

tSample Type Code: 1 - One-time grab

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

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

Table V-13

	Pollutant	Stream Code	Sample Typet	Concentrations (mg/l			D 0
			Typer	Source	Day I	Day Z	Day 3
Toxic	Pollutants	÷		-		. *	
1.	acenaphthene	396	1	ND	ND	ND	
		<u>3</u> 99	1	ND	ND	ND	
2.	acrolein	396	- 1	ND	ND	ND	
		399		ND	ND ND	ND ND	
3.	acrylonitrile	396	1	MD	MD	ND	()
		399	1	ND	ND	ND ND	i i i
4.	benzene	396	1	ND	ND	ND	
		399	1	ND ND		ND ND	ſ
5.	henzidine	206	1	N.D.			7
5.	Jenzigine	399	1		ND ND		· · · · · · · · · · · · · · · · · · ·
6	as the state of least 1						Ĥ
	carbon tetrachioride	396 399	1.	ND	ND	ND	1
- ,		577	ł	ND	ND	ND	
/.	chlorobenzene	396	1	ND	ND	ND	
		399	1	ND	ND	ND	
8.	1,2,4-trichlorobenzene	396	1	ND	ND	ND	
		399	1	ND	ND	ND	
9.	hexachlorobenzene	396	1	ND	ND	ND	
		399	1	ND	ND	ND	

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

		Stream	Sample	Concentrations (mg/1)			N
	Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3 CON
Toxic	Pollutants (Continued)						DAR
10.	1,2-dichloroethane	396 399	1 1	ND ND	ND ND ·	N D ND	Y TIN
11.	1,1,1-trichloroethane	396 399	1 1	ND ND	ND ND	ND ND	SUBC
12.	hexachloroethane	396 399	1 1	ND ND	ND ND	N D ND	ATEGO
13.	1,1-dichloroethane	396 399	1 1	ND ND	ND ND	ND ND	DRY
14.	1,1,2-trichloroethane	396 399	1 1	ND ND	ND ND	N D ND	SECI
15.	1,1,2,2-tetrachloroethane	396 399	1 1	ND ND	ND ND	ND ND	י ג ג
16.	chloroethane	396 399	1 1	ND ND	ND ND	ND ND	
17.	bis(chloromethyl)ether	396 399	· · · · · 1 · · . 1 ·	ND ND	ND ND	ND ND	
18.	bis(2-chloroethyl)ether	396 399	1	ND ND	ND ND	ND ND	· ·

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

•	<u>Pollutant</u>	Stream Code	Sample Typet	Conce Source	ntrations Day 1	(mg/1) Day 2 Day 3
Toxic	Pollutants (Continued)		•			
19.	2-chloroethyl vinyl ether	396 399	1 1	ND ND	ND ND	N D ND
20.	2-chloronaphthalene	396 399	1	ND ND	ND ND	ND ND
21.	2,4,6-trichlorophenol	396 399	1	ND ND	ND ND	ND ND
22.	p-chloro-m-cresol	396 399	1	ND ND	ND ND	ND ND
23. (chloroform	396 399	1 1.	ND ND	ND ND	N D N D
24. 2	2-chlorophenol	396 399	, 1 1	ND ND	ND ND	ND ND
25. 1	,2-dichlorobenzene	396 399	1 1	ND ND	ND ND	N D N D
26. 1	,3-dichlorobenzene	396 399	1 1	ND ND	ND ND	ND ND
27. 1	,4-dichlorobenzene	396 399	1 1 1	ND ND	ND ND	N D ND

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

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

SECONDARY TIN SUBCATEGORY SECT -

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

	Pollutant	Stream Code	Sample Typet	Con Source	<u>centratior</u> Day 1	ns (mg/1) Day 2	Day 3
Toxic	Pollutants (Continued)						
37.	1,2-diphenylhydrazine	396 399	1 1	ND ND	ND <0.01	N D ND	
38.	ethylbenzene	396 399	1	ND ND	ND ND	ND ND	
39.	fluoranthene	396 399	1	ND ND	ND ND	N D ND	
40.	4-chlorophenyl phenyl ether	396 399	1 1	ND ND	ND ND	ND ND	Ŭ L
41.	4-bromophenyl phenyl ether	396 399	1	ND ND	ND ND	N D ND	ប ច្ ក
42.	<pre>bis(2-chloroisopropyl)ether</pre>	396 399	1 1	ND ND	ND ND	ND ND	F. <
43.	bis(2-choroethoxy)methane	396 399	. 1 1	ND ND	ND ND	N D ND	
44.	methylene chloride	396 399	1 1	<0.01 <0.01	1.724 <0.01	ND ND	
45.	methyl chloride (chloromethane)	396 399	1 1	ND ND	ND ND	N D N D	
46.	methyl bromide (bromomethane)	396 399	1 1	ND ND	ND ND	ND ND	

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SECONDARY TIN SUBCATEGORY S

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

	Stream	Sample	Concentrations (mg/1)				E E
Pollutant	Code	Typet	Source	Day 1	<u>Day 2</u>	Day 3	CONI
Toxic Pollutants (Continued)							DARY
47. bromoform (tribromomethane)	396 399	1 1	ND ND	ND ND	N D N D		TIN
48. dichlorobromomethane	396 399	1 1 [:]	ND ND	ND ND	ND NĐ	·	SUBC
49. trichlorofluoromethane	396 399	1 1	ND ND	ND ND	N D ND		ATEGOI
50. dichlorodifluoromethane	396 399	1 · 1	ND ND	ND · ND	ND ND		RY
51. chlorodibromomethane	396 399	1	ND ND	ND ND	ND ND		SECT
52. hexachlorobutadiene	396 399	1 1	ND ND	ND ND	ND ND		۱ ۷
53. hexachlorocyclopentadiene	396 399	1 1	ND ND	ND ND	N D ND		
54. isophorone	396 399	1	ND ND	ND ND	ND ND	• • • • • • • • •	
55. naphthalene	396 399	1 1	ND ND	<0.01 <0.01	<0.01 <0.01		
	1						

SECONDARY TIN SUBCATEGORY SECT 1

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

	Pollutant	Stream	Sample	Con	centration	s (mg/1)	
	rollucant	Code	<u>Typet</u>	Source	Day 1	Day 2	Day 3
Toxi	c Pollutants (Continued)			. *			
56.	nitrobenzene	396 399	1 1	ND ND	ND ND	N D ND	
57.	2-nitrophenol	396 399	1 1	ND ND	<0.01	ND ND	
58.	4-nitrophenol	396 399	1	<0.01 <0.01	<0.01 ND	N D ND	
59.	2,4-dinitrophenol	396 399	1 1	ND ND	ND ND	ND ND	• •
60.	4,6-dinitro-o-cresol	396 399	1 1	ND ND	ND ND	N D ND	
61.	N-nitrosodimethylamine	396 399	1 1	NÐ ND	ND ND	ND ND	
62.	N-nitrosodiphenylamine	396 399	1 1	N D N D	<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	·

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)							
65.	phenol	396 399	1 1	ND ND	<0.01 <0.01	N D ND		
66.	bis(2-ethylhexyl) phthalate	396 399	1 	<0.01 <0.01	0.268 <0.01	<0.01 <0.01	.	
67.	butyl benzyl phthalate	396 399	1 1	ND ND	0.025	0.011 <0.01		
68.	di-n-butyl phthalate	396 399	1 1	ND ND	<0.01 <0.01	<0.01 <0.01	'n	
69.	di-n-octyl phthalate	396 399	1 1	ND ND	ND ND	N D ND		
70.	diethyl phthalate	396 399	1 1	ND ND	ND ND	ND ND		
71.	dimethyl phthalate	396 399	1 1	ND ND	ND ND	N D ND		
72.	benzo(a)anthracene	396 399	1	ND ND	ND ND	ND ND		
73.	benzo(a)pyrene	396 399	1 1	ND ND	ND ND	N D ND		

SECONDARY TIN SUBCATEGORY SECT -

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

	Pollutant	Stream Code	Sample Typet	<u>Con</u> Source	centration	ns (mg/1)	Dorr 2
Toxic	Pollutants (Continued)	······			<u></u>	Day Z	Day 5
74.	benzo(b)fluoranthene	396 399	1	ND ND	ND ND	N D N D	
75.	benzo(k)fluoranthane	396 399	1 	ND ND	ND ND	ND ND	
76.	chrysene	396 399	1 1	ND ND	ND ND	N D	
77.	acenaphthylene	396 399	1	ND ND	ND ND		
78.	anthracene (a)	396 399	1 1	ND ND	ND <0.01	N D ND	о Б
79.	benzo(ghi)perylene	396 399	1 • 1	ND ND	ND ND	ND ND	÷.
80.	fluorene	396 399	1	ND ND	ND ND	N D N D	
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	N D N D	

SECONDARY TIN SUBCATEGORY SECT

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

	Stream	Sample	Concentrations (mg/1)				
Pollutant	Code	Typet	Source	Day 1	<u>Day 2</u>	Day 3	
Toxic Pollutants (Continued)							
83. indeno (1,2,3-c,d)pyrene	396 399	1 1	ND ND	ND ND	N D ND		
84. pyrene	<u>3</u> 96 399	1	ND ND	ND ND	ND ND	• • • • • • • • • •	
85. tetrachloroethylene	396 399	1	ND ND	ND ND	N D N D		
86. toluene	396 399	1	ND ND	ND ND	ND ND		
87. trichloroethylene	396 399	1	ND ND	ND ND	N D ND		
88. vinyl chloride (chloroethylene)	396 399	1 1	ND ND	ND ND	ND ND		
89. aldrin	396 399	1	ND ND	ND ND	N D ND	*	
90. dieldrin		1.	ND ND	ND ND	ND ND		
91. chlordane	396 399	1 1	ND ND	ND ND	N D N D		
y]. CIIIOLUAIIE	399	1	ND	ND	ND		

SECONDARY TIN SUBCATEGORY SECT

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

	Pollutant		Stream Code	Sample Typet		ntrations	(mg/1)	Day 3
Toxic	<u>e Pollutants</u> (Continued)	tan an a				<u></u>	<u>Day L</u>	<u>Day J</u>
92.	4,4'-DDT		396 399	1 1	ND ND	ND ND	N D ND	
93.	4,4'-DDE		396 399	1	ND ND	ND ND	ND ND	· · · · · · · ·
94.	4,4'-DDD		396 399	1 1	ND ND	ND ND	N D ND	1. 1. 1.
95.	alpha-endosulfan		396 399	1 1	ND ND	ND ND	ND ND	
96.	beta-endosulfan		396 399	1	ND ND	ND ND	N D ND	· ·
97.	endosulfan sulfate		396 399	1 1	ND ND	ND ND	ND ND	ł
98.	endrin		396 399	1	ND ND	ND ND	N D N D	
99.	endrin aldehyde		396 399	1 1	ND ND	ND ND	ND ND	
100.	heptachlor		396 399	1	ND ND	ND ND	N D N D	

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	<u>Day 2</u>	Day 3 n	
Toxic Pollutants (Continued)						DAR	
101. heptachlor epoxide	396	1				н Н	
	399	I	UN	ND		HN	
102. alpha-BHC	396	1	ND ND	ND ND	ND ND	SUB(
102 bot $2-8HC$	396	. 1	ND	ND	N D	CATE	
105. Deca-bild	399	1	ND	ND	ND	∃GOF	
104. gamma-BHC	396	1		ND	ND ND	X	
	595	1		ND	ND	ß	
105. delta-BHC	396 399	1	ND	ND	ND	ECT	
106. PCB-1242 (b)	396	1	ND	ND	ND	I	
	399	1	ND	ND	ND	4	
107. PCB-1254 (b)	396 399	1 1	ND ND	ND ND	N D ND		
100 - pap - 1001 - (b)	396	1	ND	ND	ND		
108. PGB-1221 (D)	399	1	ND	ND	ND		
109. PCB-1232 (c)	396	1			N D N D		
	222	I .	ЦП	ND			

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•					· · ·	and a production	100 A.	
	Pollutant	· . . · ·	Stream Code	Sample Typet	Conc Source	entration Day 1	ns (mg/1) Day 2	Day 3
Toxic	<u>e Pollutants</u> (Continued)	- -	• • •	e de la companya de l La companya de la comp				·
110.	PCB-1248 (c)		396 399	1	ND ND	ND ND	N D N D	
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	
113.	toxaphene		396 399	1 1	ND ND	ND ND	ND ND	
114.	antimony		396 399	1	0.006 0.006	0.40 0.75	3.1 2.2	N E C
115.	arsenic		396 399	1 1	<0.001 <0.001	0.12	0.34 0.30	
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 1	0.032	0.020 0.031	0.032 0.028	

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

SECONDARY TIN SUBCATEGORY

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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	0.075 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	<0.025 <0.025	0.16	0.35 0.45	1997 - 19
125. selenium	396 399	1	<0.008 <0.008	0.05 0.03	<0.008 0.62	
126. silver	396 399	1	0.001 0.001	<0.0005 <0.0005	0.001 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	0.06	0.14 0.59	
					<u> </u>	

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SECONDARY TIN SUBCATEGORY SECT

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

Pollutant	Stream Code	Sample Typet	<u>Con</u> Source	centration Day 1	s (mg/l) Dav 2	Day 3
Nonconventional Pollutants		· · · · · · ·				
alkalinity	396 399	1 1	77 77	38,200 39,000	30,000 31,000	
ammonia nitrogen	396	1	2	0.8	<0.01	
		and a state of the second s	2	· · · · · · · · · · · · · · · · · · ·	<0.01	C t
calcium	396 399	1 1	17 17	0.27 0.57	0.59 0.64	A L D G
chemical oxygen demand (COD)	396 399	1 1	<1 <1	34 39	110 120	CK Y
fluoride	396 399	1	0.94 0.94	15,000 15,000	12,000 12,000	N H C
magnesium	396 399	1	7.2 7.2	0.24 0.45	0.43 0.47	H I V
phenolics	396 399	1 1	0.026 0.026	0.01 0.02	8 0.018 2 0.006	
sulfate	396 399	1	29 29	1,700 1,200	1,500 1,700	
tin	396 399	1	<0.025 <0.025	60 13	18 28	

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

	Stream	Sample	Concentrations (mg/1)			
Pollutant	Code	Typet	Source	Day 1	<u>Day 2</u>	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	51 17	
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	7.8 8.2	i

tSample Type Code: 1 - One-time grab

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

SECONDARY TIN SUBCATEGORY SECT

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Table V-14

TIN HYDROXIDE FILTRATE RAW WASTEWATER SAMPLING DATA

	Pollutant	Stream	Sample	Conc	entration	s (mg/l)	
	Forfulant	Code	<u>Type</u>	Source	Day 1	Day 2	Day 3
Toxi	c Pollutants					τ	•
1.	acenaphthene	398	1	ND	ND		
2.	acrolein	398	1	ND	ND	• •	· · · · ·
3.	acrylonitrile	398		ND	ND.	an an she	
4.	benzene	398	1	ND	ND	Т	
5.	benzidine	398	1	ND	ND		
6.	carbon tetrachloride	398	1	ND	ND	: -	
7.	chlorobenzene	398	1	ND	ND		
8.	1,2,4-trichlorobenzene	398	1	ND	ND		
9.	hexachlorobenzene	398	1	ND	ND	·	
10.	1,2-dichloroethane	398	1	ND	ND		
11.	1,1,1-trichloroethane	398	1	0.003	ND		
12.	hexachloroethane	398	1	ND	ND		
13.	1,1-dichloroethane	398	1 .	ND	ND		
14.	1,1,2-trichloroethane	398	- 1	ND	ND		

TIN HYDROXIDE FILTRATE RAW WASTEWATER SAMPLING DATA

	Pollutant	Stream <u>Code</u>	Sample Typet	Conc Source	entratior Day 1	ns (mg/1) Day 2	Day 3
Toxic	Pollutants (Continued)						
15.	1,1,2,2-tetrachloroethane	398	1	ND	ND		
16.	chloroethane	398	1	ND	ND		
. 17.	bis(chloromethyl)ether	398	1	ND	ND		
18.	bis(2-chloroethyl)ether	398	1	ND	. ND		
19.	2-chloroethyl vinyl ether	398	1	ND	ND		
20.	2-chloronaphthalene	398	1	ND	ND		
21.	2,4,6-trichlorophenol	398	1	ND	N D		
22.	p-chloro-m-cresol	398	1	ND	ND		
23.	chloroform	398	1	ND	ND		
24.	2-chlorophenol	398	1	ND	ND		
25.	1,2-dichlorobenzene	398	1	ND	ND		
26.	1.3-dichlorobenzene	398	1	ND	ND		
27.	1.4-dichlorobenzene	398	• 1.	ND	ND	•	-
28.	3,3'-dichlorobenzidine	398	1	ND	ND		

TIN HYDROXIDE FILTRATE RAW WASTEWATER SAMPLING DATA

Toxi	Pollutant	Stream _Code	Sample Typet	Conce Source	ntrations Day 1	(mg/1) Day 2 Da	ay 3 C
29.	1,1-dichloroethylene	398	1	<u> </u>	ND		UAKY
30.	1,2- <u>trans</u> -dichloroethylene	398	1	ND	ND	· · · ·	T.T.N
31.	2,4-dichlorophenol	398	1	ND	ND		ß
32.	1,2-dichloropropane	398	1	ND	ND		BCAT
33.	1,3-dichloropropene	398	1	ND	ND		'EGO
34.	2,4-dimethylphenol	398	1	ND	ND		RY
35.	2,4-dinitrotoluene	398	1	ND	ND		a co
36.	2,6-dinitrotoluene	398	1	ND	ND		ECT
37.	1,2-diphenylhydrazine	398	1	ND	ND		ן בי
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	•	

TIN HYDROXIDE FILTRATE RAW WASTEWATER SAMPLING DATA

	Pollutant	Stream _Code_	Sample Typet	<u>Conc</u> Source	entrations Day 1	3 (mg/1) Day 2	Day 3 ON
Toxic	Pollutants (Continued)						DARY
43.	bis(2-choroethoxy)methane	398	1	ND	ND		TI I
44.	methylene chloride	398	1	ND	ND		US N
45.	methyl chloride (chloromethane)	398	1 .	ND	ND		IBCA.
46.	methyl bromide (bromomethane)	398	1	ND	ND		TEGC
47.	bromoform (tribromomethane)	398	1	ND	ND		ORY
48.	dichlorobromomethane	398	1	ND	ND		70
49.	trichlorofluoromethane	398	• 1	ND	ND		SECT
50.	dichlorodifluoromethane	398	1	ND	ND		-
51.	chlorodibromomethane	398	1	ND	ND		4
52.	hexachlorobutadiene	398	1.	ND	ND		
53.	hexachlorocyclopentadiene	398	1	ND	N D		
54.	isophorone	398	. 1	ND	ND		
55.	naphthalene	398	1	ND	ND		
56.	nitrobenzene	398	1	ND	ND		

TIN HYDROXIDE FILTRATE RAW WASTEWATER SAMPLING DATA

·	Pollutant		Sample	Concentrations (mg/l)					
Tori		_code_	Typet	Source	Day 1	Day 2	Day 3	ECC	
1011	<u>c Follutants</u> (Continued)						• • •	ŇD	
57.	2-nitrophenol	398	. 1	ND	0.010			ARY	
58.	4-nitrophenol	398	1	<0.01	0.025			TIN	
59.	2,4-dinitrophenol	398	· · · · · · · · · · · · · · ·	ND	0.033			DS	
60.	4,6-dinitro-o-cresol	398	1	ND	ND			BCAT	
61.	N-nitrosodimethylamine	398	1	ND	ND			EGO	
62.	N-nitrosodiphenylamine	398	1	ND	<0.010			RY	
63.	N-nitrosodi-n-propylamine	398	1	ND	ND			ß	
64.	pentachlorophenol	398	1	ND	ND			ECT	
65.	phenol	398	1	ND	ND			। ८	
66.	bis(2-ethylhexyl) phthalate	398	1	<0.01	<0.010				
67.	butyl benzyl phthalate	398	1	ND	<0.010				
68.	di-n-butyl phthalate	398	1	ND	<0.010				
69.	di-n-octyl phthalate	398	. 1 .	ND	ND				
70.	diethyl phthalate	398	· • • 1	ND	ND				
					• =				

TIN HYDROXIDE FILTRATE RAW WASTEWATER SAMPLING DATA

		Stream	Sample	Conce	entrations	<u>s (mg/l)</u>	Dav 3	の 王 の
	Pollutant	Code	Typet	Source	Day I	<u>Day 2</u>	Day J	OND
<u>Toxic</u>	Pollutants (Continued)							ARY
71.	dimethyl phthalate	398	1	ND	ND			TTN
72.	benzo(a)anthracene	398	1	ND	ND			n SU
73.	benzo(a)pyrene	398	1	ND	ND			ВCA
74.	benzo(b)fluoranthene	398	1	ND	N D			TEGO
75.	benzo(k)fluoranthane	398	1	ND	ND			JRY
76	chrysene	398	1	ND	ND			
, 77	acenanhthylene	398	1	ND	ND			о С
//• 79	anthracene (a)	398	1	ND	N D			н. П
70.	hongo(ghi)pervlene	398	1	ND	ŅD	•		<
19.		398	1	ND	ND			
80.	Iluorene (a)	398	· 1	ND	ND			
81.	phenanthrelie (a)	398	1	ND	ND			
82.	dibenzo(a,h)anthracene	398	1	ND	ND			
83.	indeno (1,2,3-c,d)pyrene	308	1	ND	ND			
84.	pyrene	220	I					

TIN HYDROXIDE FILTRATE RAW WASTEWATER SAMPLING DATA

<u>Pollutant</u>	Stream Code	Sample Typet	Conc Source	entration. Day 1	<u>s (mg/1)</u> Day 2	Dav	
Toxic Pollutants (Continued)	•						
85. tetrachloroethylene	398	1	ND	ND			ARY
86. toluene	398	1	ND	ND			,T,T,N
87. trichloroethylene	398			ND.		- - 	N D
88. vinyl chloride (chloroethylene)	398	1	ND	ND		· ·	3CAT
89. aldrin	398	- 1	ND	ND			EGOF
90. dieldrin	398	1	ND	ND	· · · ·	· · ·	Х
91. chlordane	398	1	ND	ND		· ·	ល
92. 4,4'-DDT	398	1	ND	ND			ECT
93. 4,4'-DDE	398	1	ND	ND		•	י ר
94. 4,4'-DDD	398	1	ND	ND			-
95. alpha-endosulfan	398	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	ND	ND			×
96. beta-endosulfan	398	1	ND	ND			
97. endosulfan sulfate	398	1 · · · ·	ND	ND		· _	
98. heptachlor	398	. 1	ND	ND			

TIN HYDROXIDE FILTRATE RAW WASTEWATER SAMPLING DATA

	Stream Sample		Concentrations (mg/1)				
Pollutant	Code	Typet	Source	Day 1	Day 2	<u>Day 3</u>	
Toxic Pollutants (Continued)						1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	
99. endrin aldehyde	398	1	ND	ND		E F	
100. heptachlor	398	1	ND	ND		2	
101. heptachlor epoxide	398	1	ND	ND			
102. alpha-BHC	398	1	ND	ND			
103. beta-BHC	398	1	ND	ND			
104. gamma-BHC	398	1	ND	ND			
105. delta-BHC	398	1	ND	ND			
106 PCB-1242 (b)	398	1	ND	ND		ŀ	
107 PCB - 1254 (b)	398	1	ND	ND		•	
107. 108 1231 (b)	398	1	ND	ND			
$100 \cdot PCB - 1222$ (c)	398	1	ND	N D			
109. POB-1232 (C)	398	1	ND	N D			
110. PGB - 1240 (0) (0)	398	1	ND	ND	· ·· -		
111. PCB-1260 (C)	308	1	ND	ND			
112. PCB-1016 (C)	590	• 					

TIN HYDROXIDE FILTRATE RAW WASTEWATER SAMPLING DATA

	Pollutant	Stream Code	Sample Typet	<u>Conc</u> Source	entration Day 1	<u>s (mg/1)</u> Day 2	Day 3
Toxi	c Pollutants (Continued)						
113.	toxaphene	398	1	ND	ND		JAKY
114.	antimony	398	1 4 - 4 - 4	0.006	2.4	· · · · · ·	TIN
115.	arsenic	398	1	<0.001	0.024	· · · · · · · · · · · · · · · · · · ·	US
117.	beryllium	398	1	<0.0005	0.002		ВСАЛ
118.	cadmium	398	1	<0.001	0.002	• •	"臣GC
119.	chromium (total)	398	1	0.032	0.04	·)RY
120.	copper	398	1	0.031	0.280		Ĩ
121.	cyanide (total)	398	1	0.040	10.0)臣CT
122.	lead	398	1	0.12	0.037		I.
123.	mercury	398	1	<0.0002	<0.0002		7
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		

TIN HYDROXIDE FILTRATE RAW WASTEWATER SAMPLING DATA

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

TIN HYDROXIDE FILTRATE RAW WASTEWATER SAMPLING DATA

Pollutant	Stream	Sample	Conc		70		
Pollutant	_Code_	<u>Typet</u>	Source	Day 1	Day 2	Day 3	E C
Conventional Pollutants (Continued)		· · .					UND
total suspended solids (TSS)	398	1	9	32			ARY
pH (standard units)	398	1	7.3	8.1			TIN

SUBCATEGORY

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tSample Type Code: 1 - One-time grab
(a), (b), (c) Reported together.

Table V-15

MUD POND SUPERNATANT RAW WASTEWATER SAMPLING DATA

	Pollutant	Stream Code	Sample Typet	Conce Source	ntrations Day 1	(mg/1) Day 2	Day 3	SECON
Toxic	Pollutants							DARY
1.	acenaphthene	456	1	ND	ND			LL 2
2.	acrolein	456	1	ND	ND			N N
	acrylonitrile	456		ND	ND			UBC
4.	benzene	456	1	0.013	0.008			ATEO
5.	benzidine	456	1	ND	ND			;ORY
6.	carbon tetrachloride	456	1	ND	ND			
7.	chlorobenzene	456	1	ND	ND			SEC
8.	1,2,4-trichlorobenzene	456	1	ND	ND			н I
9.	hexachlorobenzene	456	1	0.015	0.004			4
10.	1.2-dichloroethane	456	1	ND	ND			
11.	1.1.1-trichloroethane	456	1	ND	0.003			
12.	hexachloroethane	456	1	ND	ND		. <u>-</u>	
13.	1.1-dichloroethane	456	1	ND	ND			
14.	1,1,2-trichloroethane	456	1	ND	ND			
MUD POND SUPERNATANT RAW WASTEWATER SAMPLING DATA

	Pollutant	Stream	Sample	Cone	centration	·		
	Pollutant	Code	<u>Type</u> t	Source	Day 1	Day 2	Day 3	70
Toxi	c Pollutants (Continued)							SECC
15.	1,1,2,2-tetrachloroethane	456	· 1	ND	ND			NDA
16.	chloroethane	456	1	ND	ND			RY 1
17.	bis(chloromethyl)ether	-456	1	ND	• • • • • • • • • • • • • • • • • • •			ľΠΝ
18.	bis(2-chloroethy1)ether	456	1	ND	ND			SUBO
19.	2-chloroethyl vinyl ether	456	1	ND	ND			CATE
20.	2-chloronaphthalene	456	1	ND	ND	-		GOR
21.	2,4,6-trichlorophenol	456	1	ND	ND			К
22.	p-chloro-m-cresol	456	1	ND	ND			SE
23.	chloroform	456	1	0.038	0.005			CH.
24.	2-chlorophenol	456	1	NÐ	ND			۱ ۲
25.	1,2-dichlorobenzene	456	1	ND	ND			
26.	1,3-dichlorobenzene	456	1	ND	ND		, ,	
27.	1,4-dichlorobenzene	456	1	ND	ND			
28.	3,3'-dichlorobenzidine	456	1	ND	ND	÷.,		

MUD POND SUPERNATANT RAW WASTEWATER SAMPLING DATA

	Stream	am Sample	Concentrations (mg/1)				
Pollutant	Code	Typet	Source	Day 1	<u>Day 2</u>	<u>Day 3</u>	ECC
Toxic Pollutants (Continued)							JNDA
29. 1,1-dichloroethylene	456	1	ND	ND			RY 1
30. 1,2- <u>trans</u> -dichloroethylene	456	1	ND	ND			PIN
31. 2,4-dichlorophenol	456	1	ND	ND			SUB
32. 1,2-dichloropropane	456	1	ND	ND			CATE
33. 1,3-dichloropropene	456	1	ND	ND			IGOR
34. 2,4-dimethylphenol	456	1	ND	0.004			К
35. 2,4-dinitrotoluene	456	1	ND	ND			SE
36. 2,6-dinitrotoluene	456	1	ND	ND			C H
37. 1,2-diphenylhydrazine	456	1	ND	ND			4
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		-	

MUD POND SUPERNATANT RAW WASTEWATER SAMPLING DATA

ء 	<u>Pollutant</u>	Stream Code	Sample Typet	<u>Conc</u>	entrations (mg/1 Day 1 Day 2) Day	
<u>Toxi</u>	<u>c Pollutants</u> (Continued)		· · · · ·				
43.	bis(2-choroethoxy)methane	456	· 1 · · ·	ND	ND		ARY
44.	methylene chloride	456	1	0.190	0.005		TIN
45.	methyl chloride (chloromethane)		.1	ND	n ND-	<u>.</u>	IUS
46.	methyl bromide (bromomethane)	456	1	ND	ND		3CAT
47.	bromoform (tribromomethane)	456	1	ND	ND	· · · · · · · · · · · · · · · · · · ·	EGO
48.	dichlorobromomethane	456	1	ND	ND	•	RY .
49.	trichlorofluoromethane	456	1	ND	ND		ຎ
50.	dichlorodifluoromethane	456	. 1	ND	ND	•	ECT
51.	chlorodibromomethane	456	· 1	0.002	ND		ו ל
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		
<u>Toxic</u>	Pollutants (Continued)								
57.	2-nitrophenol	456	1	ND	0.020				
58.	4-nitrophenol	456	¹ 1	ND	ND				
59.	2,4-dinitrophenol	456	1	ND	N D				
60.	4,6-dinitro-o-cresol	456	· 1	ND	N D				
61.	N-nitrosodimethylamine	456	1	ND	N D				
- 62.	N-nitrosodiphenylamine	456	. 1	ND	N D				
63.	N-nitrosodi-n-propylamine	456	1	ND	ND				
64.	pentachlorophenol	456	1	ND	ND				
65.	phenol	456	1	ND	0.003				
66.	bis(2-ethylhexyl) phthalate	456	1	0.006	0.002				
67.	butyl benzyl phthalate	456	1	ND	N D				
68.	di-n-butyl phthalate	456	1	ND	ND				
69	di-n-octyl phthalate	456	1	ND	ND				
70.	diethyl phthalate	456	1	ND	ND				

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MUD POND SUPERNATANT RAW WASTEWATER SAMPLING DATA

* .	D 11		Sample	Concentrations (mg/l)					
ана 1917 - Р. С.	Pollutant	Code	<u>Type</u> †	Source	Day 1	Day 2	Day 3		
Toxic	Pollutants (Continued)							IN DA	
71.	dimethyl phthalate	456	1	ND	N D	· ·		5 F	
72.	benzo(a)anthracene	456	1	ND	N D				
73.	benzo(a)pyrene	456				· · · · ·		а 10 10	
74.	benzo(b)fluoranthene	456	1	ND	ND			CAT	
.75.	benzo(k)fluoranthane	456	1	ND	ND	-		±GOR	
76.	chrysene	456	1	ND	ND	· · ·		ĸ	
77.	acenaphthylene	456	1	ND	ND	· ·		SE	
78.	anthracene (a)	456	1	ND	ND			CH	
79.	benzo(ghi)perylene	456	1	ND	ND			י <	
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	N D		•		
84.	pyrene	456	- 1	ND	ND		- -		

MUD POND SUPERNATANT RAW WASTEWATER SAMPLING DATA

		Stream Sam			centrations (mg/l)			
	Pollutant	Code	Typet	Source	Day 1	Day 2	Day	3
<u>Toxic</u>	Pollutants (Continued)							
85.	tetrachloroethylene	456	1	ND	N D			
86.	toluene	456	1	0.001	0.004			
87.	trichloroethylene	456	1	ND	ND			
88.	vinyl chloride (chloroethylene)	456	1	ND	ND			
89.	aldrin	456	1	ND	N D			
90.	dieldrin	456	· 1	ND	ND			
91.	chlordane	456	1	ND	ND	<i>,</i>		
92.	4,4'-DDT	456	1	ND	ND			
93.	4,4'-DDE	456	1	ND	N D			
94.	4,4'-DDD	456	1	ND	ND			
95.	alpha-endosulfan	456	1	ND	N D			
96.	beta-endosulfan	456		ND	ND	• • • • •		
97.	endosulfan sulfate	456	1	ND	ND			
98.	heptachlor	456	1	ND	ND			

MUD POND SUPERNATANT RAW WASTEWATER SAMPLING DATA

Pollutont	Stream	Sample	Concentrations (mg/1)			· .	R
	Code	<u>Type†</u>	Source	Day 1	Day 2	Day 3	
Toxic Pollutants (Continued)							NDA
99. endrin aldehyde	456	1	ND	ND			RY
100. heptachlor	456	1	ND	ND		*	ΓIN
101. heptachlor epoxide	456	1;	ND	ND		 	SUB
102. alpha-BHC	456	1	ND	ND		 	CATI
103. beta-BHC	456	1	ND	ND		•	IGOR
104. gamma-BHC	456	1	ND .	ND		-	ĸ
105. delta-BHC	456	• 1	ND	ND			SH
106. PCB-1242 (b)	456	1	ND	ND		-	CT
107. PCB-1254 (b)	456	1	ND	N D			ו ל
108. PCB-1221 (b)	456	1	ND	ND			
109. PCB-1232 (c)	456	1	ND	ND			
110. PCB-1248 (c)	456	1	ND	ND			
111. PCB-1260 (c)	456	<mark>1</mark>	ND	ND			
112. PCB-1016 (c)	456	1	ND	ND			

MUD POND SUPERNATANT RAW WASTEWATER SAMPLING DATA

	Stream	Sample	Conce	entrations	(mg/1)	Day 3
Pollutant	Code	турет	Source	<u>Day I</u>	Day 2	<u>Duy J</u>
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. cvanide (total)	456	1	0.0022	1.900		
122. lead	456	1	0.019	11		
	456	1	<0.0002	0.0004		
125. mereary	456	1	<0.001	2.1		
	456	1	0.033	0.050		
125. selenium	400	•		0.1.0		
126. silver	456	1	<0.001	0.40	-	
127. thallium	456	1	0.14	2.5		

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MUD POND SUPERNATANT RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Typet	Conc Source	centrations Day 1	(mg/1) Day 2	Day 3	0 E C
Toxic Pollutants (Continued)							ATNC
128. zinc	456	1.	0.08	190		· · · ·	к н
Nonconventional Pollutants							L T N
alkalinity	456	" 1-	60	90,000	ini .		R O S
aluminum	456	1	1.90	30,000			ELAC
ammonia nitrogen	456	· · 1	0.18				GOR
calcium	456	1 .	11	<0.1	· _ ·		Ķ
chemical oxygen demand (COD)	456	1	4.0	5,700			SE
fluoride	456	1	1.2	0.4			Ċ H
magnesium	456	1	5.5	0.12			۰ ۲
phenolics	456	1	0.011	0.011		м •	·
tin	456	1	1.6	240			
Conventional Pollutants				· ·			
oil and grease	456	1	<1				

MUD POND SUPERNATANT RAW WASTEWATER SAMPLING DATA

Pollutant Conventional Pollutants (Continued)	Stream Code	Sample Typet	Conc Source	entrations Day 1	(mg/1) Day 2	Day 3 ONDAR
total suspended solids (TSS)	456	1	1	400		н Т
pH (standard units)	456	1	6.2	13.4		ע ע
	· · · · · · · · ·					JECATEGORY

tSample Type Code: 1 - One-time grab
(a), (b), (c) Reported together.

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Table V-16

ELECTROWINNING SOLUTION AFTER CHLORINATION - PLANT C TREATED WASTEWATER SAMPLING DATA

<u>Pol</u>	lutant	Stream Code	Sample Typet	Cond Source	centrations Day 1	(mg/1) Day 2	Day	SECO
Toxic Pollutan	<u>ts</u>					** **	· · · ·	NDA
1. acenapht	hene	849	1	ND	0.001		· · · · ·	RY 1
2. acrolein		849	1	ND	ND		•	PIN
3. acryloni	trile	849	1	ND	ND	•		SUB
4. benzene		849	1	ND	ND			CATI
5. benzidin	e	849	1	ND	ND			IGOR
6. carbon to	etrachloride	849	1	ND	ND			Ř
7. chlorober	nzene	849	1	ND	ND	· ·		ES.
8. 1,2,4-tr	ichlorobenzene	849	1	ND	ND			CT
9. hexachlor	cobenzene	849	1	ND	ND	• •		۱ ۲
10. 1,2-dich	oroethane	849	1 1	ND	ND			
11. 1,1,1-tri	chloroethane	849	1	ND	ND			
12. hexachlor	oethane	849	1	ND	ND			
13. 1,1-dichl	oroethane	849	1	ND	ND	· ·		: · ·
14. 1,1,2-tri	chloroethane	849	1	ND	ND	- 		

ELECTROWINNING SOLUTION AFTER CHLORINATION - PLANT C TREATED WASTEWATER SAMPLING DATA

		Stream Sample		Conc		SEC		
	Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	ONI
Toxic	Pollutants (Continued)							DARY
15.	1,1,2,2-tetrachloroethane	849	1	ND	ND			TI
16.	,chloroethane	849	1	ND	ND			US N
17.	bis(chloromethyl)ether	849	1	ND	ND			IBCA
18.	bis(2-chloroethyl)ether	849	1	ND	ND			TEG
19.	2-chloroethyl vinyl ether	849	1	ND	ND			ЭRY
20.	2-chloronaphthalene	849	1	ND	ND			
21.	2,4,6-trichlorophenol	849	1	ND	ND			SECI
22.	p-chloro-m-cresol	849	· 1	ND	ND			I
23.	chloroform	849	1	ND	ND			4
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			

SECT Τ.

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

	Pollutant	Stream Code	Sample Typet	Conc Source	entrations Day 1	(mg/1) Day 2	Day 3	SECO
Toxic	Pollutants (Continued)							
29.	1,1-dichloroethylene	849	1	ND	ND			ARY
30.	1,2- <u>trans</u> -dichloroethylene	849	1	ND	ND			TIN
31.	2,4-dichlorophenol	849	. 1	ND	ND			SUE
32.	1,2-dichloropropane	849	1	ND	ND			CAT
33.	1,3-dichloropropene	849	1	ND	ND			EGOI
34.	2,4-dimethylphenol	849	1	ND	ND			RΥ
35.	2,4-dinitrotoluene	849	1	ND	ND			S
36.	2,6-dinitrotoluene	849	1	ND	ND			ECT
37.	1,2-diphenylhydrazine	849	1	ND	ND			l V
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	NĐ	ND			

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ELECTROWINNING SOLUTION AFTER CHLORINATION - PLANT C TREATED WASTEWATER SAMPLING DATA

	Pollutant	Stream <u>Code</u>	Sample Typet	<u>Conc</u> Source	entration: Day 1	s (mg/1) Day 2	Day 3	SECON
Toxic	Pollutants (Continued)							DARY
43.	bis(2-choroethoxy)methane	849	1	ND	ND			HH
44.	methylene chloride	849	1	ND	0.015			N N
45.	methyl chloride (chloromethane)	849	. 1	ND	ND	•	-	JBCA
46.	methyl bromide (bromomethane)	849	1	ND	ND			TEG
47.	bromoform (tribromomethane)	849	1	ND	ND			ORY
48.	dichlorobromomethane	849	1	ND	ND	,		
49.	trichlorofluoromethane	849	1	ND	ND			SEC
50.	dichlorodifluoromethane	849	1	ND	ND			н Г
51	chlorodibromomethane	849	1	ND	ND			<
50	bexachlorobutadiene	849	1	ND	ND			
53	hexachlorocyclopentadiene	849	1	ND	ND	- ,		
5.4	icophorone	. 849	1	ND	ND			
J4. 55	raphthalone	849	1	ND	0.002		•	
55.	nitrobenzene	849	1	ND	ND			

SECT Т

ELECTROWINNING SOLUTION AFTER CHLORINATION - PLANT C TREATED WASTEWATER SAMPLING DATA

	Pollutant	Stream <u>Code</u>	Sample Typet	<u>Conc</u> Source	entrations (mg/1 Day 1 Day 2) Day 3	SECO
Toxic	e Pollutants (Continued)						NDA
57.	2-nitrophenol	849	1	ND	0.020		RY
58.	4-nitrophenol	849		ND	ND		ΓIN
59.	2,4-dinitrophenol	849	1	ND	ND		SUB
60.	4,6-dinitro-o-cresol	849	1	ND	ND		CATE
61.	N-nitrosodimethylamine	849	1	ND	ND	· · · · ·	GOR
62.	N-nitrosodiphenylamine	849	1	ND	ND		К
63.	N-nitrosodi-n-propylamine	849	1	ND	ND		SE
64.	pentachlorophenol	849	1	ND	N D		C H
65.	phenol	849	1	ND	0.08		4
66.	bis(2-ethylhexyl) phthalate	849	1	0.054	N D		
67.	butyl benzyl phthalate	849	1	ND	ND	н 	:
68.	di-n-butyl phthalate	849	1	ND	ND		
<u>,</u> 69.	di-n-octyl phthalate	849		ND	ND		
70.	diethyl phthalate	849	1	ND	N D		

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ELECTROWINNING SOLUTION AFTER CHLORINATION - PLANT C TREATED WASTEWATER SAMPLING DATA

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	Pollutant	Stream Code	Sample Typet	Conc Source	entrations Day 1	3 (mg/1) Day 2	Day 3
Toxic	Pollutants (Continued)						
71.	dimethyl phthalate	849	1	ND	ND		
72.	benzo(a)anthracene	849	1	ŇD	ND		
73.	benzo(a)pyrene	849	1		ND		
74.	benzo(b)fluoranthene	849	1	ND	N D		
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	henzo(ghi)pervlene	849	1	ND	N D		
80	fluorene	849	1	ND	N D		
Q1	phenanthrene (a)	849	1	ND	ND		
01.	dibongo(a h)anthracene	849	1 -	- ND /	ND .		
82.	(1, 2, 3, 6)	849	1	ND	ND		
83.	indeno (1,2,3-c,d)pyrene	849	1	ND	0.003		
84.	pyrene	047	-				:

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SECT I

ELECTROWINNING SOLUTION AFTER CHLORINATION - PLANT C TREATED WASTEWATER SAMPLING DATA

<u>Pollutant</u>	Stream Code	Sample Typet	Conc Source	<u>Day 1</u>	(mg/1) Day 2	Day 3	
Toxic Pollutants (Continued)		×					NUN
85. tetrachloroethylene	849	1	ND	ND		•	LA L
86. toluene	849	1	0.093	0.001			L T N
87. trichloroethylene	849	· · · · · · · · · · · · · · · · · · ·	- ND	0.016	ar ha samaa maa s	در دیکھیے کار	S U U U U U
88. vinyl chloride (chloroethylene)	849	1	ND	ND			CATI
89. aldrin	849	1	ND	ND			GOR
90. dieldrin	849	1	ND	ND			Ŕ
91. chlordane	849	1	ND	ND			SE
92. 4,4'-DDT	849	1	ND	ND		• •	CT T
93. 4,4'-DDE	849	1	ND	ND			י ל
94. 4,4'-DDD	849	1	ND	ND			
95. alpha-endosulfan	849	1	ND	ND			
96. beta-endosulfan	849	1	ND	ND			
97. endosulfan sulfate	849	1	ND	ND			
98. heptachlor	849	1	ND	ND			1

ELECTROWINNING SOLUTION AFTER CHLORINATION - PLANT C TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Typet	Conc Source	entration Day 1	<u>s (mg/1)</u> Day 2	Day 3
Toxic Pollutants (Continued)						
99. endrin aldehyde	849	1	ND	ND		F F
100. heptachlor	849	1	ND	ND		, ,
101. heptachlor epoxide	849	1	ND	ND		
102. alpha-BHC	849	1	ND	ND		
103 beta-BHC	849	1	ND	ND		Ć
104 comma-BHC	849	1	ND	ND		ŀ
105 dolta-BHC	849	1	ND	ND		ł
106 DOD 1262 (b)	849	1	ND	ND		i I
106. PCB-1242 (b)	849	1	ND	ND		
107. PCB-1254 (D)	040	1	ND	ND		
108. PCB-1221 (b)	849	1	ND	ΝD		
109. PCB-1232 (c)	849	I	ND			
110. PCB-1248 (c)	849	1.	ND	ND		
111. PCB-1260 (c)	849	1	ND	N D		
112. PCB-1016 (c)	849	1	ND	ND		

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ELECTROWINNING SOLUTION AFTER CHLORINATION - PLANT C TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream	Sample	Conc	entrations	<u>s (mg/l)</u>		
Toxic Pollutants (Continued)		TAbel	source	<u>Day I</u>	Day 2	Day 3	
113. toxaphene	849	· 1 · · .	ND	ND			
114. antimony	849	1	<0.001	<0.001			
115. arsenic		·		-1 -8-	n an	· · · · · · · · · · · · · · · · · · ·	
117. beryllium	849	1	<0.001	0.012	• •		
118. cadmium	849	1	<0.001	0.32			
119. chromium (total)	849	1	0.003	0.31		'	
120. copper	849	.1	0.14	0.26		,	
121. cyanide (total)	849	1.	0.005	4.6		an a	
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		a de la companya de l Na companya de la comp	

ELECTROWINNING SOLUTION AFTER CHLORINATION - PLANT C TREATED WASTEWATER SAMPLING DATA

	Stream	Sample	Concentrations (mg/1)				- E
Pollutant	Code	Typet	Source	Day 1	<u>Day 2</u>	<u>Day 3</u>	
Toxic Pollutants (Continued)							IDAR
128. zinc	849	1	0.06	1.1			LL A
Nonconventional Pollutants							z ro
ammonia nitrogen	849	1	1.5	20			SUBC
phenolics	849	1	0.002	0.003	3		ATEC
tin	849	1	0.28	2,300			JORY
Conventional Pollutants							
oil and grease	849	1	5.6	ND			SEC
total suspended solids (TSS)	849	1	19	25,000			H I
pH (standard units)	849	1	6.5	13			<

tSample Type Code: 1 - One-time grab (a), (b), (c) Reported together.

Table V-17

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

Pollutant		Stream Code	Sample Typet	Conc Source	entrations Day 1	(mg/1) Day 2	Dav 3	SEC
Toxic Pollutants			· ·				<u> </u>	OND.
1. acenaphthene		850	1	ND	ND			ARY
2. acrolein		850	1	ND	ND			TIN
3. acrylonitrile		850	1	ND	ND		a	SUE
4. benzene		850	1	ND	0.001			3CAT
5. benzidine		850	1	ND	ND			EGOI
6. carbon tetrachloride		850	1	ND	ND			RY
7. chlorobenzene		850	1	ND	ND			Ŋ
8. 1,2,4-trichlorobenzene		850	1	ND	ND	• •		ECT
9. hexachlorobenzene		850	1	ND	ND			ו ≺
10. 1,2-dichloroethane		850	_ 1	ND	ND			•
11. 1,1,1-trichloroethane	•	850	1	ND	ND			
12. hexachloroethane		850	1	ND	ND	•	й Л	
13. 1,1-dichloroethane		850	1	ND	ND			
14. 1,1,2-trichloroethane		850	1	ND	ND			

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

	Pollutant	Stream Code	Sample Typet	Conc Source	entration: Day 1	s (mg/1) Day 2	Day 3	
Toxic	Pollutants (Continued)							UAR
15.	1,1,2,2-tetrachloroethane	. 850	1	ND	ND			н Н
16.	chloroethane	850	1	ND	ND			L IN VI T
17.	bis(chloromethyl)ether	850	1	ND	ND	.	• • •	
18.	bis(2-chloroethyl)ether	850	1	ND	ND			UTU.
19.	2-chloroethyl vinyl ether	850	1	ND	ND			GONI
,20.	2-chloronaphthalene	850	1	ND	ND			
21.	2,4,6-trichlorophenol	850	1	ND	ND			о Б
22.	p-chloro-m-cresol	850	1	ND	ND) +
23.	chloroform	850	1	ND	ND			<
24.	2-chlorophenol	850	1	ND	ND			
25.	1.2-dichlorobenzene	850	1	ND	ND			
26.	1,3-dichlorobenzene	850	. 1 -	ND	ND			
27.	1.4-dichlorobenzene	850	1	ND	ND			
28.	3,3'-dichlorobenzidine	850	1	ND	ND			

SECT - V

		Stream	Sample	Conce	entration	ns (mg/l)		ы Б
	Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3	100
Toxic	e Pollutants (Continued)						· , ·	NDA
29.	1,1-dichloroethylene	850	· 1	ND	ND			RY . J
30.	1,2- <u>trans</u> -dichloroethylene	850	1	ND	ND	·		TIN
31.	2,4-dichlorophenol	850		ND	ND			SUB
32.	1,2-dichloropropane	850	1	ND	ND	. · · · · · · · · · · · · · · · · · · ·		CATE
33.	1,3-dichloropropene	850	1	ND	ND			IGOR
34.	2,4-dimethylphenol	850	1	ND	ND		Ĩ	К
35.	2,4-dinitrotoluene	850	1	ND	ND		<pre>{</pre>	E N
36.	2,6-dinitrotoluene	850	1	ND	ND		- - -	ĊŢ
37.	1,2-diphenylhydrazine	850	1	ND	ND			ו ⊲
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	N D	•		
42.	bis(2-chloroisopropyl)ether	850	· · · · · · · · · · · · · · · · · · ·	ND	N D			

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

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

		Stream Sample	Concentrations (mg/1)					
	Pollutant	Code	Typet	Source	Day 1	Day 2	<u>Day 3</u>	ល
Toxic	Pollutants (Continued)							ECON
43.	bis(2-choroethoxy)methane	850	1	ND	ND			VDAR
44.	methylene chloride	850	1	ND	0.045			ц Х
45.	methyl chloride (chloromethane)	850	1	ND	ND			IN
46.	methyl bromide (bromomethane)	850	1	ND	ND			SUBC
47.	bromoform (tribromomethane)	850	1	ND	ND			ATE
48.	dichlorobromomethane	850	1	ND	ND			GOR
49.	trichlorofluoromethane	850	1	ND	ND			FG
50.	dichlorodifluoromethane	850	1	ND	ND			N N
51.	chlorodibromomethane	850	1	ND	ND			CT
52.	hexachlorobutadiene	850	1	ND	ND			י <
53	hexachlorocyclopentadiene	850	1	ND	ND			
54	i sophorone	850	1	ND	ND			
55	nanhthalene	850	1	ND	ND			
56	nitrohenzene	850	- 1	ND	ND			

	Pollutant	Stream Code	Sample Typet	<u>Conc</u> Source	entrations Dav 1	s (mg/1) Day 2	Day 3
Toxic	Pollutants (Continued)	<u>ha shiniyin disa a sa garanin</u>					
57.	2-nitrophenol	850	1	ND	ND		
58.	4-nitrophenol	850	1	ND	ND	· · ·	7 H
5.9·• ·	2,4-dinitrophenol				ND		N.
60.	4,6-dinitro-o-cresol	850	1	ND	ND	•	
61.	N-nitrosodimethylamine	850	1	ND	N D	·	AL E
62.	N-nitrosodiphenylamine	850	1	ND	ND		GOX
63.	N-nitrosodi-n-propylamine	850	1	ND	ND	• . •	ĸ
64.	pentachlorophenol	850	1	ND	ND	C e	U E
65.	phenol	850	1	ND	0.035		ĊŦ
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 tag	ND		·
70.	diethyl phthalate	850	1	ND	ND	· .	

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

SECONDARY TIN SUBCATEGORY SECT

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

			Stream	Sample	Conc	entration	<u>s (mg/1)</u>		
	Pollutant		Code	Typet	Source	<u>Day 1</u>	Day 2	Day 3	ល
Toxic	Pollutants (Continu	ed)							ECO
71.	dimethyl phthalate		850	1	ND	ND			NDAR
72.	benzo(a)anthracene		850	1	ND	ND			н Н
73.	benzo(a)pyrene	••	850	1.	ND	ND	-	. .	HN N
74.	benzo(b)fluoranthen	e	850	1.	ND	ND			UBC
75.	benzo(k)fluoranthan	e	850	1	ND	N D			ATE
76.	chrysene		850	1	ND	ND			JORY
77.	acenaphthylene		850	1	ND	ND			·
78.	anthracene	(a)	850	1	ND	ND			SEC
79.	benzo(ghi)perylene		850	1	ND	ND .			н Г
80.	fluorene		850	1	ND	N D			٢.
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	• 5		
84.	pyrene		850	1	ND	N D			

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

		Stream	Sample	Conc	entration	s (mg/1)		U.
	Pollutant	Code	<u>Typet</u>	Source	<u>Day 1</u>	Day 2	Day 3	
Toxic	Pollutants (Continued)			•	•			NUA
85.	tetrachloroethylene	850	1	ND	ND	n An Antonio An		KY 1
86.	toluene	850	1	0.093	0.01			L L N
.87	trichloroethylene	850		ND	-0.021			SUBO
88.	vinyl chloride (chloroethylene)	850	1	ND	ND			CATE
89.	aldrin	850	1	ND	N D		• • •	GOR
90.	dieldrin	850	1	ND	ND			Ŕ
91.	chlordane	850	1	ND	N D			SE
92.	4,4'-DDT	850	1	ND	N D			CH
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	N D			
98.	heptachlor	850	1	ND	ND			

SECONDARY TIN SUBCATEGORY

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

	Pollutar	<u>it</u>	Stream Code	Sample Typet	Conce Source	entrations Day 1	(mg/1) Day 2	Day 3	Ŋ
<u>Toxic</u>	Pollutants (C	continued)							ECON
99.	endrin aldehy	de	850	1	ND	ND			UDAR
100.	heptachlor		850	1	ND	ND			Н У
101.	heptachlor ep	oxide	850	1	ND	ND		. . .	HN
102.	alpha-BHC		850	1	ND	ND			SUBC
103.	beta-BHC		850	1	ND	ND			ATE
104.	gamma-BHC		850	1	ND	ND.			GORY
105.	delta-BHC		850	1	ND	ND			
106.	PCB-1242	(b)	850	1	ND	ND			SE
107.	PCB-1254	(b)	850	1	ND	ND			Ц -
108.	PCB-1221	(b)	850	1	ND	ND			<
109.	PCB-1232	(c)	850	1	ND	ND	-		
110.	PCB-1248		850	1	ND	ND			
111.	PCB-1260	(c)	850	1	ND	ND			
112.	PCB-1016	(c)	850	1	ND	ND			

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

	Pollutant		Stream Code	Sample Typet	Conc	entrations	<u>s (mg/1)</u>	
Toxi	<u>Pollutants</u> (Continued)				Dource	Day	Day Z	Day 3 四
113.	toxaphene	. •	850	1	ND	ND		OND
114.	antimony		850	1	<0.001	0.77		ARY
115.	arsenic		850	1	0.008	4.8		TIN
117.	beryllium		850	1	<0.001	0.007		SUIS
118.	cadmium		850	1	<0.001	0.13		3CAT
119.	chromium (total)		850	1	0.003	0.002		EGOI
120.	copper	`	850	1	0.14	0.10	•	ДХ
121.	cyanide (total)		850	1	0.005	4.70	and the second s	្រុ
122.	lead		850	1	0.001	0.51		C T
123.	mercury	· · · ·	850	1	<0.002	<0.002	•	ו ל
124.	nickel	•	850	1	0.001	2.0		
125.	selenium		850	1	3.1	30		
126.	silver		850	алар 1 ерония Калар	0.02	0.08	н н в	
127.	thallium		850	1	<0.001	0.78		

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

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

tSample Type Code: 1 - One-time grab

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

SECONDARY TIN SUBCATEGORY SECT -

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Table V-18

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

	D-11.	Stream	Sample	Conc	entration	is $(mg/1)$	
	Pollutant	_Code_	Typet	Source	Day 1	Day 2	Day 3
Toxic	Pollutants		:		на - С - С	۰. v	0 1 1 1
1.	acenaphthene	845	1	ND	ND	ND	
2.	acrolein	845	1	ND	ND	ND	ND K
3.	acrylonitrile	845	<u>1</u>	ND	ND.		ND Z
4.	benzene	845	1	ND	ND	ND	
5.	benzidine	845	1	ND	ND	ND	ND AT
6.	carbon tetrachloride	845	1	ND	ND	ND	ND OF
7.	chlorobenzene	845	1	ND	ND	ND	ND R
8.	1,2,4-trichlorobenzene	845	1	ND	ND	ND	ND ស្ត
9.	hexachlorobenzene	845	1	ND	ND	ND	ND H
10.	1,2-dichloroethane	845	1	ND	ND	ND	ND d
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 V	ND	N D

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

		Stream	Sample	Conc	entration	s (mg/1)	
	Pollutant	Code	<u>Typet</u>	Source	Day 1	Day 2	Day 3
Toxic	Pollutants (Continued)						
15.	1,1,2,2-tetrachloroethane	845	- 1	ND	ND	ND	ND
16.	chloroethane	845	1	ND	ND	ND	ND
17.	bis(chloromethyl)ether	845	1	ND	ND	ND	ND
18.	bis(2-chloroethyl)ether	845	1	ND	ND	ND	N D
19.	2-chloroethyl vinyl ether	845	1	ND	ND	ND	N D
20.	2-chloronaphthalene	845	1	ND	ND	ND	ND
21.	2,4,6-trichlorophenol	845	1	ND	0.004	ND	ND
22.	p-chloro-m-cresol	845	1	ND	ND	ND	ND
23.	chloroform	845	1	ND	ND	ND	ND
24.	2-chlorophenol	845	1	ND	ND	ND	ND
25.	1,2-dichlorobenzene	845	1	ND	ND	ND	ND
26.	1,3-dichlorobenzene	845	1	ND	ND	ND	ND
27.	1,4-dichlorobenzene	845	1	ND	ND	ND.	ND
28.	3,3 -dichlorobenzidine	845	.1	ND	ND	ND	N D

SECONDARY TIN SUBCATEGORY SECT

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

	<u>Pollutant</u>	Stream _Code	Sample Typet	<u>Conc</u> Source	entration Day 1	<u>s (mg/1)</u> Day 2	Dav 3	
Toxic	Pollutants (Continued)			. <u></u>			<u>24)</u>	SEC
29.	1,1-dichloroethylene	845	· · · 1	ND	ND	ND	ND	ONDA
30.	1,2- <u>trans</u> -dichloroethylene	845	1	ND	ND	ND	ND	RY
31.	2,4-dichlorophenol	845	1	••••• N:D ••••••		ND	[−] ND	ΓIN
32.	1,2-dichloropropane	845	1	ND	ND	ND	ND	SUB
33.	1,3-dichloropropene	845	1	ND	ND	ND	ND	CATE
34.	2,4-dimethylphenol	845	1	ND	ND	ND	ND	GOD
35.	2,4-dinitrotoluene	845	1	ND	ND	ND	ND	Ä
36.	2,6-dinitrotoluene	845	1	ŅD	ND	ND	ND	N N
37.	1,2-diphenylhydrazine	845	1	ND	ND	ND	ND	CT
38.	ethylbenzene	845	1	ND	ND	ND	ND	<u>-</u>
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		NÐ .	ND	ND	ND	
42.	bis(2-chloroisopropyl)ether	845	1	ND	ND	ND	ND	

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

		Stream	Sample	Conc	entr <u>ation</u>	us (mg/l)	
	Pollutant	Code	Typet	Source	<u>Day 1</u>	Day 2	<u>Day 3</u>
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	N D
53.	hexachlorocyclopentadiene	845	1	ND	ND	ND	ND
54.	isophorone	845	1	ND	ND	ND	N D
55.	naphthalene	845	1	ND .	ND	ND	ND
56.	nitrobenzene	845	1	ND	ND	ND	N D

SECONDARY TIN SUBCATEGORY SECT

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

	Pollutant	Stream	Sample	Conc	entration	<u>s (mg/l)</u>		
m t	D 11		Typet	Source	Day 1	<u>Day 2</u>	Day 3	Č
<u>10x1</u>	<u>c Pollutants</u> (Continued)							
57.	2-nitrophenol	845	1	ND	ND	ND	ND	NUA
58.	4-nitrophenol	845	1	ND	ND	ND	ND	RX
59.	2,4-dinitrophenol	845	1	ND	ND .	ND	ND	NT.
60.	4,6-dinitro-o-cresol	845	1	ND	ND	ND	ND	80S
61.	N-nitrosodimethylamine	845	1	ND	ND	ND	ND	CATI
62.	N-nitrosodiphenylamine	845	1	ND	ND	ND	ND	∃GOE
63.	N-nitrosodi-n-propylamine	845	1	ND	ND	ND	ND	, Y
64.	pentachlorophenol	845	1	ND	ND	ND	ND	SI
65.	phenol	845	1	ND	ND	ND		CT
6Ġ.	bis(2-ethylhexyl) phthalate	845	1	0.054	ND	ND	1 300	ا ا
67.	butyl benzyl phthalate	845	1	ND	ND	ND	0.710	
68.	di-n-butyl phthalate	845	1	ND	ND	ND		
69.	di-n-octyl phthalate	845	:	ND	ND	ND	עא 0.710	
70.	diethyl phthalate	845	. 1	ND	ND	ND	ND	

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

		Stream	Sample	Conc	entration	s (mg/l)	
	Pollutant	Code	Typet	Source	<u>Day 1</u>	<u>Day 2</u>	<u>Day 3</u>
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)pervlene	845	1	ND	ND	ND	ND
80.	fluorene	845	1	ND	ND	ND	ND
81	phenanthrene (a)	845	1	ND	ND	ND	ND
97	dibenzo(a, b)anthracene	845	1	ND	ND	ND	ND
04.	indens (1, 2, 3-a, d) purcha	845	• 1	ND	ND	ND	ND
83.	indeno (1,2,3-c,d)pyrene	045	1	ND	0.009	0.004	ND
84.	pyrene	. 040	I	MD	0.009	0.001	

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

	<u>Pollutant</u>	Stream Code	Sample Typet	<u>Conce</u> Source	Centrations (mg/l) Day 1 Day 2		Dav 3	
<u>Toxi</u>	<u>c Pollutants</u> (Continued)		• •	•			<u> </u>	С Ц С
85.	tetrachloroethylene	845	·. . 1	ND	ND	ND	ND	UND'
86.	toluene	845	1	0.093	0.009	0.001	0.014	AKY
87.	trichloroethylene	845	1	ND	0.015	ND	0.025	TTN
88.	vinyl chloride (chloroethylene)	845	1	ND	ND	ND	ND	SUE
89.	aldrin	845	1	ND	ND	ND	ND	3CAT
90.	dieldrin	845	1	ND	ND	ND	ND	EGOI
91.	chlordane	845	1	ND	ND	ND	ND	R
92.	4,4'-DDT	845	1	ND	ND	ND	ND	Ŋ
93.	4,4'-DDE	845	1	ND	ND	ND	ND	ECT
94.	4,4'-DDD	845	1	ND	ND	ND	ND 1	ו ⊲
95.	alpha-endosulfan	845	1	ND	ND	ND	ND	-
96.	beta-endosulfan	845	· 1 ·	ND	ND	ND	ND	
97.	endosulfan sulfate	845	1	ND	ND.	ND	ND	
98.	heptachlor	845	1	ND	ND	ND	ND	

41.77

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

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

SECONDARY TIN SUBCATEGORY SECT

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

	D = 11 , $z = z$	Stream	Sample	Con	centratio	ns (mg/l)	
	Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3
<u>Toxi</u>	<u>Pollutants</u> (Continued)			r , v		·	
113.	toxaphene	845	1	ND	ND		
114.	antimony	845	1	<0.001	<0.001	0.51	0.28
115.	arsenic	845	1	0.008	··		6.0
117.	beryllium	845	1	<0.001	0.014	0.001	0.004
118.	cadmium	845	1	<0.001	0.28	0.23	0.17
119.	chromium (total)	845	1	0.003	0.004	0.003	0.014
120.	copper	845	1	0.14	0.26	0.25	0.16
121.	cyanide (total)	845	1	0.005	1.6	0.81	0.85
122.	lead	845	1 ,	0.001	0.93	0.91	0.70
123.	mercury	845	1	<0.0002	<0.0002	<0.0002	<0.0002
124.	nickel	845	1	0.001	5.6	6.0	5.2
125.	selenium	845	1	3.1	39	30	30
126.	silver	845	1	0.02	0.22	0.20	0.10
127.	thallium	845	1,	<0.001	2.2	1.4	0.96

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

	Stream	Sample	Concentrations (mg/1)			
Pollutant	Code	Typet	Source	Day 1	<u>Day 2</u>	Day 3
Toxic Pollutants (Continued)						ECON
128. zinc	845	1	0.06	0.56	1.0	0.8 DAR
Nonconventional Pollutants						Y T
ammonia nitrogen	845	1	1.5	3	1.6	1.3 ²
phenolics	845	1	0.002	0.20	0.23	0.20
tin	845	1	0.28	19	22	
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 ^M
pH (standard units)	845	1	6.5	8.9	8.9	H I V

tSample Type Code: 1 - One-time grab (a), (b), (c) Reported together.

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SECONDARY TTN SILBUALE D R V R C SECT

Table V-19

FINAL EFFLUENT - PLANT C TREATED WASTEWATER SAMPLING DATA

	Pollutant	Stream Code	Sample Typet	<u>Conc</u> Source	entratio	ns (mg/1) Day 2	Daw 2
Toxi	<u>c Pollutants</u>		······································			<u>Duy Z</u>	Day 5
1.	acenaphthene	844	5 , 1	ND	ND	ND	ND
2.	acrolein	844	1	ND	ND	ND	ND
3.	acrylonitrile	844	1	ND	ND	ND	ND
4.	benzene	844	1	ND	ND	0.002	0.002
5.	benzidine	844	1	ND	ND	ND	ND
6.	carbon tetrachloride	844	, 1	ND	ND	ND	ND
, 7 _, .	chlorobenzene	844	1	ND	ND	ND	ND
8.	1,2,4-trichlorobenzene	844	1	ND	ND	ND	ND
9.	hexachlorobenzene	844	1	ND	ND	ND	ND
10.	1,2-dichloroethane	844	1	ND	ND	ND	ND
11.	1,1,1-trichloroethane	844	1	ND .	ND	ND	ND
12.	hexachloroethane	844	1	ND	ND	ND	
13.	1,1-dichloroethane	844	• 1 . • •	ND	ND	ND	ND
14.	1,1,2-trichloroethane	844	1.	ND	ND	ND	ND

FINAL EFFLUENT - PLANT C TREATED WASTEWATER SAMPLING DATA

		Stream	Sample	Concentrations (mg/1)				
	Pollutant	Code	Typet	Source	Day 1	<u>Day 2</u>	<u>Day 3</u>	SE
Toxic	Pollutants (Continued)							CON
15.	1,1,2,2-tetrachloroethane	844	1	ND	ND	ND	ND	DARY
16.	chloroethane	844	1	ND	ND	ND	ND	Ч Н Н
17.	bis(chloromethyl)ether	844	1	ND	ND	ND	ND	N N
18.	bis(2-chloroethyl)ether	844	1	ND	ND	ND	ND	UBCł
19.	2-chloroethyl vinyl ether	844	1	ND	ND	ND	ND	TEG
20.	2-chloronaphthalene	844	1	ND	ND	ND	ND	ORY
21.	2,4,6-trichlorophenol	844	1	ND	ND	ND	ND	
22.	p-chloro-m-cresol	844	1	ND	ND	ND	ND	SEC
23.	chloroform	844	1	ND	ND	ND	ND	H
24.	2-chlorophenol	844	1	ND	ND	ND	ND	<
25.	1,2-dichlorobenzene	844	1	ND	ND	ND	ND	
26.	1,3-dichlorobenzene	844	1	ND	ND	ND	ND	
27.	1,4-dichlorobenzene	844	1	ND	ND	ND	ND	
28.	3,3 -dichlorobenzidine	844	1	ND	ND	ND	ND	
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FINAL EFFLUENT - PLANT C TREATED WASTEWATER SAMPLING DATA

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Pollutant		Stream Sample		<u>Concentrations (mg/l)</u>				
m ·	<u></u>	_code_	Typet	Source	Day 1	Day 2	Day 3	
Tox1	<u>c Pollutants</u> (Continued)			•				
29.	1,1-dichloroethylene	844	1	ND	ND	ND	ND	
30.	1,2- <u>trans</u> -dichloroethylene	844	1	ND	ND	ND	ND	
31.	2,4-dichlorophenol	844		. ND.	- ND	ND	ND-	
32.	1,2-dichloropropane	844	1	ND	ND	ND	ND	
33.	1,3-dichloropropene	844	1	ND	ND	ND	ND	
34.	2,4-dimethylphenol	844	1	ND	ND	ND	ND	
35.	2,4-dinitrotoluene	844	1	ND	ND	ND	ND	
36.	2,6-dinitrotoluene	844	1	ND	ND	ND	ND	
37.	1,2-diphenylhydrazine	844	1	ND	ND	ND	ND	
88.	ethylbenzene	844	1	ND	ND	ND	ND	
9.	fluoranthene	844	1	ND	ND	ND	ND	
·0.	4-chlorophenyl phenyl ether	844	1	ND	ND	ND	ND	
1.	4-bromophenyl phenyl ether	844		ND	ND	ND	ND	
⊦2.	bis(2-chloroisopropyl)ether	844	1	ND	ND	ND	ND	

FINAL EFFLUENT - PLANT C TREATED WASTEWATER SAMPLING DATA

	Stream Sample	Concentrations (mg/1)				
Pollutant	Code	Typet	Source	Day 1	Day 2	Day 3
Foxic 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	N D
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
40. trichlorofluoromethane	844	. 1	ND	ND	ND	ND
50 dichlorodifluoromethane	844	1	ND	ND	ND	ND
51 chlorodibromomethane	844	1	ND	ND	ND	ND
50. Lungshlanghutadiono	844	1	ND	ND	ND	ND
52. nexachiorobuladiene	844	1	ND	ND	ND	ND
53. hexachlorocyclopentadiene	844	1	ND	ND	ND	ND
54. isophorone	044	· • · ·	ND	ND	ND	ND
55. naphthalene	844			NID	ND	ND
56. nitrobenzene	844	1	ИИ	ND .		

SECT 1 4

FINAL EFFLUENT - PLANT C TREATED WASTEWATER SAMPLING DATA

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

FINAL EFFLUENT - PLANT C TREATED WASTEWATER SAMPLING DATA

		Stream Sample	Sample	Concentrations (mg/l)				
	Pollutant	Code	Typet	Source	Day 1	Day 2	<u>Day 3</u>	
Toxic	Pollutants (Continued)				٩			
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	N D	
78.	anthracene (a)	844	1	ND	ND	ND	ND	
79.	benzo(ghi)perylene	844	1	ND	ND	ND	N D	
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	N D	
84	nurene	844	1	ND	ND	ND	ND	
04.	Prene							

SECT I

FINAL EFFLUENT - PLANT C TREATED WASTEWATER SAMPLING DATA

	Pollutant		Sample Typet	<u>Conc</u> Source	entration Day 1	<u>s (mg/1)</u> Day 2	Day 3	
<u>Toxi</u>	c Pollutants (Continued)				4			SEC(
85.	tetrachloroethylene	845	1	ND	ND	ND	ND	ONDA
86.	toluene	845	1	0.093	ND	ND	0.008	RY 1
87.	trichloroethylene	845	1		ND	ND	• • • N Đ • • • • • • • • •	IN
88.	vinyl chloride (chloroethylene)	845	- 1	ND	ND	ND	ND	SUBO
89.	aldrin	845	1	ND	ND	ND	ND	CATE
90.	dieldrin	845	1	ND	ND	ND	ND	GOR
91.	chlordane	845	1	ND	ND	ND	ND	Ä
92.	4,4'-DDT	845	1	ND	ND	ND	ND A	E N
93.	4,4'-DDE	845	1	ND	ND	ND	ND	С Т
94.	4,4'-DDD	845	. 1	ND	ND	ND		। द
95.	alpha-endosulfan	845	1	ND	ND	ND	ND	
96.	beta-endosulfan	845	• 1	ND	ND	ND	ND	
97.	endosulfan sulfate	845	1	ND	ND	ND	ND	
98.	heptachlor	845	1	ND	ND	ND	ND	

FINAL EFFLUENT - PLANT C TREATED WASTEWATER SAMPLING DATA

Pollutant		Stream Sa	Sample	Concentrations (mg/1)					
		ant	Code	<u>Typet</u>	Source	Day 1	Day 2	Day 3	S
Toxic	<u>Pollutants</u>	(Continued)							CON
99.	endrin alde	nyde	844	1	ND	ND	ND	ND	DAR
100.	heptachlor		844	1	ND	ND	ND	ND	ц Ч
101	hentachlor	epoxide	844	1	ND	ND	ND	ND	IN 70
101	alpha-BHC	- t	844	1	ND	ND	ND	ND	SUBC
102.			844	1	ND	ND	ND	ND	'ATE
103.	Dela-Dio		844	1	ND	ND	ND	ND	GOR
104.	gamma-BHC		866	1	ND	ND	ND	ND	К
105.	delta-BHC		044	1	NI)	ND	ND	ND	ន
106.	PCB-1242	(b)	844	I	ЦD		NID	ND	CT
107.	PCB-1254	(b)	844	1	ND	ND	ND	UN.	I
108.	PCB-1221	(b)	844	1	ND	ND	ND	ND	4
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 SECT

FINAL EFFLUENT - PLANT C TREATED WASTEWATER SAMPLING DATA

	Dollument	Stream	Sample	Con	centratio	ns (mg/l)	
	rollucant	_Code_	<u>Typet</u>	Source	Day 1	Day 2	Day 3
Toxic	Pollutants (Continued)			a a cara a c Cara a cara a		· •	
113.	toxaphene	844	1	ND	N D		
114.	antimony	844	1	<0.001	0.004	<0.001	<0.001
115.	arsenic	844	. 1	0.008	0.068	0.021	0.061
117.	beryllium	844	· 1	<0.001	<0.001	<0.001	<0.001
118.	cadmium	844	1	<0.001	<0.001	<0.001	0.02
119.	chromium (total)	844	1	0.003	0.002	0.002	0.003
120.	copper	844	· · · · · · · · · · · · · · · · · · ·	0.14	0.20	0.14	0.20
121.	cyanide (total)	844	1	0.005	0.015	0.031	0.021
122.	lead	844	1	0.001	0.015	0.010	0.015
123.	mercury	844	1	<0.002	<0.002	<0.002	<0.002
124.	nickel	844		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

FINAL EFFLUENT - PLANT C TREATED WASTEWATER SAMPLING DATA

	Stream	Sample	Concentrations (mg/1)				
Pollutant	Code	Typet	Source	Day 1	Day 2	<u>Day 3</u>	SE
Toxic Pollutants (Continued)							CON
128. zinc	844	1	0.06	0.05	0.04	<0.02	DARY
Nonconventional Pollutants							TT 2
ammonia nitrogen	844	. 1	1.5	0.5	0.6	0.8	N N N
phenolics	844	1	0.002	0.003	0.003	0.002	UBC
tin	844	1	0.28	0.95	0.85	1.4	ATEG
Conventional Pollutants							ORY
oil and grease	844	1	5.6	14	12	7.6	
total suspended solids (TSS)	844	1	19	31	32	29	SEC
pH (standard units)	844	1	6.5	6.9	7.1		۲ ۱

tSample Type Code: 1 - One-time grab

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

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Table V-20

			•				
	Pollutant	Stream Code	Sample Typet	Conce Source	ntratio Day 1	ns (mg/l) Dav 2	Dav 3
Toxic	Pollutants		· · ·				
1.	acenaphthene	858	1	ND	ND	· .	JNUA
2.	acrolein	858	1	ND	ND		LRY
3.	acrylonitrile	858	1	ND	ND		L I N
4.	benzene	858	1	ND	ND		SUB
5.	benzidine	858	1	ND	ND		CATI
6.	carbon tetrachloride	858	. 1	ND	ND		GOR
7.	chlorobenzene	858	1	ND	ND		Ň
8.	1,2,4-trichlorobenzene	858	1	ND	ND		S E
9.	hexachlorobenzene	858	1	ND	ND	. •	CT
10.	1,2-dichloroethane	858	1	ND	ND		۲: ح
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		

ELECTROWINNING SOLUTION AFTER CARBONATION - PLANT D TREATED WASTEWATER SAMPLING DATA

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ELECTROWINNING SOLUTION AFTER CARBONATION - PLANT D TREATED WASTEWATER SAMPLING DATA

	Pollutant	Stream Code	Sample Typet	Conc Source	entration Day 1	as (mg/1) Day 2	Day 3	S
Toxic	Pollutants (Continued)							3CON
15.	1,1,2,2-tetrachloroethane	858	1	ŇD	ND		-	DAR
16.	chloroethane	858	1	ND	ND			7 TI
17.	bis(chloromethyl)ether	858	1	ND	ND			ע מ
18.	bis(2-chloroethyl)ether	858	1	ND	ND			UBC/
19.	2-chloroethyl vinyl ether	858	1	ND	ND			ATEG
20.	2-chloronaphthalene	858	1	ND	ND			ORY
21.	2,4,6-trichlorophenol	858	1	ND	ND			
22.	p-chloro-m-cresol	858	1	ND	ND	•		SEC
23.	chloroform	858	1	0.037	ND			H I
24.	2-chlorophenol	858	· 1	ND	ND			4
25.	1,2-dichlorobenzene	858	1	ND	ND	· •		
26.	1,3-dichlorobenzene	858	1	ND	ND		- ·	
27.	1,4-dichlorobenzene	858	1	ND	ND			
28.	3,3'-dichlorobenzidine	858	1	ND	ND			

ELECTROWINNING SOLUTION AFTER CARBONATION - PLANT D TREATED WASTEWATER SAMPLING DATA

	Pollutant	Stream Code	Sample Typet	Con Source	centration Day 1	s (mg/1) Day 2	Day 3	
Toxic	Pollutants (Continued)	ан Ал					<u></u>	SEC
29.	1,1-dichloroethylene	858	1	ND	ND			OND
30.	1,2- <u>trans</u> -dichloroethylene	858	· 1	ND	ND			ARY
31.	2,4-dichlorophenol	858	1	ND	ND.	·		TIN
32.	1,2-dichloropropane	858	1	ND	ND		. 4	SUI
33.	1,3-dichloropropene	858	1	ND	ND			BCAI
34.	2,4-dimethylphenol	858	. • 1	ND	ND			EGO
35.	2,4-dinitrotoluene	858	1	ND	ND			RY
36.	2,6-dinitrotoluene	858	· 1 ·	ND	ND		<i>,</i>	ß
37.	1,2-diphenylhydrazine	858	1	ND	ND			ECT
38.	ethylbenzene	858	1	ND	ND			ו ל
39.	fluoranthene	858	1	ND	N D			7
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			

ELECTROWINNING SOLUTION AFTER CARBONATION - PLANT D TREATED WASTEWATER SAMPLING DATA

	Pollutant	Stream <u>Code</u>	Sample <u>Typet</u>	Conco Source	entrations Day 1	3 (mg/1) Day 2	Day 3
Toxic	Pollutants (Continued)						
43.	bis(2-choroethoxy)methane	858	1	ND	ND		
44.	methylene chloride	858	1	0.021	0.045		
45.	methyl chloride (chloromethane)	858	1	ND	ND		
46.	methyl bromide (bromomethane)	858	1	ND	ND		
40.	bromoform (tribromomethane)	858	1	ND	ND		
47.	dichlorobromomethane	858	1	ND	ND		n.
40.	trichlorofluoromethane	858	1	ND	ND		
47.	dichlorodifluoromethane	858	1	ND	ND		
50.	alchiorodiliuoromethane	858	1	ND	ND		
51.	chlorodibromomethane	858	1	ND	ND	•	
52.	hexachlorobutadiene	858	1	ND	N D		
53.	hexachlorocyclopentadiene	050	1	ND	ND		
54.	isophorone	828	· · · •	ND	ND		
55.	naphthalene	858			ND		•
56.	nitrobenzene	858	1	UN .	ND		

SECONDARY TIN SUBCATEGORY

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ELECTROWINNING SOLUTION AFTER CARBONATION - PLANT D TREATED WASTEWATER SAMPLING DATA

Toxic	<u>Pollutant</u> Pollutants (Continued)	Stream Code	Sample Typet	Conce Source	entrations (mg/ Day 1 Day	1) 2 Day	<u>3</u>
57.	2-nitrophenol	858	1	ND	ND		CONDI
58.	4-nitrophenol	858	1	ND	ND		NRY
59.	2,4-dinitrophenol	858	J		ND	a an	TIN
60.	4,6-dinitro-o-cresol	858	1	ND	ND		SUE
61.	N-nitrosodimethylamine	858	. 1	ND	ND		3CAT
62.	N-nitrosodiphenylamine	858	1	ND	ND	, ,	EGOI
63.	N-nitrosodi-n-propylamine	858	1	ND	ND		ΥS Δ2
64.	pentachlorophenol	858	1	ND	ND	n an	ល
65.	phenol	858	1	ND	0.028		ECT
66.	<pre>bis(2-ethylhexyl) phthalate</pre>	858	1	0.004	ND		- V
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 ¹¹¹¹¹¹¹	ND	ND		

ELECTROWINNING SOLUTION AFTER CARBONATION - PLANT D TREATED WASTEWATER SAMPLING DATA

		Stream Code	Sample Typet	Conc. Source	entration: Day 1	<u>3 (mg/1)</u> Day 2	Day 3	ß
	Pollutant							EC
<u>Toxic</u>	Pollutants (Continued)							DND
71.	dimethyl phthalate	858	1	ND	N D			ARY
72.	benzo(a)anthracene	858	1	ND	ND			TIN
73.	benzo(a)pyrene	858		ND	ND	···· ·		US N
74.	benzo(b)fluoranthene	858	1	ND	ND			BCA
75.	benzo(k)fluoranthane	858	1	ND	ND			TEG
76.	chrysene	858	1	ND	N D			DRY
77.	acenaphthylene	858	1	ND	ND			
78.	anthracene (a)	858	1	ND	ND			SEC
79.	benzo(ghi)perylene	858	1	ND	ND			1
80	fluorene	858	1	ND	ND			4
00.	phonanthrene (a)	858	1	ND	ND			
01.	dibonzo(a, h)anthracene	858	. 1	ND	ND			
82.	(1) = (1, 2, 3, a, d) pyrepe	858	1	ND	ND			
83.	indeno (1,2,5-c,d)pyrene	858	1	ND	NĎ			
84.	pyrene	0.0	•					

ELECTROWINNING SOLUTION AFTER CARBONATION - PLANT D TREATED WASTEWATER SAMPLING DATA

·	Pollutant	Stream Code	Sample Typet	Conce Source	<u>entration</u> Day 1	us (mg/1) Day 2	Day 3	
<u>Toxic</u>	Pollutants (Continued)				-			
85.	tetrachloroethylene	858	1	ND	ND			INDA
86.	toluene	858	1	0.005	0.001			Ц ХХ С
87.	trichloroethylene	858		0.007	0.027		 1	NT.
88.	vinyl chloride (chloroethylene)	858	1	ND	ND			SUBC
89.	aldrin	858	1	ND	ND			JATE
90.	dieldrin	858	1	ND	ND			GOR
91.	chlordane	858	1	ND	ND			К
92.	4,4'-DDT	858	1	ND	ND			SE
<u>9</u> 3.	4,4'-DDE	858	1	ND	ND			CH ·
94.	4,4'-DDD	858	1	ND	ND			- 4
95.	alpha-endosulfan	858	1	ND	ND		•	
96.	beta-endosulfan	858	1	ND	N D			
97.	endosulfan sulfate	858	1	ND	ND			
98.	heptachlor	858	1	ND	ND			

ELECTROWINNING SOLUTION AFTER CARBONATION - PLANT D TREATED WASTEWATER SAMPLING DATA

			Stream	Sample	Conc	entrations	<u>s (mg/1)</u> Day 2	Day 3
	Pollutant		COUE	турет	bource	<u>Duy</u>	<u></u>	
Toxic	Pollutants (Continu	ed)						
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	N D		
106.	PCB-1242 (b)		858	1	· ND	ND		
107.	РСВ-1254 (Ъ)		858	1	ND	ND		
108.	PCB-1221 (b)		858	1	ND	ND		
109.	PCB-1232 (c)	• • •	858	1	ND	N D		,
110.	PCB-1248 (c)		858	. 1	ND	ND		
111.	PCB-1260 (c)		858	1	ND	ND		
112.	PCB-1016 (c)		858	1	ND	ND		

SECONDARY TIN SUBCATEGORY SECT - V

ELECTROWINNING SOLUTION AFTER CARBONATION - PLANT D TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Typet	<u>Conce</u>	entrations Day 1	(mg/1) Day 2	Day 3	
Toxic Pollutants (Continued)						· · ·	SEC
113. toxaphene	858	1	ND	ND		ан 1923 — Мал 1923 — Д	OND
114. antimony	858	1	<0.001	0.300			ARY
115. arsenic	-858-	· · · · · · · · · · · · · · · · · · ·	0.007	. 2.6	n na transferi Transferi	a an sijiaa	TIN
117. beryllium	858	1	<0.001	0.003	1		SUE
118. cadmium	858	1	0.001	0.20			CAT)
119. chromium (total)	858	1	0.004	0.37			EGOF
120. copper	858	1	0.016	0.15	100 B		A2
121. cyanide (total)	858	1	0.004 3	1,000	•		SI
122. lead	858	1.	0.011	0.50		•	CT
123. mercury	858	1	0.0007	<0.0002		•	۱ ۷
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			

ELECTROWINNING SOLUTION AFTER CARBONATION - PLANT D TREATED WASTEWATER SAMPLING DATA

	Stream	Sample	Conc	entrations (mg/1))		
Pollutant	Code	Typet	Source	Day 1 Day 2	<u>Day 3</u>		
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.

SECONDARY TIN SUBCATEGORY SECT - V

Table V-21

INFLUENT TO TREATMENT - PLANT E RAW WASTEWATER SAMPLING DATA

	Pollutant	Stream	Sample	Con	centratio	ns (mg/l)	
Toxi	Pollutante		<u>ryper</u>	Source	Day 1	<u>Day 2</u>	Day 3 M
					1997 - A. M.		
114.	antimony	896	6	0.0013	0.0008	0.0016	0.0047 A
115.	arsenic	896	6	0.007	1.60	0.069	0.11 G
117.	beryllium	896		<0.010	<0.010	<0.010	<0.010 E
118.	cadmium	896	6	<0.030	0.061	0.50	0.30 SUB
119.	chromium	896	6	<0.030	<0.030	0.035	0.035 TH
120.	copper	896	6	<0.030	0.13	1.50	ក្ម 7.50 ឆ្ក
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 ⁰²
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

INFLUENT TO TREATMENT - PLANT E RAW WASTEWATER SAMPLING DATA

Stream	Sample	Concentrations (mg/1)					
Code	Typet	Source	Day 1	<u>Day 2</u>	Day 3	<u>ן</u> קיין	
				.)		L CIVI	
896	6	10	30	61	270	1	
896	6	160	200	110	<1	F F	
896	6	2.80	1.20	1.80	7.60	د م ر	
896	6	0.04	0.50	3.2	1.2		
896	6	0.12	0.13	0.75	0.040	ľ	
896	6	0.17	4.30	6.40	5.40		
896	6	0.067	0.26	0.37	0.51		
896	6	155	250	770	930		
896	6	<0.030	<0.030	0.45	1.00		
896	6.	0.40	4.7	6.4	8.8		
896	6	2.80	23.00	8.80	86.00		
896	6	0.018	0.022	0.030	0.040	ł	
896	6	0.11	0.28	0.91	1.20		
896	6	<0.030	0.70	1.70	0.64		
	Stream Code 896 896 896 896 896 896 896 896 896 896	Stream Code Sample Typet 896 6	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Stream CodeSample TypetConcentrations Source(mg/1) Day 1 896 6103061 896 6160200110 896 62.801.201.80 896 60.040.503.2 896 60.120.130.75 896 60.174.306.40 896 60.0670.260.37 896 6155250770 896 60.404.76.4 896 62.8023.008.80 896 60.0180.0220.030 896 60.110.280.91 896 60.0300.701.70	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	

INFLUENT TO TREATMENT - PLANT E RAW WASTEWATER SAMPLING DATA

Pollutant	Stream S		Co	Concentrations (mg/1)				
	Code	Typef	Source	Day 1	Day 2	Day 3	U	
Nonconventional Pollutants (Continued))					•		
Germanium	896	6	<0.50	0.50	<0.50	<0.50	NDA	
Indium	896	6	<0.50	<0.50	<0.50	<0.50	н Э	
Sodium	896			-0-18	0.1-8	0.16	LN N	
Sulfate	896	6	46	190	320	310	SUBC	
Tin	896	6	<0.25	<0.25	<0.25	<0.25	'ATE	
Titanium	896	6	<0.25	<0.25	<0.25	<0.25	GOR	
Total Dissolved Solids (TDS)	896	6	510 1	,300 1	,900 2	,600	Ļ	
Total Organic Carbon (TOC)	896	6	13	8	<20	97	SE	
Total Solids (TS)	896	6	640 1	,300 2	,100 3	,100		
Vanadium	896	6	<0.030	<0.030	<0.030	<0.030	<	
Yttrium	896	6	<0.25	<0.25	<0.25	<0.25		
Conventional Pollutants	• • • • • • • • • •					•		
Oil and Grease	896	1	<1	<1	<1	18	e	

INFLUENT TO TREATMENT - PLANT E RAW WASTEWATER SAMPLING DATA

	Stream	Stream Sample		Con		
Pollutant	Code	Typet	Source	Day 1	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

SECONDARY TIN SUBCATEGORY SECT - V

Table V-22

TREATED EFFLUENT - PLANT E TREATED WASTEWATER SAMPLING DATA

	Dollutort		Stream	Sample	Cor	centratio	ons (mg/l)	
	rollulant			Typet	Source	Day 1	Day 2	Day 3
Toxic	Pollutants	•	•		•		÷	
114.	antimony		899	6	0.0013	0.0050	0.0020	0.0013
115.	arsenic		899	6	0.007	0.14	0.052	0.082 ₋
-117.	beryllium		899	6	<0.010	<0.010	<0.010	<0.010
118.	cadmium		899	6	<0.030	0.12	0.12	0.11
119.	chromium		899	6	<0.030	<0.030	0.032	0.030
120.	copper	an a	899	6	<0.030	0.28	0.12	0.10 K
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 m
123.	mercury		899	6	0.0149	<0.0025	<0.0025	0.0030
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	۰ ۲۰۰۰ میلی ۲۰۰۰ م	899	6	<0.001	0.0036	0.0050	0.0029
128.	zinc		899	6	<0.030	0.17	0.17	0.16

TREATED EFFLUENT - PLANT E TREATED WASTEWATER SAMPLING DATA

	Stream	Sample	Concentrations (mg/1)					
Pollutant	Code	<u>Type</u> †	Sourc	e Day 1	Day 2	Day 3		
Nonconventional Pollutants								
Acidity	899	6	10	4,800	20	10		
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		
Boron	899	6	0.17	3.80	3.70	3.50		
Calcium	899	6	0.067	0.60	0.63	0.60		
Chloride	899	6	155	48	950	880		
Cobalt	899	6	<0.030	0.099	0.094	0.083		
Fluoride	899	6	0.40	<u>,</u> 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		

TREATED EFFLUENT - PLANT E TREATED WASTEWATER SAMPLING DATA

Pollutant	Stream _Code	Sample Typet	Sour	Concentra ce Day	tions (mg 1 Day	/ <u>1)</u> 2 Day	3 10
Nonconventional Pollutants (Continued)	•			· · · ·			SECO
Germanium	899	6	<0.50	<0.50	<0.50	<0.50	NDAF
Indium	899	6	<0.50	<0.50	<0.50	<0.50	ъ Ч
Sodium	899.	б	0.12	0.34	0.34	0.32	HN
Sulfate	899	. 6	46	630	600	480	SUBC
Tin	899	6	<0.25	<0.25	<0.25	<0.25	ATE
Titanium	899	6	<0.25	<0.25	<0.25	<0.25	GORY
Total Dissolved Solids (TDS)	899	6	510	3,800	3,400	3,100	
Total Organic Carbon (TOC)	899	6	13	11	35	190	SE
Total Solids (TS)	899	6	640	3,600	3,500	3,300	H H
Vanadium	899	6	<0.030	<0.030	<0.030	1.30	, L
Yttrium	899	6	<0.25	2.10	<0.25	<0.25	
Conventional Pollutants	·			н ^{ст} . • ст.			•
Oil and Grease	899	1	<1	78	11	3	· · · ·

TREATED EFFLUENT - PLANT E TREATED WASTEWATER SAMPLING DATA

		Stream	Sample	Con	centration			
Pollutant		Code	<u>Typet</u>	Source	Day 1	Day 2	Day 3	ΞS
Conventional Pollutants	(Continued)							CON
Total Suspended Solids	(TSS)	899	б	5	<1	4	⁻ 4	DAR
pH (standard units)	•	899		7.20	6.30	6.30	6.0	Y TT
			<u>.</u>				•	IS N
						, , ,		UBCA
					•			TEG
								ORY

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

TABLE V-23

SECONDARY TIN SAMPLING DATA RAW WASTEWATER FROM SELF SAMPLING DATA

Pollutant	Concentr	ation (mg/l)
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	
L	•	

titanium		• . • .	,	<2.000
vanadium	1. J. J. J.	1. S.		<1.000
	· · · ·			

Note: 88176 = Tin Mud Acid Neutralization Filtrate 88147 = De-Aluminizing Rinse





SECONDARY TIN SUBCATEGORY SECT - V







Figure V-3 SAMPLING SITES AT SECONDARY TIN PLANT C


Figure V-4 SAMPLING SITES AT SECONDARY TIN PLANT D



SAMPLING SITES AT SECONDARY TIN PLANT E

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SECTION VI

SELECTION OF POLLUTANT PARAMETERS

section examines the chemical analysis data presented in This 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 the nature of the pollutant (i.e., whether it concerning 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 POTW at the concentrations expected in industrial discharges. in

The discussion that follows describes the analysis that was priority performed to select or exclude 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 lime precipitation, sedimentation, and filtration. The treatable concentrations used for the priority organics are performance values achievable by carbon the 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 scrubbing wastewater operations. This data is presented in section V of this decided document. Based on comments, the Agency has to promulgate different limitations for tin smelter scrubbing operations than for other secondary tin operations. Although is still considered a single subcategory, secondary tin the pollutants selected for tin smelter SO₂ scrubber operations are different than for other secondary tin operations. This is 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_2 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)
- o pH

Plants which only smelt tin concentrates and control the SO₂ 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 in concentrations are well the 2.6 above mg/l treatable concentration. Furthermore, most of the specific methods used to priority metals do so by converting these metals remove to precipitates, and these priority-metal-containing precipitates should not be discharged. Meeting а limitation on total suspended solids helps ensure that removal

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 in detected raw wastewater samples this any in 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. l,l-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

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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 considered achievable by existing or available concentrations treatment technologies. These pollutants discussed are 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.

SECONDARY TIN SUBCATEGORY

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.

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Ethylbenzene was detected above its treatable concentration of 0.01 mg/l in only one out of ten raw wastewater samples. The observed treatable concentration is 0.011 mg/l. Because it was found at a treatable concentration in only one out of ten samples and because the observed value is only slightly above the treatable concentration, ethylbenzene is not selected for 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 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 pyrene is not selected for out of 12 samples, one 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 treatability 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.

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 The treatable concentrations observed range from 0.22 study. Cyanide is therefore selected for further mq/l to 24 mq/l. 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 t0 3.1 mg/l. Thallium is therefore selected for further consideration for limitation.

Zinc was detected above the concentration considered achievable by identified treatment technology (0.23 mg/l) in 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.

Table VI-1

FREQUENCY OF OCCURRENCE OF PRIORITY POLLUTANTS SECONDARY TIN SUBCATEGORY RAW WASTEWATER

•	Pollutant	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentra- tion (mg/1)(b)	Number of Streams Analyzed	Number of Samples Analyzed	ND	Detected Below Quantification Concentration	letected Below Treat- able Concen- tration	letected Above Treat- able Concen- tration
1.	acenaphthene	0.010	0.01	9	12	10			
2.	acrolein	0.010	0.01	Ŕ	10	10			
3.	acrylonitrile	0.010	0.01	8	10	10			
4.	benzene	0.010	0.01	Ř	10	10	n		,
5.	benzidine	0.010	0.01	ğ	12	12	Ζ .	· · · · · ·	2
6.	carbon tetrachloride	0.010	0.01	ล์	10	10			
7.	chlorobenzene	0.010	0.01	8	10	10	· · · · ·		
8.	1,2,4-trichlorobenzene	0.010	0.01	9	12	12			· · · · · · · · · · · · · · · · · · ·
.9.	hexachlorobenzene	0.010	0.01	ģ	12	10	2		6
10.	1,2-dichloroethane	0.010	0.01	8	10	10	2		
11.	1,1,1-trichloroethane	0.010	0.01	8	10	8	9		
12.	hexachloroethane	0.010	0.01	9	12	12	2		1
13.	1,1-dichloroethane	0.010	0.01	8	10	10			
14.	1,1,2-trichloroethane	0.010	0.01	8	10	10			
15.	1,1,2,2-tetrachloroethane	0.010	0.01	8	10	10			С ₄
16.	chloroethane	0.010	0.01	8	10	10			I
17.	bis(chloromethyl) ether	0.010	0.01	8	10	10			
18.	bis(2-chloroethyl) ether	0.010	0.01	ğ	12	12			:
19.	2-chloroethyl vinyl ether	0.010	0.01	8	10	10			
20.	2-chloronaphthalene	0.010	0.01	ğ	12	12			(
21.	2,4,6-trichlorophenol	0.010	0.01	9	12	12			
22.	parachlorometa cresol	0.010	0.01	9	12	12			, v F
23.	chloroform	0.010	0.01	8	10	8	·) · ·	·	
24.	2-chlorophenol	0.010	0.01	9	12	12	4		
25.	1,2-dichlorobenzene	0.010	0.01		12	1.2	9	·	
26.	1,3-dlchlorobenzene	0.010	0.01	9	12	12		. .	F
27.	1,4-dichlorobenzene	0.010	0.01	9	12	12			
28.	3,3'-dichlorobenzidine	0.010	0.01	9	12	12			
29.	I, I-dichloroethylene	0.010	0.01	8	10	9	1		
30.	1,2-trans-dichloroethylene	0.010	0.01	8 .	10	10	'		
<u>ال</u>	2,4-dichlorophenol	0.01Ô	0.01	9	12	12			
<i>32</i> .	1,2-dichloropropane	0.010	0.01	8	iõ	iõ			
55.	1, 3-dichloropropylene	0.010	0.01	8	·· 10	10			
54.	2,4-dimethylphenol	0.010	0.01	9	12	10	2 .		

SECONDARY TIN SUBCATEGORY SECT

Table VI-1 (Continued)

FREQUENCY OF OCCURRENCE OF PRIORITY POLLUTANTS SECONDARY TIN SUBCATEGORY RAW WASTEWATER

	Pollutant	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentra- tion (mg/1)(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	SECONI
35	2 4-dinitrotoluene	0.010	0.01	9	11	11				Ă
36.	2 6-dinitrotoluene	0.010	0.01	9	11	11				R
37.	1.2-diphenvlhydrazine	0.010	0.01	9	12	10	2			~
18.	ethylbenzene	0.010	0.01	8	10	9			I	н
39.	fluoranthene	0.010	0.01	9	12	11	1			Н
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				ß
42.	bis(2-chloroisopropyl) ether	0.010	0.01	9	12	12				L
43.	bis(2-chloroethoxy) methane	0.010	0.01	9	12	12	-			BC
44.	methylene chloride	0.010	0.01	8	10	4	3		2	5
45.	methyl chloride	0.010	0.01	8	10	10				ĥ
46.	methyl branide	0.010	0.01	8	10	. 10				E
47.	bromoform	0.010	0.01	8	10	10				- С
48.	dichlorobromomethane	0.010	0.01	8	10	10				H
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				ល
54.	isophorone	0.010	0.01	9	12	12	,			펀
55.	naphthalene	0.010	0.01	9	12	8	4			님
56.	nitrobenzene	0.010	0.01	9	12	IZ	1	· 1	3	
57.	2-nitrophenol	0.010	0.01	9	12	/	1	. I	2	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	н
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	0.010 .	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				
65.	phenol	0.010	0.01	. 9	12	6	5 6		1	
66.	bis(2-ethylhexyl) phthalate	0.010	0.01	9	12	2	0		3	
67.	butyl benzyl phthalate	0.010	0.01	9	12	/	۲ ۲			
68.	di-n-butyl phthalate	0.010	0.01	9	12	/)			

Table VI-1 (Continued)

FREQUENCY OF OCCURRENCE OF PRIORITY POLLUTANTS SECONDARY TIN SUBCATEGORY RAW WASTEWATER

	Pollutant	Analytical Quantification Concentration (mg/l)(a)	'Ireatable 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	SECOND
69.	di-n-octyl phthalate	0.010	0.01	ġ	12	12				A
70.	diethyl phthalate	0.010	0.01	ġ .	1.2	12				2
/1.	dimethyl phthalate	0.010	0.01	9 -	12	12				
72.	benzo(a)anthracene	0.010	0.01	<u>ģ</u>	12	12				H
73.	benzo(a)pyrene	0.010	0.01	á	12	12				H
74.	3,4-benzofluoranthene	0.010	0.01	9	12	12				4
75.	benzo(k)fluoranthene	0.010	0.01	0	12	12	i i interior			Š
76.	chrysene	0.010	0.01	á	12	12		1		D.
77.	acenaphthylene	0.010	0.01	ģ	12	12				· œ
78.	anthracene (c)	0.010	0.01	á	12	12	1			1
79.	benzo(ghi)perylene	0.010	0.01	á	12	12				ĥ
80.	fluorene	0.010	0.01	á	12	12				Ē
81.	phenanthrene (c)	0.010	0.01	9	12	11				പ്പ
82.	dibenzo(a,h)anthracene	0.010	0.01	ģ	12	12	I			H
83.	indeno(1,2,3-c,d)pyrene	0.010	0.01	ģ	12	12				R
84.	pyrene	0.010	0.01	á	12	10	,			-
85.	tetrachloroethylene	0.010	0.01	8	12	10	1		1	
86.	toluene	0.010	0.01	- <u>8</u>	10	10	4			
87.	trichloroethylene	0.010	0.01	8	10	0	Z		2	S
88.	vinyl_chloride -	0.010	0.01	8	10	0	Z			E
89.	aldrin	0.005	0.01	8	10	10			1	ဌ
90.	dieldrin	0.005	0.01	8	10	10				5
91.	chlordane	0.005	0.01	e o	10	10				I
92.	4,4'-DDT	0.005	0.01	8	10	10				•
93.	4,4'-DDE	0.005	0.01	8	10	10				\leq
94.	4,4'-DDD	0.005	0.01	8	10	10	· · · · ·			1-1
95.	alpha-endosulfan	0.005	0.01		10	10				
96.	beta-endosul fan	0.005	0.01	Å	10	10				
97.	endosulfan sulfate	0.005	0.01	8	10	10				
98.	endrin	0.005	0.01	8	10	10				
99.	endrin aldehyde	0.005	0.01	8	10	10				
100.	heptachlor	0.005	0.01	8	10	10				
101.	heptachlor epoxide	0.005	0.01	8	10	10		· · ·		
102.	alpha-BBC	0.005	0.01	8	10	10				
103.	beta-BHC	0.005	0.01	8	10	10				
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Table VI-1 (Continued)

FREQUENCY OF OCCURRENCE OF PRIORITY POLLUTANTS SECONDARY TIN SUBCATEGORY RAW WASTEWATER

	Pollut	tant	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentra- tion (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	
104. 105. 106. 107. 110. 111. 112. 113. 114. 115. 114. 115. 116. 117. 120. 121. 122. 123. 124. 125. 126. 127. 128.	gamma-BHC delta-BHC PCB-1242 PCB-1254 PCB-1254 PCB-1254 PCB-1252 PCB-1232 PCB-1248 PCB-1260 PCB-1016 toxaphene antimony arsenic asbestos beryllium cadmium chronium copper cyanide lead mercury nickel selenium silver thallium zinc	(d) (d) (e) (e) (e) (e) (f)	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 0.020 0.020 0.020 0.020 0.020 0.001 0.02 0.01 0.02 0.010 0.02 0.010 0.050	0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.47 0.34 10 MFL 0.20 0.049 0.07 0.39 0.047 0.39 0.047 0.08 0.036 0.22 0.20 0.07 0.34 0.23	8 8 8 8 8 8 8 8 8 8 8 8 8 8 9 9 9 9 9 9	$ \begin{array}{c} 10\\ 10\\ 10\\ 10\\ 10\\ 10\\ 10\\ 10\\ 10\\ 13\\ 14\\ 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 1	4 6 10 4 6 4 4 1 3 5	8 8 7 4 9 10 9 7 4 5 8	
129.	∠, j, /,ð-tet	Lacintor our Denzo-									

p-dioxin (TCDD)

(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.

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(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. SECONDARY TIN SUBCATEGORY SECT - VI

TABLE VI-2

TOXIC POLLUTANTS NEVER DETECTED

1.	acenaphthene
2.	acrolein
3.	acrvlonitrile
5.	benzidene
6	Carbon tetrachlorido (totrachloromethane)
7	chlorobongono
2 2	1.2 A-trichlorobonzono
10	1,2,4 ⁻ CIICHIOIODENZENE
10.	1,2-dichloroethane
12.	nexachloroethane
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'-dichlorobongiding
30	1 2-trans-dichloroothulono
30.	2 A-dighlorophonol
32	2,4 dichiorophenor
22.	1,2 dichloropropulere (1,2,1;1)
25.	2 A-dipitrotoluono
35.	2,4-dinitrotoluene
30.	2,0-dinitrotoluene
40.	4-chlorophenyl phenyl ether
41.	4-promophenyl 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
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TABLE VI-2 (Continued)

TOXIC POLLUTANTS NEVER DETECTED

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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 (ll, 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)
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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 generated in the This secondary tin subcategory. section summarizes the of these wastewaters and indicates the level of description 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 raw (untreated) wastewater data presented for specific sources as well as combined waste streams in Section V. Generally, these pollutants are present in each of the waste streams at concentrations above treatability, and these waste streams are commonly combined for treatment. Construction of one wastewater treatment system for combined treatment allows plants to take advantage of economies of scale, and, in some instances, to combine streams of differing alkalinity to reduce treatment chemical requirements. Three plants in this subcategory currently have combined wastewater treatment systems. One has cyanide oxidation with chlorine, followed by acid neutralization and sedimentation. One has lime precipitation and sedimentation and one has sedimentation lagoons only. Two options have been selected for consideration for BPT, BAT, NSPS, and pretreatment in this subcategory, based on combined treatment of these compatible waste streams.

TIN SMELTER SO2 SCRUBBER

The one plant which practices tin smelting from concentrates and residues uses an alkaline scrubber to control SO₂ 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

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 with . to dissolving it in a caustic solution. water prior This solution is then mixed with the sodium stannate solution from alkaline detinning and tin is recovered from the combined stream by electrowinning. The spent wash water treatable concentrations of priority metals contains and suspended solids. The one facility reporting this waste stream achieves zero discharge through the use of evaporation ponds.

SPENT ELECTROWINNING SOLUTION FROM NEW SCRAP

New tin plated steel scrap is used as a raw material at 10 out of 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, six achieve zero discharge by contractor disposal, sales or evaporation ponds. Of the two plants which discharge this stream, one is an indirect discharger with no treatment in place and the other is a direct discharger with treatment consisting of cyanide oxidation with chlorine, acid addition, vacuum filtration and sedimentation.

SPENT ELECTROWINNING SOLUTION FROM MUNICIPAL SOLID WASTE

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

vacuum filtration and sedimentation.

TIN HYDROXIDE SUPERNATANT FROM SCRAP

hydroxide may be precipitated from alkaline detinning Tin 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 precipitate which sedimentation. The supernatant waste stream contains treatable concentrations of cyanide and priority metals. The 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 stream is a direct discharger after treatment in waste 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 treatment is followed by chemical precipitation and sedimentation applied to the combined stream of cyanide precipitation effluent, tin smelter SO₂ 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 all 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 and 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 and subcategory-specific assumptions used to develop options 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 regulatory option. These cost estimates are also used in each determining the probable economic impact of regulation on the pollutant discharge levels. at different subcategory In addition, this section addresses nonwater quality environmental of wastewater treatment and control alternatives, impacts 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. Ι. Plant-by-plant compliance costs for the nonferrous metals manufacturing category revised have been 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 the administrative record presented in supporting this regulation. A comparison of the costs developed for proposal and the revised costs for the final rulemaking for the secondary tin 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 (1)The generation (CaF_2) during precipitation chemical was considered in cases where significant amounts of fluoride were present. If the sludge resulting from chemical precipitation was mostly composed of (> 50 percent), it was assumed to be suitable CaF₂ for 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 at 576,000 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 Option C is approximately one percent of the estimated for total plant energy usage. It is therefore concluded that the energy requirements of the treatment options considered will significant impact total have no 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 lime. 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 at secondary nonferrous metals manufacturing plants by the suggested treatment technologies and believes they are not hazardous wastes under the Agency's regulations implementing Section 3001 of RCRA, one exception. This judgment is based on the results of with 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 the 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 the technology is applied. The one exception is that recommended produced as a result of cyanide precipitation are sludges expected to exhibit hazardous characteristics, and have been treated as such in our analysis.

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

If these wastes should be identified or are listed as hazardous, they will come within the scope of RCRA's "cradle to grave" hazardous waste management program, requiring regulation from the point of generation to point of final 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), 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 (May 19, 1980), as amended at 45 FR 86973 (December 31, 33151 Finally, RCRA regulations establish standards 1980). 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 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.

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

0	Proposal	Costs	Promulgation Costs				
Option	Capital Cost	Annual Cost	Capital Cost	<u>Annual</u> <u>Cost</u>			
А	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 available (BPT). BPT reflects the currently 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. consideration is Particular given to the treatment place at the plants within the data base. already in

The factors considered in identifying BPT include the total cost of applying the technology in relation to the effluent reduction benefits from such application, the age of equipment and facilities involved, the manufacturing processes used, nonwater quality environmental impacts (including energy requirements), and other factors the Administrator considers appropriate. In general, the BPT level represents the average of the existing performances of plants of various ages, sizes, processes, or other common characteristics. Where existing performance is uniformly inadequate, BPT may be transferred from a different subcategory or category. Limitations based on transfer of technology are supported by a rationale concluding that the technology is, indeed, transferable, and a reasonable prediction that it will be capable of achieving the prescribed effluent limits (see Tanner's Council of America v. Train, 540 F.2d 1188 (4th Cir. 1976). BPT focuses on end-of-pipe treatment rather than process changes or internal controls, except where such practices are common industry practice.

TECHNICAL APPROACH TO BPT

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

As explained in Section IV, the 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, unit of production or production normalizing parameter (PNP) a was determined for each waste stream which could then be related to the flow from the process to determine a production normalized Selection of the PNP for each process element is discussed flow. Nonprocess wastewaters such as rainfall runoff in Section IV. 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 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 (lime settle technology). Cyanide sedimentation and treatable precipitation is applied to streams with 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 on а this subcategory may perform one or more of the operations in various combinations. The mass loadings (milligrams of pollutant per ton of production mg/kkg) metric were calculated by multiplying the BPT regulatory flow (1/kkg) by the concentration achievable by the BPT level of treatment technology (mg/1)for 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 the 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 (l/kkg) is a link between the production operations and the effluent limitations. The pollutant discharge attributable to each operation can be calculated from the normalized flow and effluent concentration achievable by the treatment technology and summed to derive an appropriate limitation for each plant.

INDUSTRY COST AND POLLUTANT REMOVAL ESTIMATES

In balancing costs in relation to effluent reduction benefits, EPA considers the volume and nature of existing discharges, the volume and nature of discharges expected after application of BPT, the general environmental effects of the pollutants, and the cost and economic impacts of the required pollution control level. The Act does not require or permit consideration of water quality problems attributable to particular point sources or industries, or water quality improvements in particular water quality bodies. Accordingly, water quality considerations were not the basis for selecting the proposed 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 is Option A, chemical precipitation and sedimentation technology to remove metals, fluoride, and solids from combined wastewaters to control pH, with preliminary treatment consisting of and The promulgated technology is equivalent cyanide precipitation. Chemical precipitation to the proposed technology. and sedimentation technology is already in-place at two of the three direct dischargers in the subcategory. The pollutants specifically selected for regulation at BPT arsenic, cyanide, lead, iron, tin, fluoride, TSS, and pH. are As discussed in Section X, plants which only smelt tin concentrates SO₂ off-gases with a wet scrubber will be and control not regulated for cyanide or fluoride. All other secondary tin plants will be regulated for cyanide and fluoride, but will not regulated for arsenic and iron. The BPT treatment scheme is be 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 We and 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 all cyanide species to complex cyanides and that precipitation of the complexed cyanides is solubility related, we believe that the technology will achieve identical effluent concentrations in both categories.

WASTEWATER DISCHARGE RATES

A BPT discharge rate is calculated for each building block based average of the flows of the existing plants, on the as determined from analysis of dcp. The discharge rate is used the achievable treatment concentrations to with determine BPT effluent limitations. Since the discharge rate may be different for each wastewater source, separate production normalized discharge rates for each of the 9 wastewater sources are discussed below and summarized in Table IX-1 (page 4247). 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, 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 SO2 scrubber water is 9,198 1/kkg (2,204 gal/ton) of crude tapped tin, based on greater than 90 percent recycle. This rate is allocated only to those plants which use air wet pollution control to control SO₂ emissions from tin 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). are presented rates This 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 1/kkg to 24,069 1/kkg.

SPENT ELECTROWINNING SOLUTION FROM MUNICIPAL SOLID WASTE

The BPT flow rate proposed and promulgated for spent 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 scrap. 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 flow 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 l/kkg (13,354 gal/ton) of tin metal recovered from scrap. This rate is allocated only to those facilities which precipitate tin hydroxide from tin solutions generated from alkaline detinning of tin plated steel scrap. One facility reported this practice. Water use and discharge rates are presented in Table V-7 (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. change will simplify the regulation, but will not cause This the limitations with which any plant must comply to change. At proposal, a plant generating both wastewater from plating and from sludges would have calculated ts for each operation and summed them solutions separate mq/kq limits for а 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

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

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Wastewater Stream	BPT No Discha 1/kkg	rmalized rge Rate gal/ton	Production Normalizing Parameter
Tin smelter SO ₂ 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

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TABLE IX-2

BPT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

(a) <u>Tin</u> <u>Smelter</u> <u>SO2</u> Scrubber BPT

Pollutant	or	Maximum for	Maximum for
pollutant	property	any one day	monthly average
mg,	/kg (lb/milli	on lbs) of crude	tapped tin produced
Antimony *Arsenic Cadmium Chromium Copper *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Iron Manganes *Tin	e	26.400 19.220 3.127 4.047 17.480 3.863 17.660 11.310 3.771 18.860 13.430 59.140 51.050 16.920 11.040 6.255 3.495	$ \begin{array}{c} 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\\ \end{array} $
*TSS *pH	Within t	the range of 7.5	to 10.0 at all times

*Regulated Pollutant
BPT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

(b) Dealuminizing Rinse BPT

Pollutant	or	Maximu	m for	Maximum	for
pollutant	property	any or	e day	monthly	average
			-	-	, -
mg/k	kg (lb/mill:	ion lbs)	of dealu	minized s	crap produced
Antimony			0.100		0.045
Arsenic			0.073		0.033
Cadmium			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	:		0.067		0.045
Selenium			0.043		0.019
Silver		н. т	0.014		0.006
Thallium			0.072		0.032
Zinc	· · · ·		0.051		0.021
Aluminum	,		0.225		0.112
Barium			0.194		0.089
Boron		1	0.064		0.029
*Fluoride			1.225		0.697
Iron		· · ·	0.042	· · · ·	0.021
Manganese			0.024		0.010
*Tin			0.013		0.008
*TSS		·	1.435		0.683
*pH	Within	the rang	e of 7.5	to 10.0 a	at all times

*Regulated Pollutant

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BPT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

(c) <u>Tin Mud Acid Neutralization</u> Filtrate BPT

Pollutant	or	Maximum	for	Maximum	for
pollutant	property	any one	day	monthly	average
<u></u>	mg/kg	(1b/million dewatered ti	lbs) of n mud pr	neutral: oduced	ized,
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Fluoride Iron Manganes *Tin	8	14. 10. 1. 2. 9. 1. 2. 9. 6. 2. 10. 7. 32. 28. 9. 176. 6. 3. 1. 206.	480 550 716 221 589 464 120 690 208 069 350 369 450 010 286 600 056 432 918 900		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
*pH	Wit	hin the range	e of 7.5	to 10.0	at all times

BPT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

(d) <u>Tin Hydroxide Wash</u> BPT

Pollutant	or		M	aximum	for		Ma	ximu	m fo	or	
pollutant	prop	erty	a	ny one	day		mo	nthl	y av	vera	ge
]	mg/kg	(lb/m	illi	on lbs) of	tin	hy	drox	ide	was	hed
Antimony	ā ir			34	.310			2]	15.3	00
Arsenic			-	24	.980				·J	1.1	20
Cadmium				4	.064					1.7	93
Chromium				5	.259			-		2.1	52
Copper	- 1 <u>1</u>			22	.710		1. A. A.		· 1	1.9	50
*Cyanide				3	.466				-	1.4	34
*Lead			1 A. A.	5	.020					2.3	91
Nickel	1 · · ·			22	.950		· ·	· ·	г	5.1	80
Selenium				14	.700		•		-	6 5	74
Silver				4	.901					2 0	22
Thallium				24	.500			-	· ·	0 8	92 80
Zinc				17	. 450					7.2	ט. רם
Aluminum	1.1	1		76	.860					19 2	50
Barium				66	340						50
Boron				21	0000				. J		10
*Fluoride		100 A.		/19	100			·			4U
Iron				11	3/0				2,3	7 30	JU 10
Manganese	.			Q	120					7.43) <u>1</u>
*Tin				1	-120 512					3.40	20
*TSS	·			100	100				17	4.0	3U 20
*nH	TA	ithin	the	470	• 100 of 7	,			د ک	ろ。 エ()U
F ++			che	range	UL /	• 5 T	.0.		aτ	all	times

SECONDARY TIN SUBCATEGORY SECT - IX

TABLE IX-2 (Continued)

BPT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

(e) Spent Electrowinning Solution from New Scrap BPT

Pollutant	or	<u> </u>	Max	imum	for	M	lax	imum	for	
pollutant	prope	rty	any	one	day	ń	nont	thly	average	
1	ng/kg	(lb/mil	lion	lbs	of	catho	ode	tin	produce	d
Antimony				48.	.220				21.500	ł
Arsenic				35.	.110				15.620	ł
Cadmium				5.	.712				2.520	
Chromium				7.	.392				3.024	:
Copper				31.	920				16.800	
*Cvanide				4.	.872				2.016	,
*Lead				7.	.056				3.360	ł
Nickel				32	.260				21.340	ł
Selenium				20	.660				9.240)
Silver				6	.888				2.856	,
Thallium				34	.440				15.290)
Zinc				24	.530				10.250)
Aluminum				108	.000				53.760)
Barium				93	.240				42.670)
Boron				30	.910				14.110)
*Fluoride				588	.000				334.300)
Tron				20	.160				10.250)
Manganes	e			11	.420				4.872	2
*型in	Ψ.			6	384				3.696	5
*7766				688	.800				327.600)
*pH		Within	the	range	e of	7.5	to	10.0	at all	times

BPT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

(f) <u>Spent ELectrowinning Solutions from</u> <u>Municipal Solid Waste BPT</u>

Pollutant	or	Maximum fo	r Maximum	for
pollutant	property	any one da	y monthly	average
·	ma/ka	(lb/million	lba) of MCW a	
	mg/kg	used as a ra	IDS) OL MSW S w material	crap
1			W MACCITAT	
Antimony		0.34	2	0.152
Arsenic		0.24	9	0.111
Cadmium		0.04	1	0.018
Chromium		0.05	2	0.021
Copper		0.22	6	0.119
*Cyanide		0.03	5	0.014
*Lead		0.05	0	0.024
NICKEL		0.22	8	0.151
Selenium		0.14	6	0.066
Thallium		0.04	9	0.020
Zinc		0.24	4	0.108
Aluminum	di seconda d	0.76	4 E	0.073
Barium		0.70	5 N	0.381
Boron		0.00		0.302
*Fluoride	· · · · ·	4.16	5	2 368
Iron		0.14	3	0.073
Manganese	}	0.08	1	0.035
*Tin		0.04	5	0.026
*TSS		4.87	9 •	2.321
*pH	Withir	the range o	E 7.5 to 10.0	at all times

BPT MASS LIMITATIONS FOR THE SECONDARY TIN !SUBCATEGORY

(g) <u>Tin</u> <u>Hydroxide</u> <u>Supernatant</u> from <u>Scrap</u> BPT

or	Maximum fo	r Maximum	for
property	any one da	y monthly	average
mg/kg	(lb/million recovered f	lbs) of tin me rom scrap	etal
2 Mitbi	159.70 116.30 18.92 24.48 105.70 16.14 23.37 106.80 68.44 22.81 114.10 81.23 357.80 308.80 102.40 1,947.00 66.77 37.84 21.14	$ \begin{array}{c} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\$	71.220 51.750 8.346 10.020 55.640 6.677 11.130 70.660 30.600 9.459 50.630 33.940 178.000 141.300 46.740 ,107.000 33.940 16.140 12.240 ,085.000 at all times
WICHII	i the range t		at the second
	or property mg/kg	or Maximum fo property any one da mg/kg (lb/million recovered f 159.70 116.30 18.92 24.48 105.70 16.14 23.37 106.80 68.44 22.81 114.10 81.23 357.80 308.80 102.40 1,947.00 66.77 97.84 21.14 2,281.00 Within the range c	or Maximum for Maximum property any one day monthly mg/kg (lb/million lbs) of tin me recovered from scrap 159.700 16.300 18.920 24.480 105.700 16.140 23.370 106.800 68.440 22.810 114.100 81.230 357.800 308.800 102.400 1,947.000 1,947

BPT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

(h) <u>Tin Hydroxide Supernatant from</u> <u>Plating Solutions and Sludges</u> BPT

Pollutant	07		Manimum	<u> </u>		·	
pollutant	01		Maximum	IOT	Maximum	for	
porrutant	propert	Ч. У	any one	day	monthly	averag	е
	mç	/kg (.	lb/milli	on lbs)	of tin me	etal	
۰,	recover	ed fro	om plati	ng solut	ions and	sludge	s
Antimony	1997 - 19		220	100			
Argonia			330	.100		147.20	0
Arsenic			. 240	.400		107.00	0
Cadmium			.; 39	.100		17.25	0
Chromium			50	.600		20.70	0
Copper			218	.500	-	115.000	0
*Cyanide			33	.350	•	13.800	0
*Lead			48	.300	. <u>.</u>	23.000	0
Nickel			220	.800		146.100	n i i i i i i i i i i i i i i i i i i i
Selenium	· · · · ·		141.	500		63.250	ก้ เ
Silver	; ;		47	150		19 550	, j
Thallium		<u>.</u>	235	800		104 700	י י ר
Zinc	· .		167	900		70 160	<i>ו</i> ר
Aluminum			730	500		269 000	ן ר
Barium			638	300) >
Boron		۰.	211	600		292.100)
*Fluoride		. · ·	4 025	000		90.600)
Tron			4,023.	000	2,	289.000)
Manganogo		1.1.1	· 130.	000		70.150)
manganese ★™in			/8.	200		33.350) .
			43.	/00	· ·	25.300) ·
*~U			4,715.	000	2,	243.000) · · · ·
bu	Wl	cnin t	ne range	of 7.5	to 10.0	at all	times

BPT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

(i) <u>Tin Hydroxide</u> <u>Filtrate</u> BPT

									607	
Pollutant	or		Maxim	ium I	or	1	max:	imum	LOT	
pollutant	proper	ty	any c	ne č	lay	I	non	thly	average	
-										
	mg/kg	(lb/mi	llion	lbs)	of	tin	me	tal	produced	l
Antimonv				71.8	880				32.060)
Arcenic				52.3	340				23.290)
Codmium				8.5	515				3.757	7
Chromium				11.0	20				4.508	3
Chromitum				47.5	580				25.040)
topper				7.3	263				3.005	5
*Cyanice				10 9	520				5.009)
*Lead				18 (า <u>ี่</u> ลูก				31.810)
NICKEL				20.0	200				13.77()
Selenium				10.0	500				4 25	7
Silver				TO • 1	270				22 79	, 1
Thallium				51	340	15 290				
Zinc				36.	560					
Aluminum			1	L61.0	000	80.140				J
Barium]	139.0	000				63.61	5
Boron				46.0	080				21.04	0
*Fluoride			8	376 .	500				498.40	D
Tron				30.	050				15.28	0
Manganes	_			17.	030				7.26	3
*min				9.	517				5.51	0
*022			1 - 1	027	000				488.40	0
+~11 	TA	i+hin	$\pm her$	ange	of	7.5	to	10.0) at all	times
hu	Y Y			~	~-					





BPT TREATMENT SCHEME FOR OPTION A

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SECONDARY TIN SUBCATEGORY SECT - X

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 amount of water used and discharged, of the 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

SECONDARY TIN SUBCATEGORY SECT - X

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

Next, the volume of wastewater discharged after the application of each treatment option was estimated for each operation at each plant by first comparing the actual discharge to the regulatory flow. The smaller of the two values was selected and summed with the other plant flows. The mass of pollutant discharged was then estimated by multiplying the achievable concentration values attainable with the option (mg/l) by the estimated volume of process wastewater discharged by the subcategory. Finally, the mass of pollutant removed is the difference between the estimated mass of pollutant generated by each plant in the subcategory and the mass of pollutant discharged after application of the treatment option.

The pollutant removal estimates for the 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 and operation of wastewater treatment installation with technologies to plant process wastewater discharge. EPA applied the model on a per plant basis. A plant's costs - both capital, operating and maintenance were determined by what went it has in place and by its individual process and treatment 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

After 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 this subcategory for promulgation as at proposal. These 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 process indirect discharger at proposal revised their an 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 C, precipitation Option consisting of cyanide 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.

SECONDARY TIN SUBCATEGORY

SECT - X

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

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SECONDARY TIN SUBCATEGORY SECT - X

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 This 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 and sedimentation treatment system operated for multiple metals removal. Filtration as part of the technology basis is likewise justified this technology because removes metals 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 proper performance in a chemical precipitation and insure sedimentation treatment system. The following toxic pollutants are excluded from limitation on the basis that are effectively controlled by the limitations developed thev 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 mass of product. The discharged per results of these

SECONDARY TIN SUBCATEGORY

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.

SECT - X

Table X-1

	Raw	Option A	Option A Removed	Option C Discharge	Option C Removed
D 11 · · · ·	Discharge	(ka/m)	(ka/vr)	(kg/vr)	(kg/yr)
Pollutant	(Kg/yL)	(Kg/yL)	(16/)2)	<u></u>	<u> </u>
antimony	50.79	20.54	30.25	14.06	36.73
Arsenic	152.62	21.51	131.11	15.22	137.40
admium	13.24	4.50	8.74	2.96	10.28
bromium (Total)	2.98	0.60	2.37	0.56	2.41
opper	18,75	17.20	1.54	16.13	2.61
Symide (Total)	144.87	1.03	143.83	0.98	143.88
Load	123.01	5.64	117.37	4.14	118.87
Leau Aoroury	0.34	0.34	0.00	0.34	0.00
Nickel	24.45	6.22	18.22	5.23	19.22
Solonium	129.01	13.73	115.27	9.99	119.01
Silver	2.14	0.50	1.64	0.45	1.69
Dilver Thallium	15.63	4.08	11.55	3.72	11.91
	120.83	15.15	105.67	11.40	109.42
	120000				
TOTAL PRIORITY	798.66	111.04	687.56	85.18	713.43
POLLUTANTS					•
A]	36 396 37	81,57	36,314,79	54.26	36,342.10
	215 02	177.48	37.53	177.28	37.73
Amionia	9.12	9.12	0.00	7.69	1.42
	869.57	9,40	860.17	6.30	863.27
DOLOH Coholt	6.96	1.74	5,22	1.18	5.78
What	237 848.06	626.23	237.221.82	498.12	237,349.93
Trop	7,731,14	14.27	7,716.86	9.75	7,721.39
Maanooium	338,84	3.48	335.36	2.33	336.51
Manganoso	15.32	5.57	9.75	4.87	10.44
ranganese Tip	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

SECONDARY TIN SUBCATEGORY POLLUTANT REMOVAL ESTIMATES DIRECT DISCHARGERS

A

SECONDARY TIN SUBCATEGORY SECT -

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

SECONDARY TIN SUBCATEGORY SECT -

×

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 Norn Discharg _1/kkg_	nalized ge Rate gal/ton	Production Normalizing Parameter
Tin smelter SO ₂ 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

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TABLE X-4

BAT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

(a) <u>Tin Smelter</u> <u>SO2</u> Scrubber BAT

Pollutant pollutant	or property	Maximum any one	for day	Maximum f monthly a	for average
mg/	kg (lb/millio	on lbs) c	of crude	tapped ti	in produced
Antimony *Arsenic Cadmium Chromium Copper *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Iron Manganese	2	17. 12. 1. 3. 11. 2. 5. 7. 2. 12. 9. 56. 10. 16. 11. 2. 3.	750 790 840 403 770 575 059 542 667 880 382 200 580 920 040 759 495		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

BAT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

(b) Dealuminizing Rinse BAT

Pollutant	or	Maximum for	Maximum for
pollutant	property	any one day	monthly average
mg/k	g (lb/million	n lbs) of dealu	minized scrap produced
Antimony	· .	0.068	0.030
Arsenic		0.049	0.022
Cadmium	• •	0.007	0.003
Chromium		0.013	0.005
Copper	14 - 14 A	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		0.036	0.015
Aluminum		0.214	0.095
Barium		0.040	0.018
Boron	1	0.064	0.029
*Fluoride		1.225	0.697
Iron		0.042	0.021
Manganese		0.011	0.008
*Tin		0.013	0.008

BAT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

(c) <u>Tin Mud Acid Neutralization Filtrate</u> BAT

Pollutant pollutant	or property	Maximum any one	for day	Maximum monthly	for average	
	mg/kg	(lb/million dewatered ti)	lbs) of n mud pr	neutrali	zed,	
• • • • • • • • •			7/1		4.340	
Antimony		9. 7.	015	1	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		1 967	
Nickel		2.	1/0		1 867	
Selenium		4• 1	139 161		0.606	,
Sliver			066		3.079	a. 1
Thailium		, - 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	
Manganes *Tin	e	1.	514 918		1.161	

BAT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

(d) <u>Tin Hydroxide Wash</u> BAT

Pollutant or	Maximum for	Maximum for	
porrucant property	any one day	monthry average	
mg/kg (lb/	million lbs) of	tin hydroxide washed	_
Antimony	23.070	10.280	
Arsenic	16.610	7.411	
Cadmium	2.391	0.956	
Chromium	4.423	1.793	- 4 - -
Copper	15.300	7.291	
*Cyanide	2,391	0.956	
*Lead	3.347	1.554	
Nickel	6.574	4.423	
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	۰.
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	5
*Tin	4.542	2.630	

BAT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

(e) Spent Electrowinning Solution from New Scrap BAT

Pollutant	or		Max	imum	for	Maxi	.mum	for	
pollutant	prope	erty	any	one	day	mont	hly	average	
I	ng/kg	(lb/mil	lion	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	
*Cvanide				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	9			5.	040			3.864	
*Tin				6.	384			3.696	

BAT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

(f) <u>Spent</u> <u>Munici</u>	Electrowin pal Solid	ning Solut Waste BAT	ion from		
Pollutant pollutant	or property	Maximum any one	for day	Maximum monthly	for average
· · · · · · · · · · · · · · · · · · ·	mg/kg	(lb/millic used as a	on lbs) raw mat	of MSW so erial	crap
Antimony	- 	÷. • • • • • • • • • • • • • • • • • • •	230		0.102
Arsenic		0.	165		0.074
Cadmium		0.	024		0.010
Chromium	4	Ö.	044		0 018
Copper		0.	152		0.073
*Cvanide	· .	0.	024		0.073
*Lead	s de la companya de l	0.	033		0.010
Nickel		0.	0.55		0.010
Selenium	* .	0.	000		0.044
Silvor		U.	090		0.044
Thallium		0.	0,35		0.014
Zina		0.	16/		0.073
		0.	121		0.050
Aluminum	2	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		0.	045		0.026

SECONDARY TIN SUBCATEGORY SECT - X

TABLE X-4 (Continued)

BAT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

(g) <u>Tin</u> <u>Hydroxide</u> <u>Supernatant</u> from <u>Scrap</u> BAT

Pollutant pollutant	or property	Maximum any one	for day	Maximum monthly	for average	
	mg/kg	(lb/millio recovered	on lbs) d from) of tin m scrap	etal	
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Fluoride Iron Manganes *Tin	e	107 77 11 20 71 15 30 45 16 77 56 340 63 102 1,947 66 16	.400 .340 .130 .590 .220 .130 .580 .600 .620 .140 .900 .750 .000 .990 .400 .000 .770 .690 .140		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 46.740 107.000 33.940 12.800 12.240	

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*Regulated Pollutant

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BAT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

(h) <u>Tin Hydroxide Supernatant from</u> <u>Plating Solutions and Sludges</u> BAT

Pollutant	or	Maximum for	Maximum	for
pollutant	property	any one day	monthly	average
	mg/kg	g (lb/million lbs)	of tin me	tal
	recovered	from plating solu	tions 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	1	23.000		9 200
*Lead		32.200		1/ 050
Nickel		63,250		19 550
Selenium		94,300		42.550
Silver		33 350		42.000
Thallium		161,000		70 150
Zinc		117 300		/U.LOU
Aluminum		702 700		40.300
Barium		122.200	ал — С	311./00
Boron				58.650
*Fluoride		4 025 000		96.600
Trop		4,025.000	2,	289.000
Managana		138.000		70.150
manganese	- -	34.500		26.450
~T.T.U	· *	43.700		25.300

BAT MASS LIMITATIONS FOR THE SECONDARY TIN SUBCATEGORY

(i) <u>Tin</u> <u>Hydroxide</u> <u>Filtrate</u> BAT

Pollutant pollutant	or property	Maximum for any one day	Maximum for monthly average
	mg/kg (]	Lb/million lbs) of	f tin metal produced
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Fluoride Iron Manganes	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	$\begin{array}{c} 21.540\\ 15.530\\ 2.004\\ 3.757\\ 15.280\\ 2.004\\ 3.256\\ 9.266\\ 9.266\\ 3.005\\ 15.280\\ 10.520\\ 67.870\\ 12.770\\ 21.040\\ 498.400\\ 15.280\\ 5.760\end{array}$
*Tin		9.517	5.510



4279



BAT TREATMENT SCHEME FOR OPTION A





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BAT TREATMENT SCHEME FOR OPTION C

4280

SECONDARY TIN SUBCATEGORY SECT - XI

SECTION XI

NEW SOURCE PERFORMANCE STANDARDS

This section describes the technologies for treatment of 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. New plants have the opportunity to design the best and most efficient production processes and wastewater treatment added technologies without facing the added costs and restrictions encountered in retrofitting an existing plant. and 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 best 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 for new source treatment systems. This review of the secondary tin found no new, economically feasible, subcategory technologies which could considered demonstrated be an improvement over those chosen for consideration for BAT. Additionally, there was nothing found to indicate that the wastewater flows and characteristics of new plants would not be similar to those from existing plants, since the processes used by new sources are not expected to differ from those used at existing sources. Consequently, BAT production normalized discharge rates, which are based on the best existing practices of the subcategory, can also be applied to new sources. These rates are presented in Table XI-1 (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

- o Preliminary treatment consisting of cyanide precipitation
 (where required)
- o Chemical precipitation and sedimentation

OPTION C

- Preliminary treatment consisting of cyanide precipitation (where required)
- o Chemical precipitation and sedimentation
- o 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 The BAT flow rates. Flow reduction measures for NSPS and BAT were 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 tin С (cyanide precipitation, chemical precipitation, sedimentation, and filtration).

wastewater flow rates promulgated for NSPS are the same The as promulgated BAT flow rates. The NSPS flow rates are the 4283). XI-1 (page presented in Table Additional flow reduction and more stringent treatment technologies are demonstrated or readily transferable to the secondary not tin 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 (page 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 		Production Normalizing Parameter
Tin smelter SO ₂ 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 - XI

TABLE XI-2

NSPS FOR THE SECONDARY TIN SUBCATEGORY

(a) <u>Tin Smelter</u> <u>SO2</u> Scrubber <u>NS</u>PS

Pollutant	or		Max	imum	for		Maxi	mum	for	
pollutant	prope	erty	any	one	day		mont	hly	average	
mg/	′kg (]	b/milli	on l	bs) (of cr	ude	tapp	ed t	in prod	uced
Antimony				17	.750				7.910)
*Arsenic				12	.790			•	5./03	
Cadmium				.⊥	.840				1.380	,
Copper				11	. 770	:			5.611	
*Lead				2	.575				1.196	
Nickel				5	.059				3.403	5
Selenium				7	.542				3.403	5
Silver				2	.667				5 611	Ł.
Thallium			•	21	382				3.863	-
Aluminum				56	.200				24.930)
Barium				10	.580				4.69]	-
Boron				16	.920				7.726	5
*Iron				11	.040				5.6L	
Manganese	9			2	.759				2.110	1
^T1N *™CC				ร 138	.000	,			110.400)
*pH		Within	the	rang	e of	7.5	to 1	L0.0	at all	times
NSPS FOR THE SECONDARY TIN SUBCATEGORY

(b) Dealuminizing Rinse NSPS

Pollutant o	or	Maxim	im for		Maximu	m for	· · · · · ·
porrucane j	propercy	any or	le day		monthl	y average	3 .
mg/ko	g (lb/millio	on lbs)	of de	alum	inized	scrap pro	duced
Antimony		· · ·	0.068			0 030	3
Arsenic			0.049			0.030)
Cadmium			0.007			0.022	2 . <u>.</u>
Chromium			0 013			0.003	-
Copper			0.015		· · · · ·	0.005	
*Cvanide							
*Lead		· · · · ·	0.007			0.003	
Nickel	a de la composición d La composición de la c	. •	0.010			0.005) • •
Selenium		i de la composición d	0.019		· · · ·	0.013	
Silvor		· .	0.029			0.013	
mballium			0.010			0.004	:
Zina			0.049			0.021	•
	х 		0.036			0.015	· .
Aluminum		1	0.214		-	0.095	
Barium	· · · ·		0.040			0.018	
Boron			0.064			0.029	
Fluoride	· ·		1.225			0.697	
Iron	5 -	· .	0.042			0.021	
Manganese			0.011			0.008	· · · ·
Tin	•	· · ·	0.013			0.008	. •s.
TSS			0.525			0 420	
'PH	Within	the ran	ge of	7.5	to 10.0) at all	times

NSPS FOR THE SECONDARY TIN SUBCATEGORY

(c) <u>Tin Mud Acid Neutralization</u> Filtrate NSPS

Pollutant	or	Maximum for	Maximum for	
pollutant	property	any one day	monthly average	
	mg/kg	(lb/million lbs) dewatered tin mu	of neutralized, d produced	
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Fluoride Iron Manganes *Tin	e	9.741 7.015 1.009 1.867 6.460 1.009 1.413 2.776 4.139 1.464 7.066 5.148 30.840 5.804 9.286 176.600 6.056 1.514 1.918 75.710	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 60.560 7.5 to 10.0 at all ti	meg
*pH	Wit.	nin the range of	7.5 CO 10.0 at all th	me o

NSPS FOR THE SECONDARY TIN SUBCATEGORY

(d) <u>Tin Hydroxide Wash</u> NSPS

Pollutant	or		Max	cimum	for		Maximum	for	
pollutant	prop	erty	any	one one	day		monthly	average	e
·	ma /ka	(1b/mi	1110			-	budrowi	do up ch	
	mg/ rg	(TD) mT) 01	LΤΠ	nyaroxi	ue wasn	Ξū
Antimony	,			23	.070			10.28	0
Arsenic				16	.610			7.41	1
Cadmium	1			2	.391			0.95	6
Chromium	L ·			4	.423			1.79	3
Copper				15	.300			7.29	
*Cyanide	н. 1914 г. – К. –		*	2	.391			0.95	5
*Lead				3	.347			1.55	4
Nickel				6	.574	·		4.42	3
Selenium		,		9	.801			4.42	3
Silver				. 3.	466			1.43	4
Thallium				16	.730			7.29	Ī
Zinc				12	.190			5.020	
Aluminum		1 		73	.030			32.390	
Barium				13	.750			6.096	5
Boron	\$			21	990			10.040)
*Fluoride	4 ¹			418	400			237.900	<u>,</u>
Iron				14.	340			7.29	L
Manganes	е		-	3.	586		1	2.749	- -
*Tin		1		: 4	542			2.630)
*TSS				179.	300			143.400)
*pH		Within	the	range	e of	7.5	to 10.0	at all	times

NSPS FOR THE SECONDARY TIN SUBCATEGORY

(e) Spent Electrowinning Solution from New Scrap NSPS

Pollutant	or		Max	imum	for	· ·	Max	imum	for	
pollutant	prope	erty	any	one	day	. :	mon	thly	average	- -
	mg/kg	(lb/mil	lion	lbs) of	cath	ode	tin	produce	d
Antimony Arsenic				32 23	.420 .350		•		14.450 10.420	
Cadmium Chromium				3 6 21	.360				1.344 2.520 10.250	L
*Cyanide *Lead				3	.360 .704				1.344	
Nickel Selenium				9 13 4	.240				6.216 6.216 2.016	
Thallium Zinc				23 17	.520 .140				10.250	5
Aluminum Barium Boron				102 19 30	.600 .320 .910				45.530 8.568 14.110) 3)
*Fluoride Iron Manganes	0			588 20	.000 .160				334.300 10.250 3.864)) [
*Tin *TSS				6 252	.384				3.696 201.600	5
*pH		Within	the	rang	e of	7.5	to	10.0	at all	times

NSPS FOR THE SECONDARY TIN SUBCATEGORY

(f) <u>Spent Electrowinning Solution</u> from <u>Municipal Solid Waste</u> NSPS

Pollutant	or	Maximum f	or Maximur	- for
pollutant	property	A and a a a a a a a a a a a a a a a a a a		u lor
Ferradance	propercy	any one u	ay monthiy	/ average
	ma/ka	(1b/m;11; an	They of Mari	· · · · · · · · · · · · · · · · · · ·
	mg/kg		IDS) OF MSW S	scrap
		used as a ra	aw material	
Antimony		0.0	20	
Argonia		0.2	30	0.102
Codmium	· · · · · · · · · · · · · · · · · · ·	0.10	55	0.074
Cadmitum		0.0	24	0.010
Chromium		0.04	14	0.018
Copper		0.1	52	0.073
*Cyanide	· · · · · · · · · · · · · · · · · · ·	0.02	24	0.010
*Lead		0.03	33	0.016
Nickel		0.06	56	0 044
Selenium	1. Sec. 1. Sec	0.00	18	0 044
Silver	e egite de la companya	0 0 0	25	0.044
Thallium		0.00	,	0.014
Zinc		0.10		0.073
Aluminum				0.050
Barium		0./2		0.322
Barium		0.13	7	0.061
+DION		0.21	.9	0.100
~fluoride		4.16	5	2.368
Iron		0.14	3	0.073
Manganese		0.03	6	0.027
*Tin		0.04	5	0.026
*TSS		1.78	5	1 428
*pH	Within	the range o	f 7.5 + 0.100	21720
-	· · · · · · · · · · · · · · · · · · ·		CO TO.O	at all times

NSPS FOR THE SECONDARY TIN SUBCATEGORY

(g) <u>Tin</u> <u>Hydroxide</u> <u>Supernatant</u> <u>from</u> <u>Scrap</u> NSPS

Pollutant	or	Maximum for	Maximum for	
pollutant	property	any one day	y monthly average	
	mallea	(lb/million)	lbs) of tin metal	
	mg/kg	recovered fi	rom scrap	
		ICCOVEICG I.		
Antimony		107.400	o 47 . 850	
Arsenic		77.34(0 34.500	
Cadmium		11.130	0 4.451	
Chromium		20.590	0 8.346	
Copper		71.220	0 33.940	
*Cyanide		11.130	0 4.451	
*Lead		15.580	0 7.233	
Nickel		30.600	0 20.590	*
Selenium		45.620	0 20.590	
Silver		16.140	0 6.677	
Thallium		77.90	0 33.940	
Zinc		56.75	0 23.3/0	
Aluminum		340.00	0 150.800	
Barium		63.990		
Boron		102.400	0 40./40	,
*Fluoride		1,947.000		1
Iron		66.//	0 33.940	í
Manganes	9		0 12.000	i i
*Tin				i i
*TSS		834.60	0 007.700 5 7 5 5 10 0 at all	times
*pH	Withi	n the range of	1 7.5 to 10.0 at all	CTUCO

NSPS FOR THE SECONDARY TIN SUBCATEGORY

(h) <u>Tin Hydroxide</u> <u>Supernatant from Plating</u> <u>Solutions and Sludges</u> NSPS

Pollutant	or	Monimum C.		
mollutant	01	Maximum for	Maximum for	
pollutant	property	any one day	monthly average	
	mg/kg	(1b/million 1bs	s) of tin metal	
	recovered f	rom plating sol	utions 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	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	
*pH	Within	the range of 7	.5 to 10.0 at all times	s

NSPS FOR THE SECONDARY TIN SUBCATEGORY

(i) <u>Tin Hydroxide</u> <u>Filtrate</u> NSPS

Pollutant	or	<u></u>	Max	imum	for		Maximur	n for	
pollutant	proper	ty	any	one	day		monthly	y average	
	mg/kg	(lb/mi	llic	on lb	s) of	tin	metal	produced	1
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Fluoride Iron Manganese	2			48 34 5 9 32 5 7 13 20 7 35 25 153 28 46 876 30 7	.330 .810 .009 .266 .060 .009 .012 .770 .540 .263 .060 .540 .000 .800 .080 .500 .050 .513			21.540 15.530 2.004 3.757 15.280 2.004 3.256 9.266 3.005 15.280 10.520 67.870 12.770 21.040 498.400 15.280 5.760) 1 7 1 5 5 5 5 5 5 5 5 5 5 5 5 5
*TIN *TSS *PH	Ŵ	lithin	the	375 rang	.700 e of	7.5	to 10.	300.500 0 at all) times

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 sludge disposal practices. In determining whether chosen 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 by direct dischargers complying with BAT effluent removed 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-ofpipe 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
Arsenic	7.25	0.56	6.68	0.37	6.8/
Cadmium	1.16	0.08	1.07	0.05	1.10
Chromium (total)	1.46	0.09	1.36	0.07	1.38
Copper	1.15	0.64	0.50	0.43	0./1
Cyanide (total)	19.79	0.07	19.71	0.05	19.73
Lead	4.67	0.13	4.53	0.08	4.58
Mercury	0	0	0	0	0
Nickel	12.72	0.81	11.90	0.24	12.4/
Selenium	78.98	0.33	78.64	0.22	/8./5
Silver	1.15	0.11	1.03	0.07	1.07
Thallium	7.45	0.55	6.89	0.37	/.0/
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
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
TCC	490.43	13.25	477.17	2.87	487.55
0il 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

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SECONDARY TIN SUBCATEGORY

SECT - XII

SECONDARY TIN SUBCATEGORY SECT - XII

TABLE XII-2

COST OF COMPLIANCE FOR THE SECONDARY TIN SUBCATEGORY INDIRECT DISCHARGERS

•

Option	Proposal <u>Capital Cost</u>	Costs <u>Annual</u> <u>Cost</u>	Promulgat <u>Capital Cost</u>	ion Costs <u>Annual</u> Cost
A	333400	112200	156612	46676
B.	341700	119900	1601 8 7	50044

Table XII-3

PSES AND PSNS WASTEWATER DISCHARGE RATES FOR THE SECONDARY TIN SUBCATEGORY

	PSES an Normal	d PSNS ized Bate	Production Normalizing
Wastewater Stream	<u>1/kkg</u>	gal/ton	Parameter
Tin smelter SO ₂ 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 XII-4

PSES FOR THE SECONDARY TIN SUBCATEGORY

(a) <u>Tin Smelter</u> SO₂ Scrubber PSES

Pollutant or	: M	aximum	for	Maximum	for	<u> </u>
pollutant pr	operty a	ny one	day	monthly	average	
mg/kg	g (lb/million	lbs) o	f crude	tapped	tin produ	ced
Antimony		17.	750		7,910	
*Arsenic		12.	790		5.703	
Cadmium	· · ·	1.	840		0.736	
Chromium		3.	403		1.380	1. S. S. S.
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.	040		5.611	
Manganese	,	2.	759		2.116	
*Tin	÷ .	3.	495		2.024	

TABLE XII-4

PSES FOR THE SECONDARY TIN SUBCATEGORY

(b) Dealuminizing Rinse PSES

Pollutant	or	Maximum	for	Maximum	for	
pollutant	property	any one	day	monthly	average	•
mg/k	g (lb/millior	lbs) of	dealum	inized so	erap produc	ced
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium	.g (12/ m11210		068 049 007 013 045 007 010 019 029 010 049 036		0.030 0.022 0.003 0.005 0.021 0.003 0.005 0.013 0.013 0.004 0.021 0.015	
Aluminum Barium Boron *Fluoride Iron Manganese *Tin	2	0 0 1 0 0 0	214 .040 .064 .225 .042 .011 .013		0.095 0.018 0.029 0.697 0.021 0.008 0.008	•

PSES FOR THE SECONDARY TIN SUBCATEGORY

Pollutant	or	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	3 070
Zinc		5,148	2 1 2 0
Aluminum		30 840	12 600
Barium	1. A.	5 804	
Boron	s	9.004	4 220
*Fluoride		176 600	4.239
Tron	· · ·	£ 056	100.400
Manganese			3.0/9
*Tungunese			Τ.ΤΟΤ
		T•9T8	1.110

(c) <u>Tin Mud Acid Neutralization</u> <u>Filtrate</u> PSES

PSES FOR THE SECONDARY TIN SUBCATEGORY

(d) <u>Tin Hydroxide</u> <u>Wash</u> PSES

Pollutant pollutant	or property	Maximum any one	for day	Maximum for monthly average
Ĩ	ng/kg (lb/mi	llion lbs) of tin	hydroxide washed
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Fluoride Tron		23 16 2 4 15 2 3 6 9 3 16 12 73 13 21 418 14	.070 .610 .391 .423 .300 .391 .347 .574 .801 .466 .730 .190 .030 .750 .990 .400 .340	10.280 7.411 .956 1.793 7.291 .956 1.554 4.423 4.423 1.434 7.291 5.020 32.390 6.096 10.040 237.900 7.291
Manganes *Tin	e	3	.586 .542	2.749 2.630

PSES FOR THE SECONDARY TIN SUBCATEGORY

(e) Spent Electrowinning Solution from New Scrap PSES

pollutant	or	ertv	Max:	imum	for	Maxin	num for
	E -	1	~7	one	uay	monti	iry average
1	mg/kg	(lb/mi	llion	lbs)	of	cathode t	in produced
Antimony		·* .		32.	420	. •	14,450
Arsenic				23.	350		10.420
Cadmium				3.	360		1.344
Chromium	. ,			6.	216	1	2.520
Copper				21.	500		10.250
*Cyanide				3.	360		1.344
*Lead				4.	704		2.184
Nickel				9 .	240		6.216
Selenium			١.	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
ron			I.	20.	160		10.250
Manganese	,			5.	040		3.864
~TTU				6.	384		3.696

PSES FOR THE SECONDARY TIN SUBCATEGORY

(f) <u>Spent</u> <u>ELectrowinning</u> <u>Solution</u> <u>from</u> <u>Municipal</u> <u>Solid</u> <u>Waste</u> PSES

Pollutant pollutant	or property	Maximum any one	for day	Maximum monthly	for average	
	mg/kg	(lb/millic used as a	on lbs) raw ma	of MSW so terial	crap	
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron			.230 .165 .024 .044 .152 .024 .033 .066 .098 .035 .167 .121 .727 .137 .219		.102 .074 .010 .018 .073 .010 .016 .044 .044 .014 .073 .050 .322 .061 .100	
*Fluoride Iron Manganese *Tin	e	4	.165 .143 .036 .045	·	.073 .027 .026	

PSES FOR THE SECONDARY TIN SUBCATEGORY

(g) <u>Tin Hydroxide</u> <u>Supernatant</u> from <u>Scrap</u> PSES

Pollutant pollutant	or property	Maximum for any one day	Maximum for monthly average
	mg/kg	(lb/million lbs) recovered from	of tin metal scrap
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Fluoride Iron Manganese *Tin		107.400 77.340 11.130 20.590 71.220 11.130 15.580 30.600 45.620 16.140 77.900 56.750 340.000 63.990 102.400 $1,947.000$ 66.770 16.690 21.140	- 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 1,107.000 33.940 12.800

PSES FOR THE SECONDARY TIN SUBCATEGORY

(h) <u>Tin Hydroxide Supernatant from</u> <u>Plating Solutions and Sludges</u> PSES

Pollutant	or	Maximum f	or Maximu	n for
pollutant	property	any one d	ay monthly	y average
	mg/kg recovered f	(lb/million from plating	lbs) of tin solutions and	netal d sludges
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Fluoride Iron Manganes	e	222.0 159.9 23.0 42.5 147.2 23.0 32.2 63.2 94.3 33.3 161.0 117.3 702.5 132.3 211.0 4,025.0 138.0 34.3	900 900 900 900 900 900 900 900 900 900	98.900 71.300 9.200 17.250 70.150 9.200 14.950 42.550 42.550 13.800 70.150 48.300 311.700 58.650 96.600 2,289.000 70.150 26.450 25.300
~T.T.U			,	

SECONDARY TIN SUBCATEGORY SECT - XII

TABLE XII-4 (Continued)

PSES FOR THE SECONDARY TIN SUBCATEGORY

(i) <u>Tin</u> <u>Hydroxide</u> <u>Filtrate</u> PSES

Pollutant	or	Maximum for	Maximum for	·
pollutant	property	any one day	monthly average	
	mg/kg (lb/mi	llion lbs) of	tin metal produced	<u> </u>
Antimony		48,330	21 540	
Arsenic		34.810	15 520	
Cadmium		5.009	2 004	
Chromium		9,266	2.004	
Copper		32,060	15 290	
*Cyanide	•	5,009		÷ .
*Lead		7,012	2.004	
Nickel		13,770	· · · · · · · · · · · · · · · · · · ·	·
Selenium		20.540	9.200	
Silver		7,263	3 005	
Thallium	4 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	35,060	15 290	
Zinc		25.540	10 520	e e
Aluminum		153,000	67 970	
Barium		28,800		
Boron		46,080		
*Fluoride		876.500		
Iron		30.050	15 200	
Manganese	e e e e e e e e e e e e e e e e e e e	7,513	5 760	
*Tin		9.517	5,510	۰.
	· .	1	31310	

TABLE XII-5

PSNS FOR THE SECONDARY TIN SUBCATEGORY

(a) <u>Tin</u> <u>Smelter</u> <u>SO2</u> Scrubber PSNS

Pollutant pollutant	or property	Maximum any one	for day	Maximum monthly	for average
mg,	/kg (lb/millio	on lbs) (of crude	tapped	tin produced
Antimony *Arsenic Cadmium Chromium Copper *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Iron Manganes *Tin	e	17. 12. 1. 3. 11. 2 5. 7 2 12. 9 56 10 10 11. 2 3	.750 .790 .840 .403 .770 .575 .059 .542 .667 .880 .382 .200 .580 .920 .040 .759 .495		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

SECONDARY TIN SUBCATEGORY SECT - XII

TABLE XII-5 (Continued)

PSNS FOR THE SECONDARY TIN SUBCATEGORY

(b) Dealuminizing Rinse PSNS

Pollutant pollutant	or property	Maximum for any one day	Maximum for monthly average
mg/l	cg (lb/millio	n lbs) of dealum	inized scrap produced
Antimony		0.068	0 0 2 0
Arsenic		0.049	0.030
Cadmium		0.007	0.002
Chromium		0.013	0.003
Copper		0.045	0.005
*Cyanide		0.007	0.021
*Lead		0.010	0.003
Nickel			0.005
Selenium		0.029	0.013
Silver	н ⁴	0 010	0.013
Thallium		0.049	0.004
Zinc		0.036	0.021
Aluminum	· -	0.214	0.015
Barium		0.040	0.095
Boron			0.018
*Fluoride		1 225	0.029
Iron		1.225	0.697
Manganese	. · · · · ·		0.021
*Tin		0.011	0.008
		0.013	0.008

PSNS FOR THE SECONDARY TIN SUBCATEGORY

(c) Tin Mud Acid Neutralization Filtrate PSNS

Pollutant	or	Maximum for	Maximum for
pollutant	property	any one day	monthly average
<u></u>	mg/kg	(lb/million lbs) of dewatered tin mud p	neutralized, produced
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Fluoride Iron		9.741 7.015 1.009 1.867 6.460 1.009 1.413 2.776 4.139 1.464 7.066 5.148 30.840 5.804 9.286 176.600 6.056	$\begin{array}{r} 4.340\\ 3.129\\ 0.404\\ 0.757\\ 3.079\\ 0.404\\ 0.656\\ 1.867\\ 1.867\\ 0.606\\ 3.079\\ 2.120\\ 13.680\\ 2.574\\ 4.239\\ 100.400\\ 3.079\\ 1.167\end{array}$
Manganes *Tin	e	1.514 1.918	1.110

PSNS FOR THE SECONDARY TIN SUBCATEGORY

(d) <u>Tin</u> <u>Hydroxide</u> <u>Wash</u> PSNS

Pollutant	or		Max	imum for	-	Marrian
pollutant	prope	erty	any	one day	- 7	monthly average
r	ng/kg	(lb/mi)	llion	lbs) of	tin	hydroxide washed
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Fluoride Iron Manganese *Tin				$\begin{array}{c} 23.070\\ 16.610\\ 2.391\\ 4.423\\ 15.300\\ 2.391\\ 3.347\\ 6.574\\ 9.801\\ 3.466\\ 16.730\\ 12.190\\ 73.030\\ 13.750\\ 21.990\\ 418.400\\ 14.340\\ 3.586\\ 4.542\end{array}$		$10.280 \\7.411 \\0.956 \\1.793 \\7.291 \\0.956 \\1.554 \\4.423 \\4.423 \\4.423 \\1.434 \\7.291 \\5.020 \\32.390 \\6.096 \\10.040 \\237.900 \\7.291 \\2.749 \\2.630 \\$

PSNS FOR THE SECONDARY TIN SUBCATEGORY

(e) Spent Electrowinning Solution from New Scrap PSNS

Dollutant	or		Max	imum	for	Maxi	.mum	tor	
pollutant	prope	erty	any	one	day	mont	hly	average	
. 1	ng/kg	(lb/mi	llion	lbs) of	cathode	tin	produced	
Antimony Arsenic Cadmium Chromium Copper *Cyanide *Lead Nickel Selenium Silver Thallium Zinc Aluminum Barium Boron *Fluoride Iron				32 23 3 6 21 3 4 9 13 4 23 17 102 19 30 588 20	.420 .350 .216 .500 .360 .704 .240 .780 .872 .520 .140 .600 .320 .910 .000 .160			14.450 10.420 1.344 2.520 10.250 1.344 2.184 6.216 6.216 2.016 10.250 7.056 45.530 8.568 14.110 334.300 10.250 3.864	
Manganes *Tin	е			6	.384			3.696	

PSNS FOR THE SECONDARY TIN SUBCATEGORY

Pollutant	or	Maximum for	Maximum for
pollutant	property	any one day	monthly average
	mg/kg	(lb/million lbs)	of MSW scrap
	-	used as a raw ma	terial
Antimony	· · · · ·	0 220	0 100
Arconia		0.230	0.102
Codmium		0.165	0.074
		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	
Thallium		0 167	0.014
Zinc		0,107	0.073
Aluminum			0.050
Dorium		0.727	0.322
Dartum		0.13/	0.061
Boron		0.219	0.100
*Fluoride		4.165	2.368
Iron	•	0.143	0.073
Manganese	1	0.036	0.027
*Tin		0.045	0.026

(f) <u>Spent ELectrowinning Solutions from</u> <u>Municipal Solid Waste PSNS</u>

PSNS FOR THE SECONDARY TIN SUBCATEGORY

(g) <u>Tin</u> <u>Hydroxide</u> <u>Supernatant</u> from <u>Scrap</u> PSNS

Pollutant	or	Maximum	for M	Maximum	for
pollutant	property	any one	day r	nonthly	average
	mg/kg	(lb/millio recovered	n lbs) of from sci	f tin me rap	etal
				-	
Antimony		107.	400		47 .8 50
Arsenic		77.	340		34.500
Cadmium		11.	130		4.451
Chromium		20.	590		8.346
Copper		71.	220		33.940
*Cvanide		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
Manganes	е	16.	690		12.800
*Tin		21.	140		12.240

Table XII-5 (Continued)

PSNS FOR THE SECONDARY TIN SUBCATEGORY

PSNS Secondary Tin (h) <u>Tin Hydroxide</u> <u>Supernatant from Plating</u> <u>Solutions and Sludges</u> PSNS

Pollutant	or	Maximum	for	Maximum	for
pollutant	property	any one	day	monthly	average
<u> </u>	mg/kg	(lb/millic	n lbs)	of tin me	+=1
	recovered	from platin	ng solut	ions 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	1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	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
•111n		43.	700		25.300

PSNS FOR THE SECONDARY TIN SUBCATEGORY

(i) <u>Tin Hydroxide</u> Filtrate PSNS

Pollutant	or	Maximum for	Maximum for	
pollutant	property	any one day	monthly average	
	mg/kg (lb/m	illion 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	
*Cuanide		5.009	2.004	
*Load		7.012	3.256	
Nickol		13.770	9.266	
Colonium		20.540	9.266	
Gilvor		7.263	3.005	
Ditver		35.060	15.280	
Thattum		25.540	10.520	
Allic		153,000	67.870	
Aruminum		28,800	12.770	
Barium		46 080	21.040	
BOLOU		876 500	498.400	
*Fluoride		30 050	15.280	
Iron	-	7 513	5.760	
Manganes *Tin	e	9.517	5.510	

SECONDARY TIN SUBCATEGORY SECT - XIII

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.