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Development Document for Effluent Limitations Guidelines and Standards for the

Proposed

Nonferrous Metals

Point Source Category

Phase II

Supplemental Development
Document For:

Primary and Secondary Titanium

DEVELOPMENT DOCUMENT

for

EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS

for the

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY

PHASE II

Primary and Secondary Titanium Supplement

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PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

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PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

SECTION I

SUMMARY AND CONCLUSIONS

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

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

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

- Chlorination off-gas wet air pollution control,
- Chlorination area-vent wet air pollution control,
- $TiCl_4$ handling wet air pollution control,
- Reduction area wet air pollution control,
- Melt cell wet air pollution control,
- Cathode gas wet air pollution control,
- Chlorine liquefaction wet air pollution control,
- Sodium reduction container reconditioning wash water,
- Chip crushing wet air pollution control,
- Acid leachate and rinse water,
- Sponge crushing and screening wet air pollution control,

* Acid pickle and wash water,
* Scrap milling wet air pollution control,
* Scrap detergent wash water,
* Casting crucible wash water, and
* Casting contact cooling water.

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

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

After examining the various treatment technologies, the Agency has identified BPT to represent the average of the best existing technology. The technology basis for the BPT limitations is chemical precipitation and sedimentation technology to remove metals and solids from combined wastewaters and to control pH, and oil skimming preliminary treatment for streams with treatable concentrations of oil and grease. EPA is proposing a two tier regulatory scheme for this subcategory; however, the same technologies apply to both tiers at BPT. To meet the BPT effluent limitations based on this technology, the primary and secondary titanium subcategory is expected to incur an estimated capital cost of $989,000 and an annual cost of $588,000.

EPA is proposing Level A BAT limitations for titanium plants which do not practice electrolytic recovery of magnesium and which use vacuum distillation instead of leaching to purify titanium sponge as the final product based on chemical precipitation, sedimentation, and oil skimming (BPT technology) plus in-process wastewater flow reduction. Level B BAT limitations are proposed for all other titanium plants based on chemical precipitation, sedimentation, and oil skimming pretreatment where required, (BAT technology) plus flow reduction, and filtration. The Agency considered applying the same technology levels to this entire subcategory but decided to propose this two tiered regulatory scheme because there was little additional pollutant removal from the Level A wastewater streams when treated by the added Level B technology.

There are currently no direct discharging Level A plants in this subcategory. It is estimated that if the four existing direct discharging Level B plants in this subcategory became Level A dischargers they would incur a capital cost of approximately $641,000 and an annualized cost of $325,000. The proposed Level B BAT limitations would incur an estimated capital cost of $1,030,000, and an annualized cost of $585,000.

NSPS is equivalent to BAT with additional flow reduction based on dry scrubbing and by-product recovery. 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 with additional flow reduction based on dry scrubbing and by-product recovery has been determined as the best demonstrated technology.

The technology basis for PSES is equivalent to BAT. To meet the pretreatment standards for existing sources, the primary and secondary titanium subcategory is estimated to incur a capital and an annual cost. These compliance costs are not presented here because the data on which they are based have been claimed to be confidential. For PSNS, the Agency selected end-of-pipe treatment and in-process flow reduction control techniques equivalent to NSPS.

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

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

PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

SECTION II

RECOMMENDATIONS

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

(a) Chlorination off-gas wet air pollution control,
(b) Chlorination area-vent wet air pollution control,
(c) $TiCl_4$ handling wet air pollution control,
(d) Reduction area wet air pollution control,
(e) Melt cell wet air pollution control,
(f) Cathode gas wet air pollution control,
(g) Chlorine liquefaction wet air pollution control,
(h) Sodium reduction container reconditioning wash water,
(i) Chip crushing wet air pollution control,
(j) Acid leachate and rinse water,
(h) Sponge crushing and screening wet air pollution control,
(l) Acid pickle and wash water,
(m) Scrap milling wet air pollution control,
(n) Scrap detergent wash water,
(o) Casting crucible wash water, and
(p) Casting contact cooling water.

2. BPT is proposed based on the performance achievable by the application of oil skimming pretreatment for removal of oil and grease, followed by chemical precipitation and sedimentation (lime and settle) technology. EPA is proposing a two tier regulatory scheme for this subcategory; however, the same technologies apply to both tiers at BPT. Thus, the following BPT limitations are proposed:

A. Level A

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(a) Chlorination Off-Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.412	0.169
Lead	0.393	0.187
Nickel	1.797	1.189
Thallium	1.919	0.852
Fluoride	32.760	18.720
Titanium	0.412	0.168
Oil and Grease	18.720	11.230
Total suspended solids	38.380	18.250
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(b) Chlorination Area-Vent Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.458	0.187
Lead	0.437	0.208
Nickel	1.997	1.321
Thallium	2.132	0.946
Fluoride	36.400	20.800
Titanium	0.458	0.187
Oil and Grease	20.800	12.480
Total suspended solids	42.640	20.280
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(c) $TiCl_4$ Handling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ handled		
Chromium (total)	0.082	0.034
Lead	0.079	0.037
Nickel	0.359	0.238
Thallium	0.383	0.170
Fluoride	6.545	3.740
Titanium	0.082	0.034
Oil and Grease	3.740	2.244
Total suspended solids	7.667	3.647
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(d) Sponge Crushing and Screening Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	2.847	1.165
Lead	2.718	1.294
Nickel	12.420	8.217
Thallium	13.260	5.888
Fluoride	226.500	129.400
Titanium	2.847	1.165
Oil and Grease	129.400	77.640
Total suspended solids	265.300	126.200
pH	Within the range of 7.5 to 10.0 at all times	

B. Level B

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(a) Chlorination Off-Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.412	0.169
Lead	0.393	0.187
Nickel	1.797	1.189
Thallium	1.919	0.852
Fluoride	32.760	18.720
Titanium	0.412	0.168
Oil and Grease	18.720	11.230
Total suspended solids	38.380	18.250
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(b) Chlorination Area-Vent Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.458	0.187
Lead	0.437	0.208
Nickel	1.997	1.321
Thallium	2.132	0.946
Fluoride	36.400	20.800
Titanium	0.458	0.187
Oil and Grease	20.800	12.480
Total suspended solids	42.640	20.280
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(c) $TiCl_4$ Handling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ handled		
Chromium (total)	0.082	0.034
Lead	0.079	0.037
Nickel	0.359	0.238
Thallium	0.383	0.170
Fluoride	6.545	3.740
Titanium	0.082	0.034
Oil and Grease	3.740	2.244
Total suspended solids	7.667	3.647
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(d) Reduction Area Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	18.180	7.435
Lead	17.350	8.261
Nickel	79.300	52.460
Thallium	84.670	37.590
Fluoride	1,446.000	826.100
Titanium	18.170	7.435
Oil and Grease	826.100	495.700
Total suspended solids	1,694.000	805.400
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(e) Melt Cell Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	9.352	3.826
Lead	8.927	4.251
Nickel	40.810	26.990
Thallium	43.570	19.340
Fluoride	743.900	425.100
Titanium	9.352	3.826
Oil and Grease	425.100	255.100
Total suspended solids	871.400	414.500
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(f) Cathode Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	2.705	1.107
Lead	2.582	1.230
Nickel	11.800	7.807
Thallium	12.600	5.594
Fluoride	215.200	123.000
Titanium	2.705	1.106
Oil and Grease	123.000	73.770
Total suspended solids	252.000	119.900
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(g) Chlorine Liquefaction Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	130.900	53.560
Lead	125.000	59.510
Nickel	571.300	377.900
Thallium	610.000	270.800
Fluoride	10,420.000	5,951.000
Titanium	130.900	53.560
Oil and Grease	5,951.000	3,571.000
Total suspended solids	12,200.000	5,803.000
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(h) Sodium Reduction Container Reconditioning Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.564	0.231
Lead	0.539	0.256
Nickel	2.462	1.628
Thallium	2.628	1.167
Fluoride	44.870	25.640
Titanium	0.564	0.231
Oil and Grease	25.640	15.390
Total suspended solids	52.560	25.000
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(i) Chip Crushing Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	10.090	4.126
Lead	9.627	4.584
Nickel	44.010	29.110
Thallium	46.990	20.860
Fluoride	802.300	458.400
Titanium	10.090	4.126
Oil and Grease	458.400	275.100
Total suspended solids	939.800	447.000
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(j) Acid Leachate and Rinse Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	5.210	2.131
Lead	4.973	2.368
Nickel	22.730	15.040
Thallium	24.270	10.770
Fluoride	414.400	236.800
Titanium	5.210	2.131
Oil and Grease	236.800	142.100
Total suspended solids	485.500	230.900
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(k) Sponge Crushing and Screening Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	2.847	1.165
Lead	2.718	1.294
Nickel	12.420	8.217
Thallium	13.260	5.888
Fluoride	226.500	129.400
Titanium	2.847	1.165
Oil and Grease	129.400	77.640
Total suspended solids	265.300	126.200
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(l) Acid Pickle and Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium pickled		
Chromium (total)	0.027	0.011
Lead	0.026	0.012
Nickel	0.117	0.077
Thallium	0.125	0.056
Fluoride	2.135	1.220
Titanium	0.027	0.011
Oil and Grease	1.220	0.732
Total suspended solids	2.501	1.190
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(m) Scrap Milling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of scrap milled		
Chromium (total)	0.995	0.407
Lead	0.950	0.452
Nickel	4.341	2.871
Thallium	4.635	2.058
Fluoride	79.140	45.220
Titanium	0.995	0.407
Oil and Grease	45.220	27.130
Total suspended solids	92.700	44.090
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(n) Scrap Detergent Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of scrap washed		
Chromium (total)	7.948	3.252
Lead	7.587	3.613
Nickel	34.680	22.940
Thallium	37.030	16.440
Fluoride	632.300	361.300
Titanium	7.948	3.251
Oil and Grease	361.300	216.800
Total suspended solids	740.600	352.300
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(o) Casting Crucible Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium cast		
Chromium (total)	0.210	0.086
Lead	0.200	0.095
Nickel	0.916	0.606
Thallium	0.978	0.434
Fluoride	16.700	9.540
Titanium	0.210	0.086
Oil and Grease	9.540	5.724
Total suspended solids	19.560	9.302
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(p) Casting Contact Cooling Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium cast		
Chromium (total)	321.100	131.400
Lead	306.500	146.000
Nickel	1,401.000	926.800
Thallium	1,496.000	664.100
Fluoride	25,540.000	14,600.000
Titanium	321.900	131.400
Oil and Grease	14,600.000	8,757.000
Total suspended solids	29,920.000	14,230.000
pH	Within the range of 7.5 to 10.0 at all times	

3. EPA is proposing Level A BAT limitations for titanium plants which do not practice electrolytic recovery of magnesium and which use vacuum distillation instead of leaching to purify titanium sponge as the final product based on oil skimming pretreatment for removal of oil and grease, followed by chemical precipitation and sedimentation (lime and settle) technology, plus in-process wastewater flow reduction. Level B BAT limitations are proposed for all other titanium plants based on oil skimming pretreatment, followed by

chemical precipitation and sedimentation (lime and settle) technology, plus flow reduction and multimedia filtration. The following BAT effluent limitations are proposed:

A. Level A

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(a) Chlorination Off-Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.412	0.169
Lead	0.393	0.187
Nickel	1.797	1.189
Thallium	1.919	0.852
Fluoride	32.760	18.720
Titanium	0.412	0.168

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(b) Chlorination Area-Vent Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.458	0.187
Lead	0.437	0.208
Nickel	1.997	1.321
Thallium	2.132	0.946
Fluoride	36.400	20.800
Titanium	0.458	0.187

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(c) $TiCl_4$ Handling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ handled		
Chromium (total)	0.082	0.034
Lead	0.079	0.037
Nickel	0.359	0.237
Thallium	0.383	0.170
Fluoride	6.545	3.740
Titanium	0.082	0.034

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(d) Sponge Crushing and Screening Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.285	0.116
Lead	0.272	0.129
Nickel	1.242	0.822
Thallium	1.326	0.589
Fluoride	22.650	12.940
Titanium	0.285	0.116

B. Level B

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(a) Chlorination Off-Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.346	0.140
Lead	0.262	0.122
Nickel	0.515	0.346
Thallium	1.310	0.571
Fluoride	32.760	18.720
Titanium	0.346	0.140

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(b) Chlorination Area-Vent Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.385	0.156
Lead	0.291	0.135
Nickel	0.572	0.385
Thallium	1.456	0.634
Fluoride	36.400	20.800
Titanium	0.385	0.156

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(c) *$TiCl_4$ Handling* Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ handled		
Chromium (total)	0.069	0.028
Lead	0.052	0.024
Nickel	0.103	0.069
Thallium	0.262	0.114
Fluoride	6.545	3.740
Titanium	0.069	0.028

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(d) Reduction Area Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	1.528	0.620
Lead	1.157	0.537
Nickel	2.272	1.528
Thallium	5.782	2.519
Fluoride	144.600	82.600
Titanium	1.528	0.620

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(e) Melt Cell Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.787	0.319
Lead	0.595	0.276
Nickel	1.170	0.787
Thallium	2.976	1.297
Fluoride	74.410	42.520
Titanium	0.787	0.319

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(f) Cathode Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.228	0.092
Lead	0.172	0.080
Nickel	0.338	0.228
Thallium	0.861	0.375
Fluoride	21.530	12.300
Titanium	0.228	0.092

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(g) Chlorine Liquefaction Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	11.010	4.464
Lead	8.332	3.868
Nickel	16.370	11.010
Thallium	41.660	18.150
Fluoride	1,042.000	595.100
Titanium	11.010	4.463

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(h) Sodium Reduction Container Reconditioning Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.474	0.192
Lead	0.359	0.167
Nickel	0.705	0.474
Thallium	1.795	0.782
Fluoride	44.870	25.640
Titanium	0.474	0.192

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(i) Chip Crushing Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.848	0.344
Lead	0.642	0.298
Nickel	1.261	0.848
Thallium	3.209	1.398
Fluoride	80.220	45.840
Titanium	0.848	0.344

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(j) Acid Leachate and Rinse Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	4.381	1.776
Lead	3.315	1.539
Nickel	6.512	4.381
Thallium	16.580	7.222
Fluoride	414.400	236.800
Titanium	4.381	1.776

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(k) Sponge Crushing and Screening Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.239	0.097
Lead	0.181	0.084
Nickel	0.356	0.239
Thallium	0.906	0.365
Fluoride	22.650	12.940
Titanium	0.239	0.097

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(l) Acid Pickle and Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium pickled		
Chromium (total)	0.023	0.009
Lead	0.017	0.008
Nickel	0.034	0.023
Thallium	0.085	0.037
Fluoride	2.135	1.220
Titanium	0.023	0.009

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(m) Scrap Milling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of scrap milled		
Chromium (total)	0.084	0.034
Lead	0.064	0.030
Nickel	0.125	0.084
Thallium	0.318	0.138
Fluoride	7.945	4.540
Titanium	0.084	0.034

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(n) Scrap Detergent Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of scrap washed		
Chromium (total)	6.684	2.710
Lead	5.058	2.349
Nickel	9.935	6.684
Thallium	25.290	11.020
Fluoride	632.300	361.300
Titanium	6.684	2.710

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(o) Casting Crucible Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium cast		
Chromium (total)	0.177	0.072
Lead	0.134	0.062
Nickel	0.262	0.177
Thallium	0.668	0.291
Fluoride	16.700	9.540
Titanium	0.176	0.067

BAT LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(p) Casting Contact Cooling Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium cast		
Chromium (total)	27.000	10.950
Lead	20.430	9.487
Nickel	40.140	27.000
Thallium	102.200	44.510
Fluoride	2,554.000	1,460.000
Titanium	8.500	3.446

4. EPA is proposing Level A NSPS for titanium plants which do not practice electrolytic recovery of magnesium and which use vacuum distillation instead of leaching to purify titanium sponge as the final product based on oil skimming pretreatment for removal of oil and grease, followed by chemical precipitation and sedimentation (lime and settle) technology, plus in-process wastewater flow reduction beyond that proposed for Level A BAT based on dry scrubbing and by-product recovery. Level B NSPS are proposed for all other titanium plants based on oil skimming pretreatment, followed by chemical precipitation and sedimentation (lime and settle) technology, plus flow reduction, including zero discharge for four streams based on dry scrubbing and by-product recovery, and multimedia filtration at the end of the treatment scheme. The following effluent standards are proposed for new sources:

A. Level A

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(a) Chlorination Off-Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.412	0.169
Lead	0.393	0.187
Nickel	1.797	1.189
Thallium	1.919	0.852
Fluoride	32.760	18.720
Titanium	0.412	0.168
Total suspended solids	38.380	18.250
Oil and Grease	18.720	11.230
ph	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(b) Chlorination Area-Vent Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.458	0.187
Lead	0.437	0.208
Nickel	1.997	1.321
Thallium	2.132	0.946
Fluoride	36.400	20.800
Titanium	0.458	0.187
Total suspended solids	42.640	20.280
Oil and Grease	20.800	12.280
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(c) $TiCl_4$ Handling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ handled		
Chromium (total)	0.082	0.034
Lead	0.079	0.037
Nickel	0.359	0.237
Thallium	0.383	0.170
Fluoride	6.545	3.740
Titanium	0.082	0.034
Total suspended solids	7.667	3.647
Oil and Grease	3.740	2.244
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(d) Sponge Crushing and Screening Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.000	0.000
Lead	0.000	0.000
Nickel	0.000	0.000
Thallium	0.000	0.000
Fluoride	0.000	0.000
Titanium	0.000	0.000
Total suspended solids	0.000	0.000
Oil and Grease	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

B. Level B

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(a) Chlorination Off-Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.346	0.140
Lead	0.262	0.122
Nickel	0.515	0.346
Thallium	1.310	0.571
Fluoride	32.760	18.720
Titanium	0.346	0.140
Oil and Grease	9.360	9.360
Total suspended solids	14.040	11.230
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(b) Chlorination Area-Vent Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.385	0.156
Lead	0.291	0.135
Nickel	0.572	0.385
Thallium	1.456	0.634
Fluoride	36.400	20.800
Titanium	0.385	0.156
Oil and Grease	10.400	10.400
Total suspended solids	15.600	12.480
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(c) $TiCl_4$ Handling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ handled		
Chromium (total)	0.069	0.028
Lead	0.052	0.024
Nickel	0.103	0.069
Thallium	0.262	0.114
Fluoride	6.545	3.740
Titanium	0.069	0.028
Oil and Grease	1.870	1.870
Total suspended solids	2.805	2.244
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(d) Reduction Area Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	1.528	0.620
Lead	1.157	0.537
Nickel	2.272	1.528
Thallium	5.782	2.519
Fluoride	144.600	82.600
Titanium	1.528	0.620
Oil and Grease	41.300	41.300
Total suspended solids	61.950	49.560
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(e) Melt Cell Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.787	0.319
Lead	0.595	0.276
Nickel	1.170	0.787
Thallium	2.976	1.297
Fluoride	74.410	42.520
Titanium	0.787	0.319
Oil and Grease	21.260	21.260
Total suspended solids	31.890	25.510
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(f) Cathode Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.228	0.092
Lead	0.172	0.080
Nickel	0.338	0.228
Thallium	0.861	0.375
Fluoride	21.530	12.300
Titanium	0.228	0.092
Oil and Grease	6.150	6.150
Total suspended solids	9.225	7.380
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(g) Chlorine Liquefaction Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.000	0.000
Lead	0.000	0.000
Nickel	0.000	0.000
Thallium	0.000	0.000
Fluoride	0.000	0.000
Titanium	0.000	0.000
Oil and Grease	0.000	0.000
Total suspended solids	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(h) Sodium Reduction Container Reconditioning Wash

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.474	0.192
Lead	0.359	0.167
Nickel	0.705	0.474
Thallium	1.795	0.782
Fluoride	44.870	25.640
Titanium	0.474	0.192
Oil and Grease	12.820	12.820
Total suspended solids	19.230	15.390
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(i) Chip Crushing Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.000	0.000
Lead	0.000	0.000
Nickel	0.000	0.000
Thallium	0.000	0.000
Fluoride	0.000	0.000
Titanium	0.000	0.000
Oil and Grease	0.000	0.000
Total suspended solids	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(j) Acid Leachate and Rinse Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	4.381	1.776
Lead	3.315	1.539
Nickel	6.512	4.381
Thallium	16.580	7.222
Fluoride	414.400	236.800
Titanium	4.381	1.776
Oil and Grease	118.400	118.400
Total suspended solids	177.600	142.100
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(k) Sponge Crushing and Screening Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.000	0.000
Lead	0.000	0.000
Nickel	0.000	0.000
Thallium	0.000	0.000
Fluoride	0.000	0.000
Titanium	0.000	0.000
Oil and Grease	0.000	0.000
Total suspended solids	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(l) Acid Pickle and Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium pickled		
Chromium (total)	0.023	0.009
Lead	0.017	0.008
Nickel	0.034	0.023
Thallium	0.085	0.037
Fluoride	2.135	1.220
Titanium	0.023	0.009
Oil and Grease	0.610	0.610
Total suspended solids	0.915	0.732
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(m) Scrap Milling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of scrap milled		
Chromium (total)	0.000	0.000
Lead	0.000	0.000
Nickel	0.000	0.000
Thallium	0.000	0.000
Fluoride	0.000	0.000
Titanium	0.000	0.000
Oil and Grease	0.000	0.000
Total suspended solids	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(n) Scrap Detergent Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of scrap washed		
Chromium (total)	6.684	2.710
Lead	5.058	2.349
Nickel	9.935	6.684
Thallium	25.290	11.020
Fluoride	632.300	361.300
Titanium	6.684	2.710
Oil and Grease	180.700	180.700
Total suspended solids	271.000	216.800
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(o) Casting Crucible Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium cast		
Chromium (total)	0.177	0.072
Lead	0.134	0.062
Nickel	0.262	0.177
Thallium	0.668	0.291
Fluoride	16.700	9.540
Titanium	0.176	0.067
Oil and Grease	4.770	4.770
Total suspended solids	7.155	5.724
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(p) Casting Contact Cooling Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium cast		
Chromium (total)	27.000	10.950
Lead	20.430	9.487
Nickel	40.140	27.000
Thallium	102.200	44.510
Fluoride	2,554.000	1,460.000
Titanium	8.500	3.446
Oil and Grease	729.800	729.800
Total suspended solids	1,095.000	875.700
pH	Within the range of 7.5 to 10.0 at all times	

5. EPA is proposing Level A PSES for titanium plants which do not practice electrolytic recovery of magnesium and which use vacuum distillation instead of leaching to purify titanium sponge as the final product based on oil skimming pretreatment for removal of oil and grease, followed by chemical precipitation and sedimentation (lime and settle) technology, plus in-process wastewater flow reduction. Level B PSES are proposed for all other titanium plants based on oil skimming pretreatment, followed by chemical precipitation and sedimentation (lime and settle) technology, plus flow reduction and multimedia filtration. The following pretreatment standards are proposed for existing sources:

A. Level A

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(a) Chlorination Off-Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.412	0.169
Lead	0.393	0.187
Nickel	1.797	1.189
Thallium	1.919	0.852
Fluoride	32.760	18.720
Titanium	0.412	0.168

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(b) Chlorination Area-Vent Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.458	0.187
Lead	0.437	0.208
Nickel	1.997	1.321
Thallium	2.132	0.946
Fluoride	36.400	20.800
Titanium	0.458	0.187

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(c) $TiCl_4$ Handling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ handled		
Chromium (total)	0.082	0.034
Lead	0.079	0.037
Nickel	0.359	0.237
Thallium	0.383	0.170
Fluoride	6.545	3.740
Titanium	0.082	0.034

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(d) Sponge Crushing and Screening Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.285	0.116
Lead	0.272	0.129
Nickel	1.242	0.822
Thallium	1.326	0.589
Fluoride	22.650	12.940
Titanium	0.285	0.116

B. Level B

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(a) Chlorination Off-Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.346	0.140
Lead	0.262	0.122
Nickel	0.515	0.346
Thallium	1.310	0.571
Fluoride	32.760	18.720
Titanium	0.346	0.140

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(b) Chlorination Area-Vent Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.385	0.156
Lead	0.291	0.135
Nickel	0.572	0.385
Thallium	1.456	0.634
Fluoride	36.400	20.800
Titanium	0.385	0.156

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(c) $TiCl_4$ Handling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ handled		
Chromium (total)	0.069	0.028
Lead	0.052	0.024
Nickel	0.103	0.069
Thallium	0.262	0.114
Fluoride	6.545	3.740
Titanium	0.069	0.028

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(d) Reduction Area Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	1.528	0.620
Lead	1.157	0.537
Nickel	2.272	1.528
Thallium	5.782	2.519
Fluoride	144.600	82.600
Titanium	1.528	0.620

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(e) Melt Cell Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.787	0.319
Lead	0.595	0.276
Nickel	1.170	0.787
Thallium	2.976	1.297
Fluoride	74.410	42.520
Titanium	0.787	0.319

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(f) Cathode Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.228	0.092
Lead	0.172	0.080
Nickel	0.338	0.228
Thallium	0.861	0.375
Fluoride	21.530	12.300
Titanium	0.228	0.092

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(g) Chlorine Liquefaction Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	11.010	4.464
Lead	8.332	3.868
Nickel	16.370	11.010
Thallium	41.660	18.150
Fluoride	1,042.000	595.100
Titanium	11.010	4.463

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(h) Sodium Reduction Container Reconditioning Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.474	0.192
Lead	0.359	0.167
Nickel	0.705	0.474
Thallium	1.795	0.782
Fluoride	44.870	25.640
Titanium	0.474	0.192

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(i) Chip Crushing Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.848	0.344
Lead	0.642	0.298
Nickel	1.261	0.848
Thallium	3.209	1.398
Fluoride	80.220	45.840
Titanium	0.848	0.344

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(j) Acid Leachate and Rinse Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	4.381	1.776
Lead	3.315	1.539
Nickel	6.512	4.381
Thallium	16.580	7.222
Fluoride	414.400	236.800
Titanium	4.381	1.776

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(k) Sponge Crushing and Screening Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.239	0.097
Lead	0.181	0.084
Nickel	0.356	0.239
Thallium	0.906	0.395
Fluoride	22.650	12.940
Titanium	0.239	0.097

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(l) Acid Pickle and Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium pickled		
Chromium (total)	0.023	0.009
Lead	0.017	0.008
Nickel	0.034	0.023
Thallium	0.085	0.037
Fluoride	2.135	1.220
Titanium	0.023	0.009

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(m) Scrap Milling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of scrap milled		
Chromium (total)	0.084	0.034
Lead	0.064	0.030
Nickel	0.125	0.084
Thallium	0.318	0.138
Fluoride	7.945	4.540
Titanium	0.084	0.034

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(n) Scrap Detergent Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of scrap washed		
Chromium (total)	6.684	2.710
Lead	5.058	2.349
Nickel	9.935	6.684
Thallium	25.290	11.020
Fluoride	632.300	361.300
Titanium	6.684	2.710

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(o) Casting Crucible Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium cast		
Chromium (total)	0.177	0.072
Lead	0.134	0.062
Nickel	0.262	0.177
Thallium	0.668	0.291
Fluoride	16.700	9.540
Titanium	0.176	0.067

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(p) Casting Contact Cooling Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium cast		
Chromium (total)	27.000	10.950
Lead	20.430	9.487
Nickel	40.140	27.000
Thallium	102.200	44.510
Fluoride	2,554.000	1,460.000
Titanium	8.500	3.446

6. EPA is proposing Level A PSNS for titanium plants which do not practice electrolytic recovery of magnesium and which use vacuum distillation instead of leaching to purify titanium sponge as the final product based on oil skimming pretreatment for removal of oil and grease, followed by chemical precipitation and sedimentation (lime and settle) technology, plus in-process wastewater flow reduction beyond that proposed for Level A BAT based on dry scrubbing and by-product recovery. Level B PSNS are proposed for all other titanium plants based on oil skimming pretreatment, followed by chemical precipitation and sedimentation (lime and settle) technology, plus flow reduction, including zero discharge for four streams based on dry scrubbing and by-product recovery, and multimedia filtration at the end of the treatment scheme. The following pretreatment standards are proposed for new sources:

A. Level A

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(a) Chlorination Off-Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.412	0.169
Lead	0.393	0.187
Nickel	1.797	1.189
Thallium	1.919	0.852
Fluoride	32.760	18.720
Titanium	0.412	0.168

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(b) Chlorination Area-Vent Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.458	0.187
Lead	0.437	0.208
Nickel	1.997	1.321
Thallium	2.132	0.946
Fluoride	36.400	20.800
Titanium	0.458	0.187

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(c) $TiCl_4$ Handling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ handled		
Chromium (total)	0.082	0.034
Lead	0.079	0.037
Nickel	0.359	0.237
Thallium	0.383	0.170
Fluoride	6.545	3.740
Titanium	0.082	0.034

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(d) Sponge Crushing and Screening Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.000	0.000
Lead	0.000	0.000
Nickel	0.000	0.000
Thallium	0.000	0.000
Fluoride	0.000	0.000
Titanium	0.000	0.000

B. Level B

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(a) Chlorination Off-Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.346	0.140
Lead	0.262	0.122
Nickel	0.515	0.346
Thallium	1.310	0.571
Fluoride	32.760	18.720
Titanium	0.346	0.140

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(b) Chlorination Area-Vent Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.385	0.156
Lead	0.291	0.135
Nickel	0.572	0.385
Thallium	1.456	0.634
Fluoride	36.400	20.800
Titanium	0.385	0.156

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(c) $TiCl_4$ Handling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ handled		
Chromium (total)	0.069	0.028
Lead	0.052	0.024
Nickel	0.103	0.069
Thallium	0.262	0.114
Fluoride	6.545	3.740
Titanium	0.069	0.028

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(d) Reduction Area Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	1.528	0.620
Lead	1.157	0.537
Nickel	2.272	1.528
Thallium	5.782	2.519
Fluoride	144.600	82.600
Titanium	1.528	0.620

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(e) Melt Cell Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.787	0.319
Lead	0.595	0.276
Nickel	1.170	0.787
Thallium	2.976	1.297
Fluoride	74.410	42.520
Titanium	0.787	0.319

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(f) Cathode Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.228	0.092
Lead	0.172	0.080
Nickel	0.338	0.228
Thallium	0.861	0.375
Fluoride	21.530	12.300
Titanium	0.228	0.092

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(g) Chlorine Liquefaction Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.000	0.000
Lead	0.000	0.000
Nickel	0.000	0.000
Thallium	0.000	0.000
Fluoride	0.000	0.000
Titanium	0.000	0.000

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(h) Sodium Reduction Container Reconditioning Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.474	0.192
Lead	0.359	0.167
Nickel	0.705	0.474
Thallium	1.795	0.782
Fluoride	44.870	25.640
Titanium	0.474	0.192

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(i) Chip Crushing Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.000	0.000
Lead	0.000	0.000
Nickel	0.000	0.000
Thallium	0.000	0.000
Fluoride	0.000	0.000
Titanium	0.000	0.000

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(j) Acid Leachate and Rinse Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	4.381	1.776
Lead	3.315	1.539
Nickel	6.512	4.381
Thallium	16.580	7.222
Fluoride	414.400	236.800
Titanium	4.381	1.776

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(k) Sponge Crushing and Screening Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.000	0.000
Lead	0.000	0.000
Nickel	0.000	0.000
Thallium	0.000	0.000
Fluoride	0.000	0.000
Titanium	0.000	0.000

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(l) Acid Pickle and Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium pickled		
Chromium (total)	0.023	0.009
Lead	0.017	0.008
Nickel	0.034	0.023
Thallium	0.085	0.037
Fluoride	2.135	1.220
Titanium	0.023	0.009

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(m) Scrap Milling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of scrap milled		
Chromium (total)	0.000	0.000
Lead	0.000	0.000
Nickel	0.000	0.000
Thallium	0.000	0.000
Fluoride	0.000	0.000
Titanium	0.000	0.000

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(n) Scrap Detergent Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of scrap washed		
Chromium (total)	6.684	2.710
Lead	5.058	2.349
Nickel	9.935	6.684
Thallium	25.290	11.020
Fluoride	632.300	361.300
Titanium	6.684	2.710

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(o) Casting Crucible Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium cast		
Chromium (total)	0.177	0.072
Lead	0.134	0.062
Nickel	0.262	0.177
Thallium	0.668	0.291
Fluoride	16.700	9.540
Titanium	0.176	0.067

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(p) Casting Contact Cooling Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium cast		
Chromium (total)	27.000	10.950
Lead	20.430	9.487
Nickel	40.140	27.000
Thallium	102.200	44.510
Fluoride	2,554.000	1,460.000
Titanium	8.500	3.446

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

PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

SECTION III

INDUSTRY PROFILE

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

The largest use of titanium is for compressor blades, rotors, and other parts for aircraft gas turbine engines. The second largest use is in airframe structures of both military and commercial aircraft. The most rapid growth in titanium use has been for industrial uses, such as heat exchangers and chemical industry equipment, where the metal's superior resistance to heat and corrosion is required.

DESCRIPTION OF TITANIUM PRODUCTION

The production processes used at titanium manufacturing plants depend largely on the raw materials used and the final products produced. Four major operations may be performed:

1. Chlorination of rutile ore,
2. Reduction to titanium sponge,
3. Titanium sponge purification, and
4. Casting and secondary titanium processing.

Some plants perform all four operations. Other plants begin with titanium tetrachloride and perform only the last three. Also, some plants sell the titanium sponge product without continuing to the casting operation. One plant carburizes rutile ore in a dry process to produce titanium carbide. Production processes for the titanium subcategory are presented schematically in Figure III-1 and described in detail below.

RAW MATERIALS

The major raw material used in titanium production is rutile ore which is approximately 95 percent TiO_2. This ore is mined predominantly from deposits on Australia's east coast. Rutile ore is converted by direct chlorination to titanium tetrachloride, a process intermediate which can be purchased for use as a raw material, and then reduced to titanium metal sponge. Scrap titanium in the form of chips, massive scrap, or millings may be blended with the titanium sponge and alloys before casting into ingots or bars.

CHLORINATION OF RUTILE ORE

Titanium tetrachloride, $TiCl_4$, is produced by the chlorination of rutile ore and coke in a fluidized bed reactor. The $TiCl_4$, which is a liquid at ambient temperature and pressure, is condensed from the reaction gas and purified by distillation.

Water wash towers are used to cleanse off-gases from the condensers. The scrubbed gas then passes through a caustic tower and a Venturi scrubber. The gas stream leaving the Venturi scrubber may be released to the atmosphere or it may pass through another set of three scrubbers which also cleanse the chlorination area-vent gases. Each of these wet air pollution control devices is a source of wastewater.

REDUCTION TO TITANIUM METAL

Titanium tetrachloride is reduced to titanium metal in four plants by the Kroll process. This batch process employs magnesium as the reducing agent in an inert atmosphere. The $TiCl_4$ is added to magnesium in a retort furnace where it is converted to titanium metal and magnesium chloride. Molten magnesium chloride is tapped off as it is formed, and periodic vent taps are made during the reduction process to remove chloride vapors. The wet scrubbers used to cleanse these vapors are a source of wastewater for this process.

In one plant, during periods of rapid reduction, excess $MgCl_2$ is collected in a melt cell before it is transferred to electrolytic cells for recovery. Vapors generated by the molten chloride may be controlled by wet scrubbers resulting in a wastewater stream.

The titanium sponge produced by reduction is refined by distillation to remove magnesium and magnesium chloride contaminants. The Mg and $MgCl_2$ may be condensed and recycled to the reduction operation without producing any waste streams or may be recovered electrolytically.

In the electrolytic recovery process, molten $MgCl_2$ is transferred to an electrolytic cell where it is separated into its constituent elements. The magnesium floats to the top of the cells and is collected for sale or reuse in the reduction furnaces.

The chlorine gas formed during magnesium recovery is passed through a bag filter. The filtered gas is then recycled to the chlorination or reduction processes or is liquefied and sold as liquid chlorine. Some air escapes from the gas during liquefaction and although its volume is small, it is saturated with chlorine and must be treated before venting to the atmosphere. Burners may be used to convert the escaping chlorine to HCl vapors which are then scrubbed with water. This wet air pollution control represents a wastewater source.

An alternative to the Kroll process is the Hunter process in which $TiCl_4$ is reduced to titanium metal by sodium in an inert atmosphere. While the sodium reduction process is frequently used to produce titanium sponge in both Japan and England, only one plant in the United States employs this method. No wet air pollution controls are reportedly associated with the reduction of $TiCl_4$ at that plant, and sodium recovery from spent leach liquor is performed off-site. Thus, there are no reported wastewater sources from the sodium reduction process.

After the reduction of $TiCl_4$ to titanium metal by magnesium or sodium, the titanium product is chipped out of the reaction container and crushed before further processing. The wet dust control scrubber for the crushing operation is a source of wastewater. If the empty container is cleaned and returned to the reduction facility for reuse, a wash water waste stream is generated.

One plant in the United States reports the production of titanium sponge by reducing rutile ore with calcium hydride (CaH_2) in a hydrogen atmosphere without forming the chlorinated intermediate. No wastewater sources were reported for this reduction process.

SPONGE PURIFICATION

Remaining impurities, such as magnesium and chlorides of magnesium and sodium, are removed from the titanium by leaching or by vacuum distillation. In the first method, crushed titanium chips are leached with nitric or hydrochloric acid and then rinsed with water. Both the spent leachate and the rinse water are wastewater streams. In the second method, impurities are vacuum-distilled from the crushed titanium chips with no wastewater generation.

The purified metal may be sold as titanium sponge, crushed and sold as titanium powder, or further processed by alloying and casting. Wet scrubbers control dust from the crushing operation and represent a wastewater source.

CASTING AND SECONDARY TITANIUM PROCESSING

Titanium scrap may be blended with leached titanium sponge and alloying metals before being melted and formed into ingots. Massive scrap, including titanium plate and sheet metal, is pickled with a mixture of hydrochloric, hydrofluoric, and nitric acids before alloying, creating an acidic waste stream of the pickle liquor and wash water. Titanium scrap chips and millings are crushed and then washed with a detergent solution to remove oil and dirt contaminants before alloying. Wastewater sources from these processes include the dust scrubber for the scrap milling operation and the detergent wash water.

The blended titanium and alloying metals are melted and cast as titanium ingots. The wastewater flow associated with the melt shop is an oily stream from the washing of melt crucibles.

PROCESS WASTEWATER SOURCES

A variety of processes are involved in primary and secondary titanium production. The significant wastewater sources that are associated with this subcategory can be subdivided as follows:

1. Chlorination off-gas wet air pollution control,
2. Chlorination area-vent wet air pollution control,
3. $TiCl_4$ handling wet air pollution control,
4. Reduction area wet air pollution control,
5. Melt cell wet air pollution control,
6. Cathode gas wet air pollution control,
7. Chlorine liquefaction wet air pollution control,
8. Sodium reduction container reconditioning wash water,
9. Chip crushing wet air pollution control,
10. Acid leachate and rinse water,
11. Sponge crushing and screening wet air pollution control,
12. Acid pickle and wash water,
13. Scrap milling wet air pollution control,
14. Scrap detergent wash water,
15. Casting crucible wash water, and
16. Casting contact cooling water.

The sources of these wastewater streams are identified by their respective numbers in Figure III-1.

OTHER WASTEWATER SOURCES

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

1. Stormwater runoff, and
2. Maintenance and cleanup water.

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

AGE, PRODUCTION, AND PROCESS PROFILE

Figure III-2 shows the location of the eight titanium plants operating in the United States. This figure shows that most of the titanium plants are located in the Western and Northeastern states.

Table III-1 summarizes the relative age and discharge status of the eight titanium plants. Three plants began nonferrous manufacturing operations within a few years of 1940, three began operations between 1956 and 1958, and two have have started up since 1975.

Table III-2 lists the 1982 production ranges for the titanium plants. Five of the eight plants produce small quantities of titanium, less than 500 kkg/yr. Of the remaining three plants, two produce more than 5,000 kkg/yr.

Table III-3 lists the major production processes associated with the manufacture of titanium. Also shown is the number of plants generating wastewater from these processes.

Table III-1

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

Type of Plant Discharge	Initial Operating Year (Range) (Plant Age in Years)					Total
	1982-1963 (0-20)	1962-1953 (20-30)	1952-1943 (30-40)	1942-1933 (40-50)	Before 1932 (50+)	
Direct	0	3	0	1	0	4
Indirect	1	0	0	1	0	2
Zero	1	0	0	0	0	1
Dry	0	0	1	0	0	1
Total	2	3	1	2	0	8

Table III-2

PRODUCTION RANGES FOR THE TITANIUM SUBCATEGORY

Type of Plant Discharge	Titanium Production Ranges for 1982 (kkg/yr)					Total Number of Plants
	0-250	250-500	500-1,000	1,000-5,000	5,000+	
Direct	1	0	0	1	2	4
Indirect*						2
Zero	0	1	0	0	0	1
Dry	1	0	0	0	0	1
						8

*Data for these plants are claimed to be confidential.

Table III-3

SUMMARY OF TITANIUM SUBCATEGORY PROCESSES AND
ASSOCIATED WASTE STREAMS

Process	Number of Plants With Process	Number of Plants Reporting Generation of Wastewater*
Chlorination of Rutile Ore	2	
- Chlorination Off-Gas Wet Air Pollution Control	2	2
- Chlorination Area-Vent Wet Air Pollution Control	1	1
Reduction to Titanium Sponge	4	
- $TiCl_4$ Handling Wet Air Pollution Control	1	1
- Reduction Area Wet Air Pollution Control	4	4
- Melt Cell Wet Air Pollution Control	1	1
- Cathode Gas Wet Air Pollution Control	2	2
- Chlorine Liquefaction Wet Air Pollution Control	1	1
- Sodium Reduction Container Reconditioning Wash	1	1
- Chip Crushing Wet Air Pollution Control	2	2
Titanium Sponge Purification	5	
- Acid Leachate and Rinse Waste	4	4
- Sponge Crushing and Screening Wet Air Pollution Control	1	1
Casting and Secondary Titanium Processing	3	
- Acid Pickle and Wash Water	3	3
- Scrap Milling Wet Air Pollution Control	1	1
- Scrap Detergent Wash Water	2	2
- Casting Crucible Wash Water	2	2
- Casting Contact Cooling Water	1	1

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

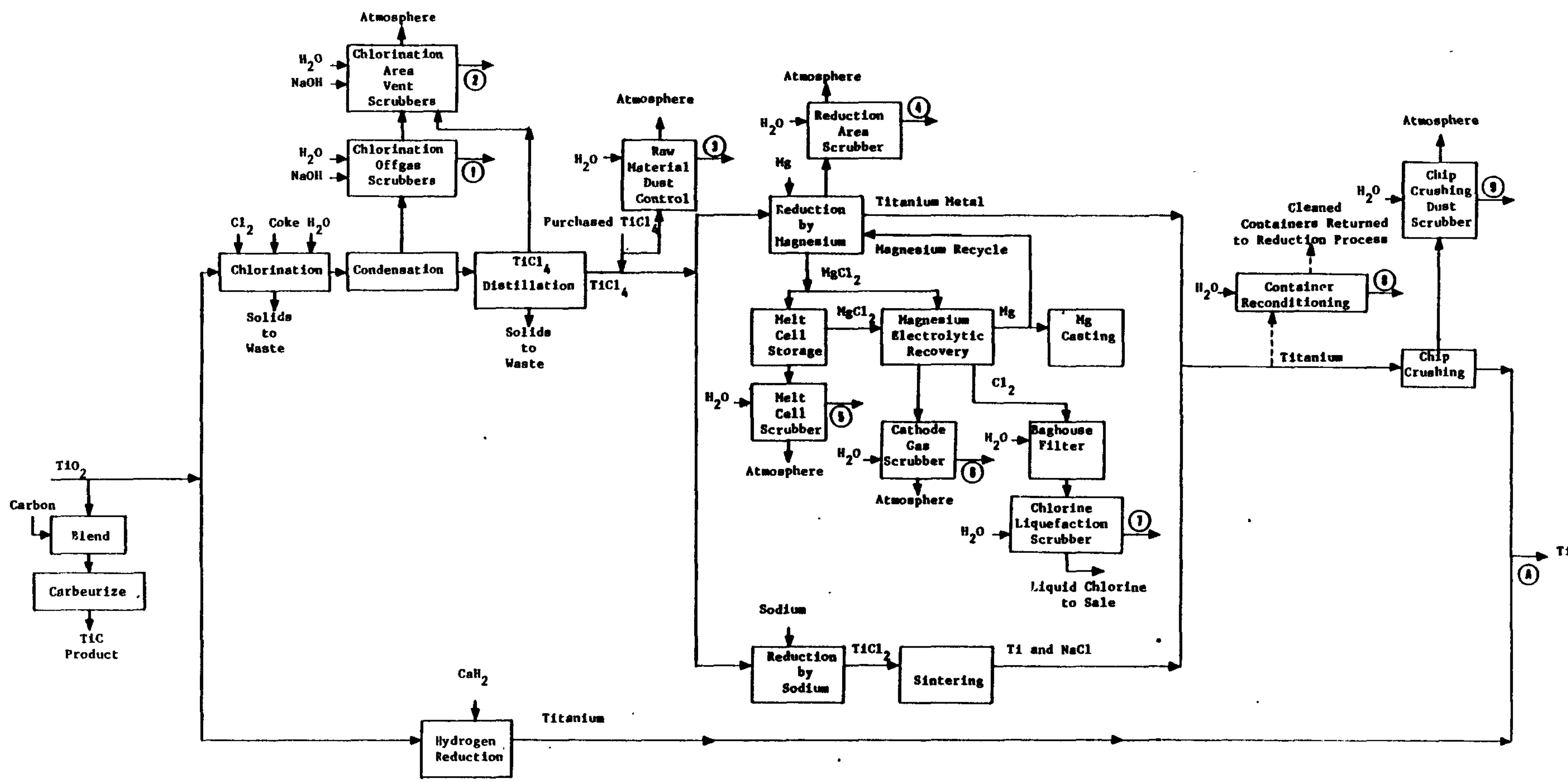

Figure III-1

TITANIUM PRODUCTION PROCESS

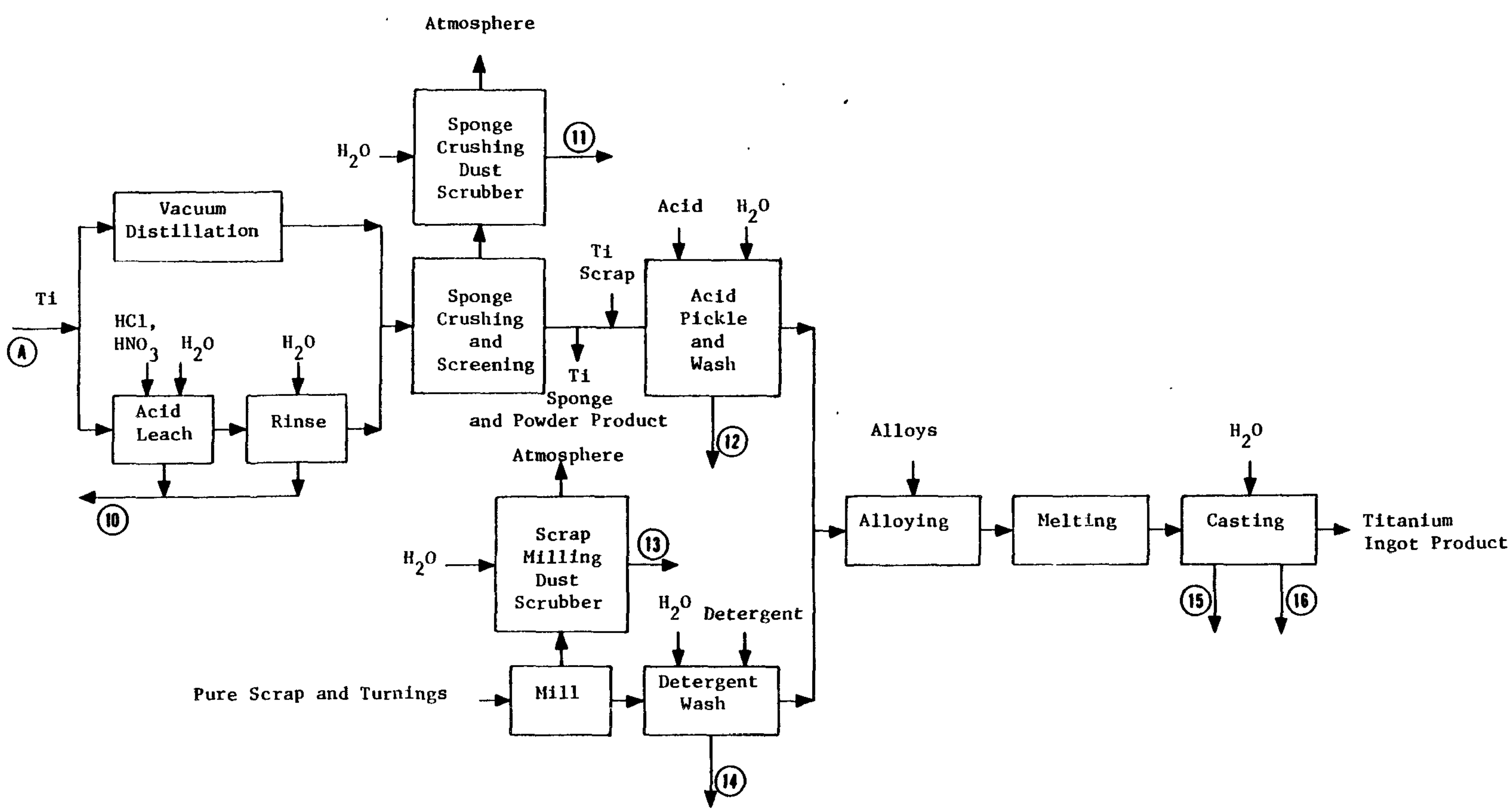

Figure III-1 (Continued)

TITANIUM PRODUCTION PROCESS

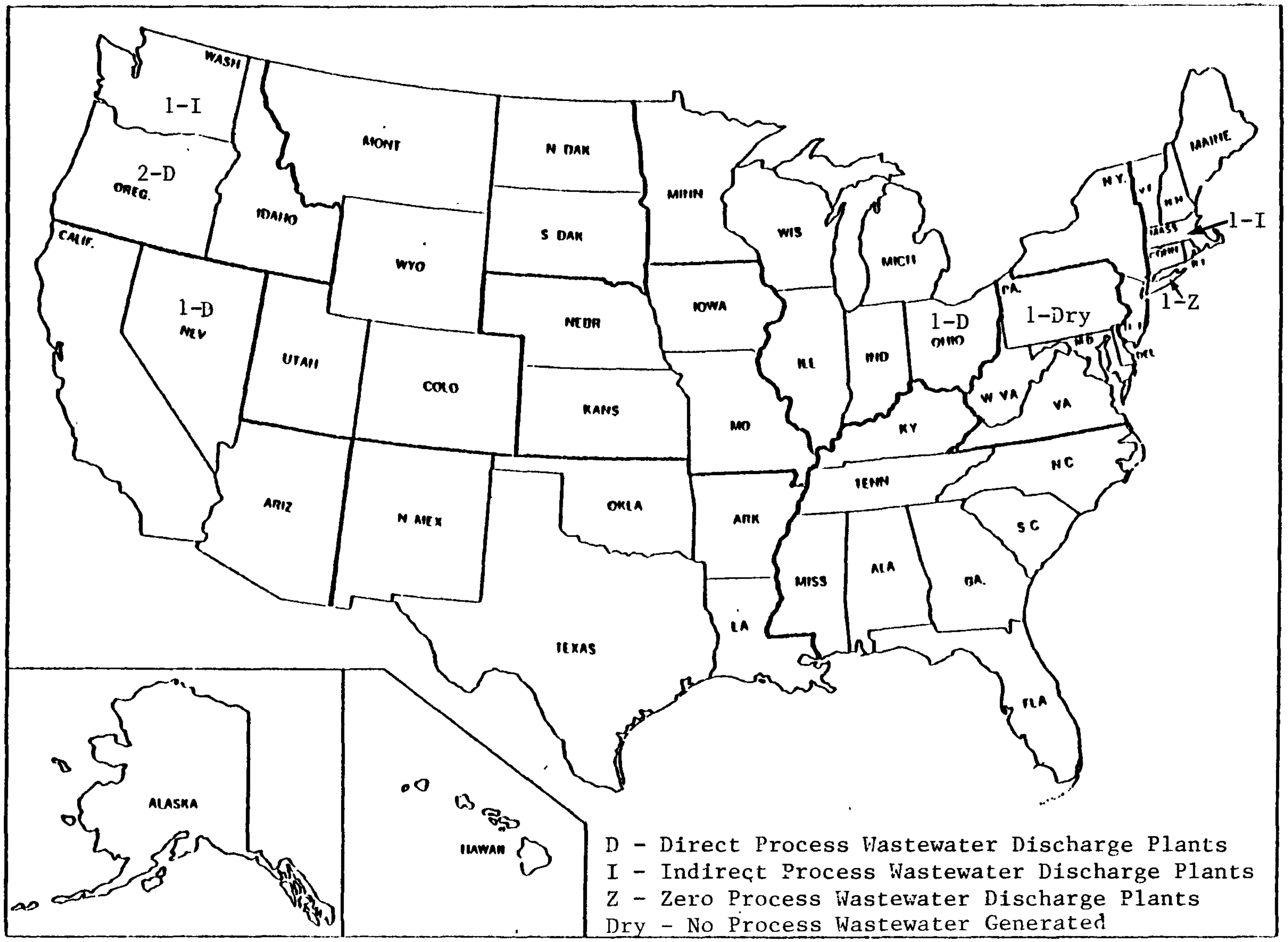

Figure III-2

GEOGRAPHIC LOCATIONS OF THE TITANIUM SUBCATEGORY PLANTS

PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

SECTION IV

SUBCATEGORIZATION

As discussed in Section IV of the General Development Document, the nonferrous metals manufacturing category has been subcategorized to take into account pertinent industry characteristics, manufacturing process variations, and a number of other factors which affect the ability of the facilities to achieve effluent limitations. This section summarizes the factors considered during the designation of the primary and secondary titanium subcategory and its related subdivisions.

FACTORS CONSIDERED IN SUBCATEGORIZATION

The following factors were evaluated for use in determining appropriate subcategories for the nonferrous metals category:

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

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

In Section IV of the General Development Document, each of these factors is described, and the rationale for selecting metal products, manufacturing processes and raw materials as the principal factors used for subcategorization is discussed. On the basis of these factors, the nonferrous metals manufacturing category (Phase II) was divided in 21 subcategories, one of them being primary and secondary titanium.

FACTORS CONSIDERED IN SUBDIVIDING THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

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

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

1. Chlorination off-gas wet air pollution control,
2. Chlorination area-vent wet air pollution control,
3. $TiCl_4$ handling wet air pollution control,
4. Reduction area wet air pollution control,
5. Melt cell wet air pollution control,
6. Cathode gas wet air pollution control,
7. Chlorine liquefaction wet air pollution control,
8. Sodium reduction container reconditioning wash water,
9. Chip crushing wet air pollution control,
10. Acid leachate and rinse water,
11. Sponge crushing and screening wet air pollution control,
12. Acid pickle and wash water,
13. Scrap milling wet air pollution control,
14. Scrap detergent wash water,
15. Casting crucible wash water, and
16. Casting contact cooling water.

These subdivisions follow directly from differences between the processing steps used in titanium production. Chlorination of rutile ore, reduction to titanium sponge, sponge purification, and casting and secondary titanium processing each have various steps which may generate wastewaters.

Chlorination of rutile ore to titanium tetrachloride, $TiCl_4$, establishes the need for the first two subdivisions. The $TiCl_4$, which is a liquid at ambient temperature and pressure, is condensed from the reaction gas and purified by distillation. Wet air pollution control devices may be used to control off-gases from the condensers and fumes from the chlorination area. These two subdivisions are necessary to account for these wastewater sources.

The third through ninth subdivisions result from differences in the processes by which $TiCl_4$ is reduced to titanium metal sponge.

Wet air pollution control may be required at plants which store and handle $TiCl_4$ as a raw material. If magnesium is used in the reduction process, wet air pollution control may be required for the reaction off-gases. Three subdivisions result from the wet air pollution control associated with the recovery of magnesium and chlorine from magnesium chloride formed during TiO_2 reduction. When sodium is used in the reduction process, a wastewater stream is created by the washing of reusable reaction vessels. Another subdivision results from the wet air pollution control which may be required when titanium sponge is chipped out of the reaction containers. These seven separate subdivisions are necessary because some plants do not use all of these processes.

The tenth and eleventh subdivisions result from the differences in titanium sponge purification practices among plants. Remaining impurities such as magnesium and sodium chlorides are removed from the titanium sponge by vacuum distillation or by leaching. Vacuum distillation is a dry process, but leaching results in a wastewater stream. Wet air pollution control may be associated with the crushing and screening of the purified sponge in plants where titanium powder is a final product. Subdivisions for leaching and wet air pollution control are necessary to reflect the presence or absence of these processes at each plant.

The twelfth through sixteenth subdivisions account for the differences in casting and secondary titanium processing between plants. Scrap metal may require milling, pickling, or detergent washing operations, each of which may create a wastewater stream. Casting operations may include the use of crucible wash water and contact cooling water. Separate subdivisions are necessary for these operations to account for these wastewater sources.

OTHER FACTORS

Factors other than manufacturing processes which were considered in this evaluation either support the establishment of the 16 subdivisions or were determined to be inappropriate bases for subdivision. Air pollution control methods, treatment costs, and total energy requirements are functions of the selected subcategorization factors, namely metal product, raw materials, and production processes. For reasons discussed in Section IV of the General Development Document, factors such as plant age, plant size, and number of employees were also evaluated and determined to be inappropriate bases for subdivision of this 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 limitations and guidelines 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, the amount of titanium produced by the manufacturing process is used as the PNP. This is based on the principle that the amount of wastewater generated is proportional to the amount of product made. The PNPs for the 16 subdivisions are as follows:

	Subdivision	PNP
1.	Chlorination off-gas wet air pollution control	kkg of $TiCl_4$ produced
2.	Chlorination area-vent wet air pollution control	kkg of $TiCl_4$ produced
3.	$TiCl_4$ handling wet air pollution control	kkg of $TiCl_4$ handled
4.	Reduction area wet air pollution control	kkg of titanium produced
5.	Melt cell wet air pollution control	kkg of titanium produced
6.	Cathode gas wet air pollution control	kkg of titanium produced
7.	Chlorine liquefaction wet air pollution control	kkg of titanium produced
8.	Sodium reduction container reconditioning wash water	kkg of titanium produced
9.	Chip crushing wet air pollution control	kkg of titanium produced
10.	Acid leachate and rinse water	kkg of titanium produced
11.	Sponge crushing and screening wet air pollution control	kkg of titanium produced
12.	Acid pickle and wash water	kkg of titanium pickled
13.	Scrap milling wet air pollution control	kkg of scrap milled
14.	Scrap detergent wash water	kkg of scrap washed
15.	Casting crucible wash water	kkg of titanium cast
16.	Casting contact cooling water	kkg of titanium cast

PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

SECTION V

WATER USE AND WASTEWATER CHARACTERISTICS

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

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

In order to quantify the pollutant discharge from primary and secondary titanium plants, a field sampling program was conducted. Wastewater samples were analyzed for 124 of the 126 toxic pollutants and other pollutants deemed appropriate. (Because the analytical standard for TCDD was judged to be too hazardous to be made generally available, samples were never analyzed for this pollutant. Samples were also never analyzed for asbestos. There is no reason to expect that TDCC or asbestos would be present in primary and secondary titanium wastewater.) A total of three plants were selected for sampling in the titanium manufacturing subcategory. 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. In general, the samples were analyzed for three classes of pollutants: toxic organic pollutants, toxic metal pollutants, and criteria pollutants (which includes both conventional and nonconventional pollutants).

As described in Section IV of this supplement, the primary and secondary titanium subcategory has been further divided into 16 subdivisions, so that the proposed regulation contains mass discharge limitations and standards for 16 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. Chlorination off-gas wet air pollution control,
2. Chlorination area-vent wet air pollution control,
3. $TiCl_4$ handling wet air pollution control,
4. Reduction area wet air pollution control,
5. Melt cell wet air pollution control,
6. Cathode gas wet air pollution control,
7. Chlorine liquefaction wet air pollution control,
8. Sodium reduction container reconditioning wash water,
9. Chip crushing wet air pollution control,
10. Acid leachate and rinse water,
11. Sponge crushing and screening wet air pollution control,
12. Acid pickle and wash water,
13. Scrap milling wet air pollution control,
14. Scrap detergent wash water,
15. Casting crucible wash water, and
16. Casting contact cooling water.

WASTEWATER FLOW RATES

Data supplied by data collection portfolio responses were evaluated, and two flow-to-production ratios were calculated for each stream. The two ratios, water use and wastewater discharge flow, 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 titanium 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 titanium produced. Differences between the water use and wastewater flows associated with a given stream result from recycle, evaporation, and carry-over on the product. As an example, the acid leachate and rinse wastewater is related to titanium metal production. The discharge rate is therefore expressed in liters of leachate and rinse wastewater per metric ton of titanium metal produced.

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-16 at the end of this section. Where appropriate, an attempt was made to identify factors that could account for variations in water use and discharge rates. These variations are discussed later in this section by subdivision. A similar analysis of factors affecting the wastewater flows is presented in Sections X, XI, and XII where representative BAT, NSPS, and pretreatment flows are selected for use in calculating the effluent limitations.

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

WASTEWATER CHARACTERISTICS DATA

Data used to characterize the various wastewaters associated with primary and secondary titanium production come from two sources: data collection portfolios (dcp) and analytical data from field sampling trips.

DATA COLLECTION PORTFOLIOS

In the data collection portfolios, plants were asked to indicate which of the toxic pollutants were known or believed to be present in their effluent. One plant indicated that toxic organics were known to be present, and one plant indicated that toxic organics were believed to be present in their effluent. Five plants stated that some of the toxic metals were known or believed to be present in their effluent. The responses for eight of the toxic metals and cyanide are summarized below.

Pollutant	Known Present	Believed Present
Arsenic	1	0
Chromium	2	1
Copper	2	1
Cyanide	1	1
Lead	0	1
Mercury	1	0
Nickel	3	0
Silver	0	1
Zinc	2	1

FIELD SAMPLING DATA

In order to quantify the concentrations of pollutants present in wastewater from primary and secondary titanium plants, wastewater samples were collected at three of the eight plants. Diagrams indicating the sampling sites and contributing production processes are shown in Figures V-1 and V-2 (at the end of this section).

The sampling data for the primary and secondary titanium subcategory are presented in Tables V-17 through V-26 at the end of this section. Tables V-17 through V-20 show raw wastewater analyses, and Table V-21 presents an analysis of a treated effluent. The stream codes listed may be used to identify the location of each of the samples on process flow diagrams in 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. Additional sampling data for the primary and secondary titanium subcategory are contained in the confidential record.

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 are generally considered not quantifiable at concentrations equal to or less than 0.010 mg/l. Below this concentration, organic analytical results are not quantitatively accurate; however, the analyses are useful to indicate the presence of a particular pollutant. The pesticide fraction is considered not quantifiable at concentrations equal to or less than 0.005 mg/l.

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

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

Because primary and secondary titanium production involves 16 principal sources of wastewater, each of which has potentially different characteristics and flows, the wastewater characteristics and discharge rates corresponding to each subdivision will be described separately. A brief discussion of why the associated production processes generate a wastewater and explanations for variations of water use within each subdivision will also be presented.

CHLORINATION OFF-GAS WET AIR POLLUTION CONTROL

Rutile ore, TiO_2, is converted to $TiCl_4$ by chlorination in two of the eight titanium plants. The resulting $TiCl_4$ gas is condensed and purified before sent to the reduction facility. Off-gases from the condensers pass through a water wash tower, a caustic tower, and a Venturi scrubber in series to remove chlorine gas and particulates introduced during the chlorination process.

The three scrubbers are considered together to be a single wastewater source because both plants reporting the use of chlorination off-gas scrubbers use all three in series as a single unit operation. The water use and discharge rates for chlorination off-gas wet air pollution contol are listed in Table V-1. No sampling data are available for chlorination off-gas wet air pollution control, but the wastewater is expected to be heavily laden with chlorine and particulates and to contain low concentrations of metals.

CHLORINATION AREA-VENT WET AIR POLLUTION CONTROL

In one plant, the cleaned gas from the chlorination off-gas scrubbers is routed to a chlorination area scrubbing system where it is combined with ventilation vapors from $TiCl_4$ purification operations. Like the off-gas scrubbers, the area-vent wet air pollution control consists of a water wash tower, and a Venturi scrubber operated in series. After passing through this system, the cleaned gases are vented to the atmosphere.

The water use and discharge rates for chlorination area-vent wet air pollution control are listed in Table V-2. No sampling data are available for this stream, but the wastewater is expected to be heavily laden with chlorine and particulates and to contain low concentrations of metals.

$TiCl_4$ HANDLING WET AIR POLLUTION CONTROL

Four plants use $TiCl_4$ as a raw material in titanium production. One of these plants reports the use of wet air pollution control with an associated wastewater flow. The water use and discharge rates for this stream are listed in Table V-3. No sampling data are available for this stream, but it is expected to be similar to the wastewater from the reduction area scrubber which is characterized by treatable levels of solids, chlorides, and metals.

REDUCTION AREA WET AIR POLLUTION CONTROL

The reduction of $TiCl_4$ to titanium metal is accomplished by a batch process using either sodium or magnesium as the reducing agent. In the four plants which practice magnesium reduction in an inert atmosphere, vent taps are made periodically to remove vapors from the reduction vessel. These vapors are cleansed in a reduction area scrubber and then vented to the atmosphere. No wet air pollution control was reported for reduction of $TiCl_4$ by sodium.

The water use and discharge rates for reduction area wet air pollution control are listed in Table V-4. Sampling data are presented in Table V-17. Additional sampling data for this stream are contained in the confidential record. This waste stream is characterized by treatable concentrations of magnesium, chloride, chromium, and nickel.

MELT CELL WET AIR POLLUTION CONTROL

During the reduction of $TiCl_4$ by magnesium, molten magnesium chloride is tapped off as formed and transferred to electrolytic cells for magnesium recovery. In one plant, during periods of rapid $MgCl_2$ formation, excess $MgCl_2$ is stored in a melt cell before continuing on to the electrolytic cell. Vapors from the melt cell are collected and converted to hydrochloric acid in a water scrubber.

The water use and discharge rates for melt cell wet air pollution control are listed in Table V-5. Sampling data for this waste stream are contained in the confidential record. This stream is characterized by an acidic pH and low concentrations of toxic metals.

CATHODE GAS WET AIR POLLUTION CONTROL

Three plants report electrolytic recovery of magnesium from the $MgCl_2$ formed during the reduction operation. Depending on the type of electrolytic cell used, a cathode gas may be generated. This gas is passed through a baghouse and a caustic tower, resulting in a caustic waste stream.

The water use and discharge rates for cathode gas wet air pollution control are listed in Table V-6. No sampling data are available for this stream, but it is expected to be similar to the wastewater from the melt cell scrubber which contains quantifiable concentrations of toxic metals.

CHLORINE LIQUEFACTION WET AIR POLLUTION CONTROL

The electrolytic reduction of $MgCl_2$ generates chlorine gas. After passing through bagfilters, this gas returns to the chlorination or reduction processes or is liquefied and sold. Some air always escapes from the gas during liquefaction and although its volume is small, it is saturated with chlorine and must be treated before venting to the atmosphere. Burners convert the escaping chlorine to HCl vapors in the one plant which practices chlorine liquefaction. The HCl vapors are then scrubbed with water, creating an acidic waste stream.

The water use and discharge rates for chlorine liquefaction wet air pollution control are listed in Table V-7. Sampling data for this waste stream are contained in the confidential record. This stream is characterized by a low pH and treatable concentrations of toxic metals.

SODIUM REDUCTION CONTAINER RECONDITIONING WASH WATER

The conversion of $TiCl_4$ to titanium metal is a batch process which is carried out in a retort vessel. When the reduction is complete, the titanium cake is chipped out of the container and sent on for further processing. The container can then be cleaned and returned to the reduction process for reuse. Of the two plants reporting reduction container cleaning and reuse, one uses magnesium to reduce $TiCl_4$ and one uses sodium. Only the plant using sodium in its reduction process reports a wastewater flow from the container reconditioning operation.

The water use and discharge rates for the sodium reduction container reconditioning wash are listed in Table V-8. No sampling data are available for this stream, but it is expected to contain chlorides, dissolved and suspended solids, and quantifiable concentrations to toxic metals.

CHIP CRUSHING WET AIR POLLUTION CONTROL

The titanium cake formed by reduction is chipped out of the reduction container and sent on for further purification. To increase the effectiveness of these purification steps, the titanium chips may be crushed when they are removed from the reduction container. Two plants report wet air pollution control for the crushing operation with various degrees of recycle of scrubber water.

The water use and discharge rates for chip crushing wet air pollution control are listed in Table V-9. No sampling data are available for this waste stream, but it is expected to contain titanium, suspended solids, and low concentrations of metals.

ACID LEACHATE AND RINSE WATER

Purification of the titanium chips to remove the remaining Mg and $MgCl_2$ impurities can be accomplished either by vacuum distillation or by leaching. Vacuum distillation, practiced by one plant, does not result in the production of a wastewater stream. Acid leaching with HCl or HNO_3 followed by a water rinse produces acidic wastewater streams at the four plants reporting this purification process.

The water use and discharge rates for acid leachate and rinse water are listed in Table V-10. At two plants, separate wastewater samples were taken from the leaching and rinsing operations. At one plant, a combined leach and rinse wastewater sample was analyzed. The sampling data are presented in Tables V-18, V-19, and V-20. Additional data on this waste stream are contained in the confidential record. This waste stream is characterized by treatable concentrations of copper, lead, nickel, thallium, and suspended solids.

SPONGE CRUSHING AND SCREENING WET AIR POLLUTION CONTROL

Of the seven plants producing titanium metal, four sell titanium sponge or powder as their final product and three do further processing to produce titanium ingots and castings. One plant reports a wastewater flow from a dust control scrubber associated with the crushing, screening, and storgae of leached titanium powder.

The water use and discharge rates for the sponge crushing and screening wet air pollution control are listed in Table V-11. No sampling data are available for this waste stream, but it is expected to contain suspended solids, titanium, and low concentrations of toxic metals.

ACID PICKLE AND WASH WATER

Three plants report the use of acid pickling to remove surface oxides from massive titanium scrap before alloying and casting. The pickling mixture typically contains nitric, hydrochloric, and hydrofluoric acids. When a washing step was associated with the acid pickling, flow data were reported for the combined pickle and wash stream.

The water use and discharge rates for acid pickle and wash water are listed in Table V-12. Sampling data for this waste stream are contained in the confidential record. This acidic waste stream is characterized by a low production normalized flow and treatable concentrations of antimony, cadmium, chromium, copper, lead, nickel, and zinc. No sampling data for fluoride are available, but because hydrofluoric acid is commonly used as a pickling acid, a high concentration of fluoride in the wastewater stream is expected.

SCRAP MILLING WET AIR POLLUTION CONTROL

Pure titanium scrap and turnings can be alloyed with titanium sponge and cast into ingots. One plant mills the scrap and provides wet air pollution control. The water use and discharge rates for scrap milling wet air pollution control are listed in Table V-13. No sampling data are available for this stream, but it is expected to contain suspended solids, titanium, and low concentrations of toxic metals,

SCRAP DETERGENT WASH WATER

Scrap material such as titanium turnings must be washed with a soapy solution to remove oil and dirt before being alloyed and cast into ingots. This batch process results in a caustic waste stream which is reported at two plants. The water use and discharge rates for scrap detergent wash water are listed in Table V-14. Sampling data for this waste stream are contained in the confidential record. This waste stream is characterized by treatable concentrations of oil and grease, suspended solids, and toxic metals.

CASTING CRUCIBLE WASH WATER

Two plants report a waste stream from the washing of crucibles used in casting operations. The water use and discharge rates of this oily waste from the only plant to provide flow data are reported in Table V-15. No sampling data are available for this stream, but it is expected to be similar to casting contact cooling water which contains treatable concentrations of oil and grease, suspended solids, and toxic metals.

CASTING CONTACT COOLING WATER

One plant reports the use of contact cooling water from a cooling pond in its casting operations. The only other plant reporting casting cooling water uses noncontact water. The water use and discharge rates of the casting contact cooling water are listed in Table V-16. Sampling data for this waste stream are contained in the confidential record. This waste stream is characterized by treatable concentrations of oil and grease, suspended solids, and nickel.

Table V-1

WATER USE AND DISCHARGE RATES FOR CHLORINATION OFF-GAS WET AIR POLLUTION CONTROL

(l/kkg of $TiCl_4$ produced)

Plant Code	Percent Recycle	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1125	0	936	936
1085	NR	NR	3,334

NR = Present, but data not reported in dcp.

Table V-2

WATER USE AND DISCHARGE RATES FOR
CHLORINATION AREA-VENT WET AIR POLLUTION CONTROL

(l/kkg of $TiCl_4$ produced)

Plant Code	Percent Recycle	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1125	0	1,040	1,040

Table V-3

WATER USE AND DISCHARGE RATES FOR
$TiCl_4$ HANDLING WET AIR POLLUTION CONTROL

(l/kkg of $TiCl_4$ handled)

Plant Code	Percent Recycle	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1075	NR	NR	187

NR = Present, but data not reported in dcp.

Table V-4

WATER USE AND DISCHARGE RATES FOR REDUCTION AREA WET AIR POLLUTION CONTROL

(l/kkg of Ti metal produced)

Plant Code	Percent Recycle	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1125	0	15,789	15,789
1017	0	42,508	42,508
1085	0	65,613	65,613
1044	0	39,598	39,598

Table V-5

WATER USE AND DISCHARGE RATES FOR
MELT CELL WET AIR POLLUTION CONTROL

(l/kkg of Ti metal produced)

Plant Code	Percent Recycle	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1017	0	21,254	21,254

Table V-6

WATER USE AND DISCHARGE RATES FOR
CATHODE GAS WET AIR POLLUTION CONTROL

(l/kkg of Ti metal produced)

Plant Code	Percent Recycle	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1085	0	4,374	4,374
1044	NR	NR	7,919

NR = Present, but data not reported in dcp.

Table V-7

WATER USE AND DISCHARGE RATES FOR
CHLORINE LIQUEFACTION WET AIR POLLUTION CONTROL

(1/kkg of Ti metal produced)

Plant Code	Percent Recycle	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1017	0	297,559	297,559

Table V-8

WATER USE AND DISCHARGE RATES FOR
SODIUM REDUCTION CONTAINER RECONDITIONING WASH WATER

(l/kkg of Ti metal produced)

Plant Code	Percent Recycle	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1075	0	1,282	1,282

Table V-9

WATER USE AND DISCHARGE RATES FOR
CHIP CRUSHING WET AIR POLLUTION CONTROL

(l/kkg of Ti metal produced)

Plant Code	Percent Recycle	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1075	0*	22,922	22,922
1085	NR	NR	1,094

*One hundred percent reuse in other plant processes.

NR = Present, but data not reported in dcp.

Table V-10

WATER USE AND DISCHARGE RATES FOR ACID LEACHATE AND RINSE WATER

(l/kkg of Ti metal produced)

Plant Code	Percent Recycle	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1058	0	16,354	16,354
1017	0	11,840	11,840
1075*	0	27,728	27,728
1085	0	16,185	16,185

*Reported acid leachate flow only.

Table V-11

WATER USE AND DISCHARGE RATES FOR
SPONGE CRUSHING AND SCREENING WET AIR POLLUTION CONTROL

(l/kkg of Ti metal produced)

Plant Code	Percent Recycle	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1075	0	6,470	6,470

Table V-12

WATER USE AND DISCHARGE RATES FOR
ACID PICKLE AND WASH WATER

(l/kkg of Ti metal pickled)

Plant Code	Percent Recycle	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1017	NR	NR	95
1085	0	27	27
1149	NR	NR	NR

NR = Present, but data not reported in dcp.

Table V-13

WATER USE AND DISCHARGE RATES FOR
SCRAP MILLING WET AIR POLLUTION CONTROL

(l/kkg of scrap milled)

Plant Code	Percent Recycle	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1085	0	2,261	2,261

Table V-14

WATER USE AND DISCHARGE RATES FOR
SCRAP DETERGENT WASH WATER

(l/kkg of scrap washed)

Plant Code	Percent Recycle	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1017	0	18,064	18,064
1085	0	27,397	27,397

Table V-15

WATER USE AND DISCHARGE RATES FOR CASTING CRUCIBLE WASH WATER

(l/kkg of Ti metal cast)

Plant Code	Percent Recycle	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1017	0	477	477
1085	NR	NR	NR

NR = Present, but data not reported in dcp.

Table V-16

WATER USE AND DISCHARGE RATES FOR CASTING CONTACT COOLING WATER

(l/kkg of Ti metal cast)

Plant Code	Percent Recycle	Production Normalized Water Use Flow	Production Normalized Discharge Flow
1017	NR	NR	729,730

Table V-17

TITANIUM SAMPLING DATA
REDUCTION AREA WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	204	1		ND		
2. acrolein	204	1		ND		
3. acrylonitrile	204	1		ND		
4. benzene	204	1		ND		
5. benzidine	204	1		ND		
6. carbon tetrachloride	204	1		ND		
7. chlorobenzene	204	1		ND		
8. 1,2,4-trichlorobenzene	204	1		ND		
9. hexachlorobenzene	204	1		ND		
10. 1,2-dichloroethane	204	1		ND		
11. 1,1,1-trichloroethane	204	1		ND		
12. hexachloroethane	204	1		ND		
13. 1,1-dichloroethane	204	1		ND		

Table V-17 (Continued)

TITANIUM SAMPLING DATA
REDUCTION AREA WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
14. 1,1,2-trichloroethane	204	1		ND		
15. 1,1,2,2-tetrachloroethane	204	1		ND		
16. chloroethane	204	1		ND		
17. bis(chloromethyl)ether	204	1		ND		
18. bis(2-chloroethyl)ether	204	1		ND		
19. 2-chloroethyl vinyl ether	204	1		ND		
20. 2-chloronaphthalene	204	1		ND		
21. 2,4,6-trichlorophenol	204	1		ND		
22. p-chloro-m-cresol	204	1		ND		
23. chloroform	204	1		ND		
24. 2-chlorophenol	204	1		ND		
25. 1,2-dichlorobenzene	204	1		ND		
26. 1,3-dichlorobenzene	204	1		ND		
27. 1,4-dichlorobenzene	204	1		ND		

Table V-17 (Continued)

TITANIUM SAMPLING DATA
REDUCTION AREA WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
28. 3,3'-dichlorobenzidine	204	1		ND		
29. 1,1-dichloroethylene	204	1		ND		
30. 1,2-trans-dichloroethylene	204	1		ND		
31. 2,4-dichlorophenol	204	1		ND		
32. 1,2-dichloropropane	204	1		ND		
33. 1,3-dichloropropene	204	1		ND		
34. 2,4-dimethylphenol	204	1		ND		
35. 2,4-dinitrotoluene	204	1		ND		
36. 2,6-dinitrotoluene	204	1		ND		
37. 1,3-diphenylhydrazine	204	1		ND		
38. ethylbenzene	204	1		ND		
39. fluoranthene	204	1		ND		
40. 4-chlorophenyl phenyl ether	204	1		ND		

Table V-17 (Continued)

TITANIUM SAMPLING DATA
REDUCTION AREA WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
41. 4-bromophenyl phenyl ether	204	1		ND		
42. bis(2-chloroisopropyl)ether	204	1		ND		
43. bis(2-chloroethoxy)methane	204	1		ND		
44. methylene chloride	204	1		ND		
45. methyl chloride (chloromethane)	204	1		ND		
46. methyl bromide (bromomethane)	204	1		ND		
47. bromoform (tribromomethane)	204	1		ND		
48. dichlorobromomethane	204	1		ND		
49. trichlorofluoromethane	204	1		ND		
50. dichlorodifluoromethane	204	1		ND		
51. chlorodibromomethane	204	1		ND		
52. hexachlorobutadiene	204	1		ND		
53. hexachlorocyclopentadiene	204	1		ND		
54. isophorone	204	1		ND		

Table V-17 (Continued)

TITANIUM SAMPLING DATA
REDUCTION AREA WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
55. naph:halene	204	1		ND		
56. nitrobenzene	204	1		ND		
57. 2-nitrophenol	204	1		ND		
58. 4-nitrophenol	204	1		ND		
59. 2,4-dinitrophenol	204	1		ND		
60. 4,6-dinitro-o-cresol	204	1		ND		
61. N-nitrosodimethylamine	204	1		ND		
62. N-nitrosodiphenylamine	204	1		ND		
63. N-nitrosodi-n-propylamine	204	1		ND		
64. pentachlorophenol	204	1		ND		
65. phenol	204	1		ND		
66. bis(2-ethylhexyl) phthalate	204	1		0.040		
67. butyl benzyl phthalate	204	1		ND		

Table V-17 (Continued)

TITANIUM SAMPLING DATA
REDUCTION AREA WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
68. di-n-butyl phthalate	204	1		ND		
69. di-n-octyl phthalate	204	1		ND		
70. diethyl phthalate	204	1		ND		
71. dimethyl phthalate	204	1		ND		
72. benzo(a)anthracene	204	1		ND		
73. benzo(a)pyrene	204	1		ND		
74. benzo(b)fluoranthene	204	1		ND		
75. benzo(k)fluoranthane	204	1		ND		
76. chrysene	204	1		ND		
77. acenaphthylene	204	1		ND		
78. anthracene (a)	204	1		ND		
79. benzo(ghi)perylene	204	1		ND		
80. fluorene	204	1		ND		
81. phenanthrene (a)	204	1		ND		

Table V-17 (Continued)

TITANIUM SAMPLING DATA
REDUCTION AREA WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
82. dibenzo(a,h)anthracene	204	1		ND		
83. indeno (1,2,3-c,d)pyrene	204	1		ND		
84. pyrene	204	1		ND		
85. tetrachloroethylene	204	1		ND		
86. toluene	204	1		ND		
87. trichloroethylene	204	1		ND		
88. vinyl chloride (chloroethylene)	204	1		ND		
89. aldrin	204	1		ND		
90. dieldrin	204	1		ND		
91. chlordane	204	1		ND		
92. 4,4'-DDT	204	1		ND		
93. 4,4'-DDE	204	1		ND		
94. 4,4'-DDD	204	1		ND		

Table V-17 (Continued)

TITANIUM SAMPLING DATA
REDUCTION AREA WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
95. alpha-endosulfan	204	1		ND		
96. beta-endosulfan	204	1		ND		
97. endosulfan sulfate	204	1		ND		
98. endrin	204	1		ND		
99. endrin aldehyde	204	1		ND		
100. heptachlor	204	1		ND		
101. heptachlor epoxide	204	1		ND		
102. alpha-BHC	204	1		ND		
103. beta-BHC	204	1		ND		
104. gamma-BHC	204	1		ND		
105. delta-BHC	204	1		ND		
106. PCB-1242 (b)	204	1		ND		
107. PCB-1254 (b)	204	1		ND		
108. PCB-1221 (b)	204	1		ND		

Table V-17 (Continued)

TITANIUM SAMPLING DATA
REDUCTION AREA WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
109. PCB-1232 (c)	204	1		ND		
110. PCB-1248 (c)	204	1		ND		
111. PCB-1260 (c)	204	1		ND		
112. PCB-1016 (c)	204	1		ND		
113. toxaphene	204	1		ND		
Conventional Pollutants						
pH (standard units)	204	1		7.4		

†Sample Type Code: 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
A - Anticipated quality if new process implemented.

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

Table V-18

TITANIUM SAMPLING DATA
ACID LEACHATE AND RINSE WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	211	1		ND	ND	
2. acrolein	211	1				
3. acrylonitrile	211	1				
4. benzene	211	1				
5. benzidine	211	1		ND	ND	
6. carbon tetrachloride	211	1				
7. chlorobenzene	211	1		ND	ND	
8. 1,2,4-trichlorobenzene	211	1				
9. hexachlorobenzene	211	1		ND	ND	
10. 1,2-dichloroethane	211	1				
11. 1,1,1-trichloroethane	211	1				
12. hexachloroethane	211	1		ND	ND	
13. 1,1-dichloroethane	211	1				

Table V-18 (Continued)

TITANIUM SAMPLING DATA
ACID LEACHATE AND RINSE WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
19. 2-chloroethyl vinyl ether	211	1				
20. 2-chloronaphthalene	211	1		ND	ND	
21. 2,4,6-trichlorophenol	211	1		ND	ND	
22. p-chloro-m-cresol	211	1		ND	ND	
23. chloroform	211	1				
24. 2-chlorophenol	211	1		ND	ND	
25. 1,2-dichlorobenzene	211	1		ND	ND	
26. 1,3-dichlorobenzene	211	1		ND	ND	
27. 1,4-dichlorobenzene	211	1		ND	ND	
28. 3,3'-dichlorobenzidine	211	1		ND	ND	
29. 1,1-dichloroethylene	211	1				
30. 1,2-trans-dichloroethylene	211	1				
31. 2,4-dichlorophenol	211	1		ND	ND	

Table V-18 (Continued)

TITANIUM SAMPLING DATA
ACID LEACHATE AND RINSE WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
32. 1,2-dichloropropane	211	1				
33. 1,3-dichloropropene	211	1				
34. 2,4-dimethylphenol	211	1		ND	ND	
35. 2,4-dinitrotoluene	211	1		ND	ND	
36. 2,6-dinitrotoluene	211	1		ND	ND	
37. 1,2-diphenylhydrazine	211	1		ND	ND	
38. ethylbenzene	211	1				
39. fluoranthene	211	1		ND	ND	
40. 4-chlorophenyl phenyl ether	211	1		ND	ND	
41. 4-bromophenyl phenyl ether	211	1		ND	ND	
42. bis(2-chloroisopropyl)ether	211	1		ND	ND	
43. bis(2-choroethoxy)methane	211	1		ND	ND	
44. methylene chloride	211	1		ND	ND	
45. methyl chloride (chloromethane)	211	1				

Table V-18 (Continued)

TITANIUM SAMPLING DATA
ACID LEACHATE AND RINSE WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
46. methyl bromide (bromomethane)	211	1				
47. bromoform (tribromomethane)	211	1				
48. dichlorobromomethane	211	1				
49. trichlorofluoromethane	211	1				
50. dichlorodifluoromethane	211	1				
51. chlorodibromomethane	211	1				
52. hexachlorobutadiene	211	1		ND	ND	
53. hexachlorocyclopentadiene	211	1		ND	ND	
54. isophorone	211	1		ND	ND	
55. naphthalene	211	1		ND	ND	
56. nitrobenzene	211	1		ND	ND	
57. 2-nitrophenol	211	1		ND	ND	
58. 4-nitrophenol	211	1		ND	ND	

Table V-18 (Continued)

TITANIUM SAMPLING DATA
ACID LEACHATE AND RINSE WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
59. 2,4-dinitrophenol	211	1		ND	ND	
60. 4,6-dinitro-o-cresol	211	1		ND	ND	
61. N-nitrosodimethylamine	211	1		ND	ND	
62. N-nitrosodiphenylamine	211	1		ND	ND	
63. N-nitrosodi-n-propylamine	211	1		ND	ND	
64. pentachlorophenol	211	1		ND	ND	
65. phenol	211	1		ND	ND	
66. bis(2-ethylhexyl) phthalate	211	1		0.040	0.03	
67. butyl benzyl phthalate	211	1		ND	ND	
68. di-n-butyl phthalate	211	1		*	*	
69. di-n-octyl phthalate	211	1		ND	ND	
70. diethyl phthalate	211	1		*	*	
71. dimethyl phthalate	211	1		ND	ND	
72. benzo(a)anthracene	211	1		ND	ND	

Table V-18 (Continued)

TITANIUM SAMPLING DATA
ACID LEACHATE AND RINSE WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
73. benzo(a)pyrene	211	1		ND	ND	
74. benzo(b)fluoranthene	211	1		ND	ND	
75. benzo(k)fluoranthane	211	1		ND	*	
76. chrysene	211	1		ND	ND	
77. acenaphthylene	211	1		ND	ND	
78. anthracene (a)	211	1		ND	ND	
79. benzo(ghi)perylene	211	1		ND	ND	
80. fluorene	211	1		ND	ND	
81. phenanthrene (a)	211	1		ND	ND	
82. dibenzo(a,h)anthracene	211	1		ND	ND	
83. indeno (1,2,3-c,d)pyrene	211	1		ND	ND	
84. pyrene	211	1		ND	ND	
85. tetrachloroethylene	211	1				

Table V-18 (Continued)

TITANIUM SAMPLING DATA
ACID LEACHATE AND RINSE WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
86. toluene	211	1				
87. trichloroethylene	211	1				
88. vinyl chloride (chloroethylene)	211	1				
89. aldrin	211	1		ND	ND	
90. dieldrin	211	1		ND	ND	
91. chlordane	211	1		ND	ND	
92. 4,4'-DDT	211	1		ND	ND	
93. 4,4'-DDE	211	1		ND	ND	
94. 4,4'-DDD	211	1		ND	0.160	
95. alpha-endosulfan	211	1		ND	0.090	
96. beta-endosulfan	211	1		ND	ND	
97. endosulfan sulfate	211	1		ND	ND	
98. endrin	211	1		ND	ND	
99. endrin aldehyde	211	1		ND	ND	

Table V-18 (Continued)

TITANIUM SAMPLING DATA
ACID LEACHATE AND RINSE WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
100. heptachlor	211	1		ND	ND	
101. heptachlor epoxide	211	1		ND	ND	
102. alpha-BHC	211	1		**	0.040	
103. beta-BHC	211	1		**	0.030	
104. gamma-BHC	211	1		ND	ND	
105. delta-BHC	211	1		ND	ND	
106. PCB-1242 (b)	211	1		ND	ND	
107. PCB-1254 (b)	211	1		ND	ND	
108. PCB-1221 (b)	211	1		ND	ND	
109. PCB-1232 (c)	211	1		ND	ND	
110. PCB-1248 (c)	211	1		ND	ND	
111. PCB-1260 (c)	211	1		ND	ND	
112. PCB-1016 (c)	211	1		ND	ND	

Table V-18 (Continued)

TITANIUM SAMPLING DATA
ACID LEACHATE AND RINSE WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
113. toxaphene	211	1		ND	ND	
114. antimony	211	1		0.88	0.83	
115. arsenic	211	1		0.27	0.62	
117. beryllium	211	1		0.002	<0.001	
118. cadmium	211	1		0.21	0.19	
119. chromium (total)	211	1		0.27	0.21	
120. copper	211	1		1.7	0.54	
121. cyanide (total)	211	1		<1	10,000	
122. lead	211	1		2.6	2.9	
123. mercury	211	1		0.001	0.002	
124. nickel	211	1		1.3	1.6	
125. selenium	211	1		0.22	0.19	
126. silver	211	1		1.2	0.29	

Table V-18 (Continued)

TITANIUM SAMPLING DATA
ACID LEACHATE AND RINSE WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
127. thallium	211	1		3.0	1.7	
128. zinc	211	1		0.67	0.43	
Nonconventional Pollutants						
Phenolics	211	1		19	9.0	
Titanium	211	1		190	1.7	
Conventional Pollutants						
pH (standard units)	211	1		1.9	ND	

†Sample Type Code: 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
A - Anticipated quality if new process implemented.

*Less than 0.01 mg/l.

**Less than 0.005 mg/l.

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

Table V-19

TITANIUM SAMPLING DATA
ACID LEACHATE
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	320	1	ND	ND		
2. acrolein	320	1	ND	ND		
3. acrylonitrile	320	1	ND	ND		
4. benzene	320	1	ND	ND		
5. benzidine	320	1	ND	ND		
6. carbon tetrachloride	320	1	ND	ND		
7. chlorobenzene	320	1	ND	ND		
8. 1,2,4-trichlorobenzene	320	1	ND	ND		
9. hexachlorobenzene	320	1	ND	ND		
10. 1,2-dichloroethane	320	1	ND	ND		
11. 1,1,1-trichloroethane	320	1	ND	ND		
12. hexachloroethane	320	1	ND	ND		
13. 1,1-dichloroethane	320	1	ND	ND		

Table V-19 (Continued)

TITANIUM SAMPLING DATA
ACID LEACHATE
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
14. 1,1,2-trichloroethane	320	1	ND	ND		
15. 1,1,2,2-tetrachloroethane	320	1	ND	ND		
16. chloroethane	320	1	ND	ND		
17. bis(chloromethyl)ether	320	1	ND	ND		
18. bis(2-chloroethyl)ether	320	1	ND	ND		
19. 2-chloroethyl vinyl ether	320	1	ND	ND		
20. 2-chloronaphthalene	320	1	ND	ND		
21. 2,4,6-trichlorophenol	320	1	ND	ND		
22. p-chloro-m-cresol	320	1	ND	ND		
23. chloroform	320	1	0.100	ND		
24. 2-chlorophenol	320	1	ND	ND		
25. 1,2-dichlorobenzene	320	1	ND	ND		
26. 1,3-dichlorobenzene	320	1	ND	ND		
27. 1,4-dichlorobenzene	320	1	ND	ND		

Table V-19 (Continued)

TITANIUM SAMPLING DATA
ACID LEACHATE
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
28. 3,3'-dichlorobenzidine	320	1	ND	ND		
29. 1,1-dichloroethylene	320	1	ND	ND		
30. 1,2-trans-dichloroethylene	320	1	ND	ND		
31. 2,4-dichlorophenol	320	1	ND	ND		
32. 1,2-dichloropropane	320	1	ND	ND		
33. 1,3-dichloropropene	320	1	ND	ND		
34. 2,4-dimethylphenol	320	1	ND	ND		
35. 2,4-dinitrotoluene	320	1	ND	ND		
36. 2,6-dinitrotoluene	320	1	ND	ND		
37. 1,2-diphenylhydrazine	320	1	ND	ND		
38. ethylbenzene	320	1	ND	ND		
39. fluoranthene	320	1	ND	ND		
40. 4-chlorophenyl phenyl ether	320	1	ND	ND		

Table V-19 (Continued)

TITANIUM SAMPLING DATA
ACID LEACHATE
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
41. 4-bromophenyl phenyl ether	320	1	ND	ND		
42. bis(2-chloroisopropyl)ether	320	1	ND	ND		
43. bis(2-chloroethoxy)methane	320	1	ND	ND		
44. methylene chloride	320	1	0.010	0.410		
45. methyl chloride (chloromethane)	320	1	ND	ND		
46. methyl bromide (bromomethane)	320	1	ND	ND		
47. bromoform (tribromomethane)	320	1	ND	ND		
48. dichlorobromomethane	320	1	0.050	ND		
49. trichlorofluoromethane	320	1	ND	ND		
50. dichlorodifluoromethane	320	1	ND	ND		
51. chlorodibromomethane	320	1	*	ND		
52. hexachlorobutadiene	320	1	ND	ND		
52. hexachlorocyclopentadiene	320	1	ND	ND		
54. isophorone	320	1	ND	ND		

Table V-19 (Continued)

TITANIUM SAMPLING DATA
ACID LEACHATE
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
55. naphthalene	320	1	ND	ND		
56. nitrobenzene	320	1	ND	ND		
57. 2-nitrophenol	320	1	ND	ND		
58. 4-nitrophenol	320	1	ND	ND		
59. 2,4-dinitrophenol	320	1	ND	ND		
60. 4,6-dinitro-o-cresol	320	1	ND	ND		
61. N-nitrosodimethylamine	320	1	ND	ND		
62. N-nitrosodiphenylamine	320	1	ND	ND		
63. N-nitrosodi-n-propylamine	320	1	ND	ND		
64. pentachlorophenol	320	1	ND	*		
65. phenol	320	1	ND	*		
66. bis(2-ethylhexyl) phthalate	320	1	*	*		
67. butyl benzyl phthalate	320	1	ND	*		

Table V-19 (Continued)

TITANIUM SAMPLING DATA
ACID LEACHATE
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
68. di-n-butyl phthalate	320	1	*	*		
69. di-n-octyl phthalate	320	1	ND	ND		
70. diethyl phthalate	320	1	*	ND		
71. dimethyl phthalate	320	1	ND	ND		
72. benzo(a)anthracene	320	1	ND	ND		
73. benzo(a)pyrene	320	1	ND	ND		
74. benzo(b)fluoranthene	320	1	ND	ND		
75. benzo(k)fluoranthane	320	1	ND	ND		
76. chrysene	320	1	ND	ND		
77. acenaphthylene	320	1	ND	ND		
78. anthracene (a)	320	1	ND	ND		
79. benzo(ghi)perylene	320	1	ND	ND		
80. fluorene	320	1	ND	ND		
81. phenanthrene (a)	320	1	ND	ND		

Table V-19 (Continued)

TITANIUM SAMPLING DATA
ACID LEACHATE
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
82. dibenzo(a,h)anthracene	320	1	ND	ND		
83. indeno (1,2,3-c,d)pyrene	320	1	ND	ND		
84. pyrene	320	1	ND	ND		
85. tetrachloroethylene	320	1	ND	ND		
86. toluene	320	1	*	0.067		
87. trichloroethylene	320	1	ND	ND		
88. vinyl chloride (chloroethylene)	320	1	ND	ND		
89. aldrin	320	1	ND	ND		
90. dieldrin	320	1	ND	ND		
91. chlordane	320	1	ND	ND		
92. 4,4'-DDT	320	1	ND	ND		
93. 4,4'-DDE	320	1	ND	ND		
94. 4,4'-DDD	320	1	ND	ND		

Table V-19 (Continued)

TITANIUM SAMPLING DATA
ACID LEACHATE
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
95. alpha-endosulfan	320	1	ND	ND		
96. beta-endosulfan	320	1	ND	ND		
97. endosulfan sulfate	320	1	ND	ND		
98. endrin	320	1	ND	ND		
99. endrin aldehyde	320	1	ND	ND		
100. heptachlor	320	1	ND	ND		
101. heptachlor epoxide	320	1	ND	ND		
102. alpha-BHC	320	1	ND	ND		
103. beta-BHC	320	1	ND	ND		
104. gamma-BHC	320	1	ND	ND		
105. delta-BHC	320	1	ND	ND		
106. PCB-1242 (b)	320	1	ND	ND		
107. PCB-1254 (b)	320	1	ND	ND		
108. PCB-1221 (b)	320	1	ND	ND		

Table V-19 (Continued)

TITANIUM SAMPLING DATA
ACID LEACHATE
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
109. PCB-1232 (c)	320	1	ND	ND		
110. PCB-1248 (c)	320	1	ND	ND		
111. PCB-1260 (c)	320	1	ND	ND		
112. PCB-1016 (c)	320	1	ND	ND		
113. toxaphene	320	1	ND	ND		
114. antimony	320	1	<0.003	0.027		
115. arsenic	320	1	0.004	0.060		
117. beryllium	320	1	<0.0002	<0.0002		
118. cadmium	320	1	0.020	0.28		
119. chromium (total)	320	1	0.040	0.30		
120. copper	320	1	0.060	0.58		
121. cyanide (total)	320	1	0.008	0.010		
122. lead	320	1	0.14	4.0		
123. mercury	320	1	<0.0002	<0.0002		

Table V-19 (Continued)

TITANIUM SAMPLING DATA
ACID LEACHATE
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
124. nickel	320	1	0.075	2.6		
125. selenium	320	1	<0.002	0.009		
126. silver	320	1	<0.0002	0.0014		
127. thallium	320	1	<0.001	3.8		
128. zinc	320	1	0.90	0.48		
Nonconventional Pollutants						
Fluoride	320	1	1.4	0.76		
Phenolics	320	1	14	<0.1		
Conventional Pollutants						
Oil and Grease	320	1	1.1	3.2		
Total Suspended Solids (TSS)	320	1	0	320		
pH (standard units)	320	1		0.6		

Table V-19 (Continued)

TITANIUM SAMPLING DATA
ACID LEACHATE
RAW WASTEWATER

†Sample Type Code:
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
A - Anticipated quality if new process implemented.

*Less than 0.01 mg/l.

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

Table V-20

TITANIUM SAMPLING DATA
LEACHING RINSE WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	319	1	ND	ND		
2. acrolein	319	1	ND	ND		
3. acrylonitrile	319	1	ND	ND		
4. benzene	319	1	ND	ND		
5. benzidine	319	1	ND	ND		
6. carbon tetrachloride	319	1	ND	ND		
7. chlorobenzene	319	1	ND	ND		
8. 1,2,4-trichlorobenzene	319	1	ND	ND		
9. hexachlorobenzene	319	1	ND	ND		
10. 1,2-dichloroethane	319	1	ND	ND		
11. 1,1,1-trichloroethane	319	1	ND	ND		
12. hexachloroethane	319	1	ND	ND		
13. 1,1-dichloroethane	319	1	ND	ND		
14. 1,1,2-trichloroethane	319	1	ND	ND		

Table V-20 (Continued)

TITANIUM SAMPLING DATA
LEACHING RINSE WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
15. 1,1,2,2-tetrachloroethane	319	1	ND	ND		
16. chloroethane	319	1	ND	ND		
17. bis(chloromethyl)ether	319	1	ND	ND		
18. bis(2-chloroethyl)ether	319	1	ND	ND		
19. 2-chloroethyl vinyl ether	319	1	ND	ND		
20. 2-chloronaphthalene	319	1	ND	ND		
21. 2,4,6-trichlorophenol	319	1	ND	ND		
22. p-chloro-m-cresol	319	1	ND	ND		
23. chloroform	319	1	0.100	ND		
24. 2-chlorophenol	319	1	ND	ND		
25. 1,2-dichlorobenzene	319	1	ND	ND		
26. 1,3-dichlorobenzene	319	1	ND	ND		
27. 1,4-dichlorobenzene	319	1	ND	ND		

Table V-20 (Continued)

TITANIUM SAMPLING DATA
LEACHING RINSE WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
28. 3,3'-dichlorobenzidine	319	1	ND	ND		
29. 1,1-dichloroethylene	319	1	ND	ND		
30. 1,2-trans-dichloroethylene	319	1	ND	ND		
31. 2,4-dichlorophenol	319	1	ND	ND		
32. 1,2-dichloropropane	319	1	ND	ND		
33. 1,3-dichloropropene	319	1	ND	ND		
34. 2,4-dimethylphenol	319	1	ND	ND		
35. 2,4-dinitrotoluene	319	1	ND	ND		
36. 2,6-dinitrotoluene	319	1	ND	ND		
37. 1,2-diphenylhydrazine	319	1	ND	ND		
38. ethylbenzene	319	1	ND	ND		
39. fluoranthene	319	1	ND	ND		
40. 4-chlorophenyl phenyl ether	319	1	ND	ND		
41. 4-bromophenyl phenyl ether	319	1	ND	ND		

Table V-20 (Continued)

TITANIUM SAMPLING DATA
LEACHING RINSE WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
42. bis(2-chloroisopropyl)ether	319	1	ND	ND		
43. bis(2-chloroethoxy)methane	319	1	ND	ND		
44. methylene chloride	319	1	0.010	0.035		
45. methyl chloride (chloromethane)	319	1	ND	ND		
46. methyl bromide (bromomethane)	319	1	ND	ND		
47. bromoform (tribromomethane)	319	1	ND	ND		
48. dichlorobromomethane	319	1	0.050	ND		
49. trichlorofluoromethane	319	1	ND	ND		
50. dichlorodifluoromethane	319	1	ND	ND		
51. chlorodibromomethane	319	1	*	ND		
52. hexachlorobutadiene	319	1	ND	ND		
53. hexachlorocyclopentadiene	319	1	ND	ND		
54. isophorone	319	1	ND	ND		

Table V-20 (Continued)

TITANIUM SAMPLING DATA
LEACHING RINSE WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
55. naphthalene	319	1	ND	ND		
56. nitrobenzene	319	1	ND	ND		
57. 2-nitrophenol	319	1	ND	ND		
58. 4-nitrophenol	319	1	ND	ND		
59. 2,4-dinitrophenol	319	1	ND	ND		
60. 4,6-dinitro-o-cresol	319	1	ND	ND		
61. N-nitrosodimethylamine	319	1	ND	ND		
62. N-nitrosodiphenylamine	319	1	ND	ND		
63. N-nitrosodi-n-propylamine	319	1	ND	ND		
64. pentachlorophenol	319	1	ND	ND		
65. phenol	319	1	ND	*		
66. bis(2-ethylhexyl) phthalate	319	1	*	ND		
67. butyl benzyl phthalate	319	1	ND	ND		
68. di-n-butyl phthalate	319	1	*	ND		

Table V-20 (Continued)

TITANIUM SAMPLING DATA
LEACHING RINSE WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
69. di-n-octyl phthalate	319	1	ND	ND		
70. diethyl phthalate	319	1	*	ND		
71. dimethyl phthalate	319	1	ND	ND		
72. benzo(a)anthracene	319	1	ND	ND		
73. benzo(a)pyrene	319	1	ND	ND		
74. benzo(b)fluoranthene	319	1	ND	ND		
75. benzo(k)fluoranthane	319	1	ND	ND		
76. chrysene	319	1	ND	ND		
77. acenaphthylene	319	1	ND	ND		
78. anthracene (a)	319	1	ND	ND		
79. benzo(ghi)perylene	319	1	ND	ND		
80. fluorene	319	1	ND	ND		
81. phenanthrene (a)	319	1	ND	ND		

Table V-20 (Continued)

TITANIUM SAMPLING DATA
LEACHING RINSE WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
82. dibenzo(a,h)anthracene	319	1	ND	ND		
83. indeno (1,2,3-c,d)pyrene	319	1	ND	ND		
84. pyrene	319	1	ND	ND		
85. tetrachloroethylene	319	1	ND	ND		
86. toluene	319	1	*	*		
87. trichloroethylene	319	1	ND	ND		
88. vinyl chloride (chloroethylene)	319	1	ND	ND		
89. aldrin	319	1	ND	ND		
90. dieldrin	319	1	ND	ND		
91. chlordane	319	1	ND	ND		
92. 4,4'-DDT	319	1	ND	ND		
93. 4,4'-DDE	319	1	ND	ND		
94. 4,4'-DDD	319	1	ND	ND		
95. alpha-endosulfan	319	1	ND	ND		

Table V-20 (Continued)

TITANIUM SAMPLING DATA
LEACHING RINSE WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
96. beta-endosulfan	319	1	ND	ND		
97. endosulfan sulfate	319	1	ND	ND		
98. endrin	319	1	ND	ND		
99. endrin aldehyde	319	1	ND	ND		
100. heptachlor	319	1	ND	ND		
101. heptachlor epoxide	319	1	ND	ND		
102. alpha-BHC	319	1	ND	ND		
103. beta-BHC	319	1	ND	ND		
104. gamma-BHC	319	1	ND	ND		
105. delta-BHC	319	1	ND	ND		
106. PCB-1242 (b)	319	1	ND	ND		
107. PCB-1254 (b)	319	1	ND	**		
108. PCB-1221 (b)	319	1	ND	ND		

Table V-20 (Continued)

TITANIUM SAMPLING DATA
LEACHING RINSE WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
109. PCB-1232 (c)	319	1	ND	ND		
110. PCB-1248 (c)	319	1	ND	ND		
111. PCB-1260 (c)	319	1	ND	ND		
112. PCB-1016 (c)	319	1	ND	ND		
113. toxaphene	319	1	ND	ND		
114. antimony	319	1	<0.003	0.074		
115. arsenic	319	1	0.004	0.100		
117. beryllium	319	1	<0.0002	<0.0002		
118. cadmium	319	1	0.020	0.16		
119. chromium (total)	319	1	0.040	1.2		
120. copper	319	1	0.060	2.9		
121. cyanide (total)	319	1	0.008	0.009		
122. lead	319	1	0.14	2.8		
123. mercury	319	1	<0.0002	<0.0002		

Table V-20 (Continued)

TITANIUM SAMPLING DATA
LEACHING RINSE WATER
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
124. nickel	319	1	0.075	7.0		
125. selenium	319	1	<0.002	0.014		
126. silver	319	1	<0.0002	0.034		
127. thallium	319	1	<0.001	2.4		
128. zinc	319	1	0.090	0.54		
Nonconventional Pollutants						
Ammonia Nitrogen	319	1	0.060	0.026		
Fluoride	319	1	1.4	0.99		
Phenolics	319	1	14	6		
Conventional Pollutants						
Total Suspended Solids (TSS)	319	1	0	320		
pH (standard units)	319	1		0.8		

Table V-20 (Continued)

TITANIUM SAMPLING DATA
LEACHING RINSE WATER
RAW WASTEWATER

†Sample Type Code:
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
A - Anticipated quality if new process implemented.

*Less than 0.01 mg/l.

**Less than 0.005 mg/l.

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

Table V-21

TITANIUM SAMPLING DATA
TREATED EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	240	1		ND	ND	
2. acrolein	240	1		ND	ND	
3. acrylonitrile	240	1		ND		
4. benzene	240	1		*	*	
5. benzidine	240	1		ND	ND	
6. carbon tetrachloride	240	1		ND	*	
7. chlorobenzene	240	1		ND	ND	
8. 1,2,4-trichlorobenzene	240	1		ND	ND	
9. hexachlorobenzene	240	1		ND	ND	
10. 1,2-dichloroethane	240	1		ND	ND	
11. 1,1,1-trichloroethane	240	1		*	*	
12. hexachloroethane	240	1		ND	ND	
13. 1,1-dichloroethane	240	1		ND	ND	
14. 1,1,2-trichloroethane	240	1		ND	ND	

Table V-21 (Continued)

TITANIUM SAMPLING DATA
TREATED EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
15. 1,1,2,2-tetrachloroethane	240	1		ND	ND	
16. chloroethane	240	1		ND	ND	
17. bis(chloromethyl)ether	240	1		ND	ND	
18. bis(2-chloroethyl)ether	240	1		ND	ND	
19. 2-chloroethyl vinyl ether	240	1		ND	ND	
20. 2-chloronaphthalene	240	1		ND	ND	
21. 2,4,6-trichlorophenol	240	1		ND	ND	
22. p-chloro-m-cresol	240	1		ND	ND	
23. chloroform	240	1		ND	ND	
24. 2-chlorophenol	240	1		ND	ND	
25. 1,2-dichlorobenzene	240	1		ND	ND	
26. 1,3-dichlorobenzene	240	1		ND	ND	
27. 1,4-dichlorobenzene	240	1		ND	ND	
28. 3,3'-dichlorobenzidine	240	1		ND	ND	

Table V-21 (Continued)

TITANIUM SAMPLING DATA
TREATED EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
29. 1,1-dichloroethylene	240	1		ND	ND	
30. 1,2-trans-dichloroethylene	240	1		ND	ND	
31. 2,4-dichlorophenol	240	1		ND	ND	
32. 1,2-dichloropropane	240	1		ND	ND	
33. 1,3-dichloropropene	240	1		ND	ND	
34. 2,4-dimethylphenol	240	1		ND	ND	
35. 2,4-dinitrotoluene	240	1		ND	ND	
36. 2,6-dinitrotoluene	240	1		ND	ND	
37. 1,2-diphenylhydrazine	240	1		ND	ND	
38. ethylbenzene	240	1		ND	ND	
39. fluoranthene	240	1		ND	ND	
40. 4-chlorophenyl phenyl ether	240	1		ND	ND	
41. 4-bromophenyl phenyl ether	240	1		ND	ND	
42. bis(2-chloroisopropyl)ether	240	1		ND	ND	

Table V-21 (Continued)

TITANIUM SAMPLING DATA
TREATED EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
43. bis(2-chloroethoxy)methane	240	1		ND	ND	
44. methylene chloride	240	1		0.020	*	
45. methyl chloride (chloromethane)	240	1		ND	ND	
46. methyl bromide (bromomethane)	240	1		ND	ND	
47. bromoform (tribromomethane)	240	1		ND	ND	
48. dichlorobromomethane	240	1		ND	ND	
49. trichlorofluoromethane	240	1		ND	ND	
50. dichlorodifluoromethane	240	1		ND	ND	
51. chlorodibromomethane	240	1		ND	ND	
52. hexachlorobutadiene	240	1		ND	ND	
53. hexachlorocyclopentadiene	240	1		ND	ND	
54. isophorone	240	1		ND	ND	
55. naphthalene	240	1		ND	ND	
56. nitrobenzene	240	1		ND	ND	

Table V-21 (Continued)

TITANIUM SAMPLING DATA
TREATED EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
57. 2-nitrophenol	240	1		ND	ND	
58. 4-nitrophenol	240	1		ND	ND	
59. 2,4-dinitrophenol	240	1		ND	ND	
60. 4,6-dinitro-o-cresol	240	1		ND	ND	
61. N-nitrosodimethylamine	240	1		ND	ND	
62. N-nitrosodiphenylamine	240	1		ND	ND	
63. N-nitrosodi-n-propylamine	240	1		ND	ND	
64. pentachlorophenol	240	1		ND	ND	
65. phenol	240	1		ND	ND	ND
66. bis(2-ethylhexyl) phthalate	240	1		*	*	
67. butyl benzyl phthalate	240	1		ND	ND	
68. di-n-butyl phthalate	240	1		*	*	
69. di-n-octyl phthalate	240	1		ND	ND	
70. diethyl phthalate	240	1		ND	*	

Table V-21 (Continued)

TITANIUM SAMPLING DATA
TREATED EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
71. dimethyl phthalate	240	1		ND	ND	
72. benzo(a)anthracene	240	1		ND	ND	
73. benze(a)pyrene	240	1		ND	ND	
74. benzo(b)fluoranthene	240	1		ND	ND	
75. benzo(k)fluoranthane	240	1		ND	ND	
76. chrysene	240	1		ND	ND	
77. acenaphthylene	240	1		ND	ND	
78. anthracene (a)	240	1		ND	ND	
79. benzo(ghi)perylene	240	1		ND	ND	
80. fluorene	240	1		ND	ND	
81. phenanthrene (a)	240	1		ND	ND	
82. dibenzo(a,h)anthracene	240	1		ND	ND	
83. indeno (1,2,3-c,d)pyrene	240	1		ND	ND	
84. pyrene	240	1		ND	ND	

Table V-21 (Continued)

TITANIUM SAMPLING DATA
TREATED EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
85. tetrachloroethylene	240	1		ND	ND	
86. toluene	240	1		ND	ND	
87. trichloroethylene	240	1		ND	ND	
88. vinyl chloride (chloroethylene)	240	1		ND	ND	
89. aldrin	240	1		ND	ND	
90. dieldrin	240	1		ND	ND	
91. chlordane	240	1		ND	ND	
92. 4,4'-DDT	240	1		ND	ND	
93. 4,4'-DDE	240	1		ND	ND	
94. 4,4'-DDD	240	1		ND	ND	
95. alpha-endosulfan	240	1		ND	ND	
96. beta-endosulfan	240	1		ND	ND	
97. endosulfan sulfate	240	1		ND	ND	
98. endrin	240	1		ND	ND	

Table V-21 (Continued)

TITANIUM SAMPLING DATA
TREATED EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
99. endrin aldehyde	240	1		ND	ND	
100. heptachlor	240	1		ND	ND	
101. heptachlor epoxide	240	1		ND	ND	
102. alpha-BHC	240	1		ND	ND	
103. beta-BHC	240	1		ND	ND	
104. gamma-BHC	240	1		ND	ND	
105. delta-BHC	240	1		ND	ND	
106. PCB-1242 (b)	240	1		ND	ND	
107. PCB-1254 (b)	240	1		ND	ND	
108. PCB-1221 (b)	240	1		ND	ND	
109. PCB-1232 (c)	240	1		ND	ND	
110. PCB-1248 (c)	240	1		ND	ND	
111. PCB-1260 (c)	240	1		ND	ND	
112. PCB-1016 (c)	240	1		ND	ND	

Table V-21 (Continued)

TITANIUM SAMPLING DATA
TREATED EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
113. toxaphene	240	1		ND	ND	
114. antimony	240	1		0.031	0.014	
115. arsenic	240	1		<0.001	<0.001	
117. beryllium	240	1		<0.001	<0.001	
118. cadmium	240	1		<0.001	<0.001	
119. chromium (total)	240	1		0.001	<0.001	
120. copper	240	1		0.150	0.140	
121. cyanide (total)	240	1		0.060	0.068	
122. lead	240	1		0.016	0.020	
123. mercury	240	1		0.001	<0.001	
124. nickel	240	1		<0.001	0.11	
125. selenium	240	1		0.065	0.028	
126. silver	240	1		0.016	0.001	
127. thallium	240	1		0.13	0.12	
128. zinc	240	1		0.020	0.050	

Table V-21 (Continued)

TITANIUM SAMPLING DATA
TREATED EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants						
Ammonia Nitrogen	240	1		1.1	0.38	
Phenolics	240	1		<1	<1	
Titanium	240	1		0.40	1.4	
Conventional Pollutants						
Oil and Grease	240	1		0.9	69	

†Sample Type Code:
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
A - Anticipated quality if new process implemented.

*Less than 0.01 mg/l.

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

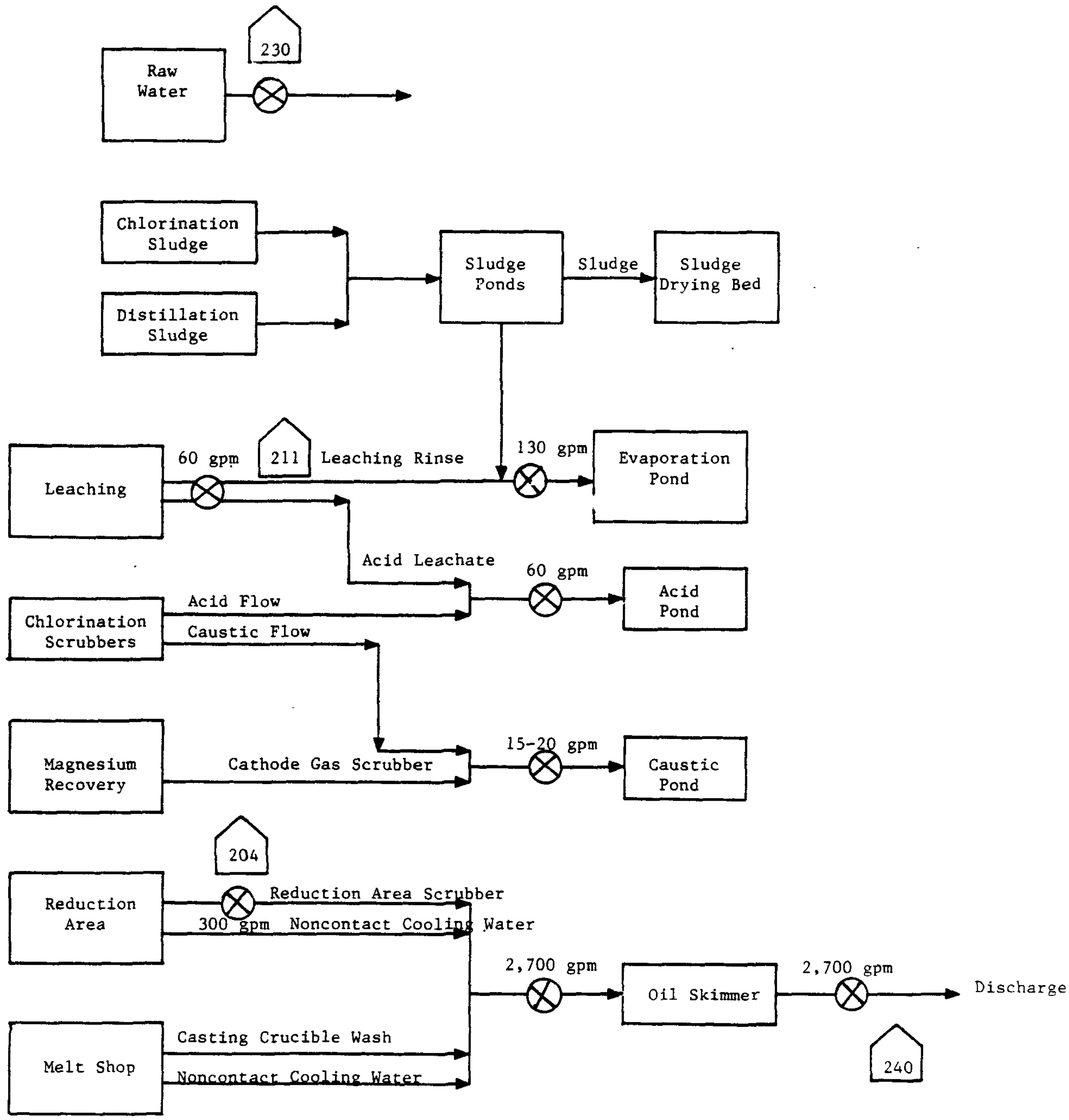

Figure V-1

SAMPLING SITES AT TITANIUM PLANT B

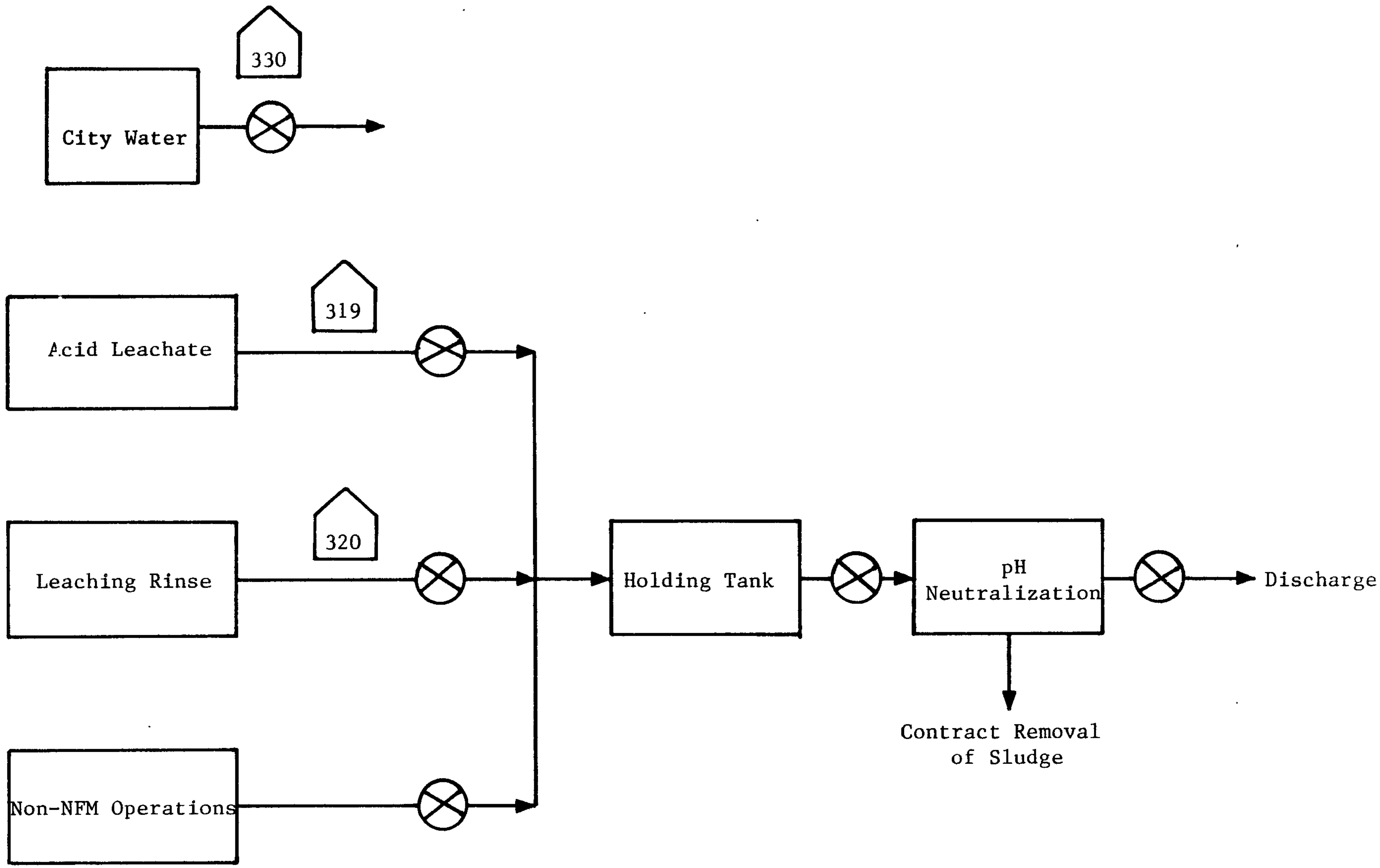

Figure V-2

SAMPLING SITES AT TITANIUM PLANT C

PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

SECTION VI

SELECTION OF POLLUTANT PARAMETERS

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

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

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

CONVENTIONAL AND NONCONVENTIONAL POLLUTANT PARAMETERS

This study considered samples from the primary and secondary titanium subcategory for three conventional pollutant parameters (oil and grease, total suspended solids, and pH) and six nonconventional pollutant parameters (ammonia, chloride, fluoride, magnesium, phenolics (4AAP), and titanium).

CONVENTIONAL AND NONCONVENTIONAL POLLUTANT PARAMETERS SELECTED

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

titanium
fluoride
oil and grease
total suspended solids (TSS)

pH

Based on an examination of the raw materials and production processes employed in the primary and secondary titanium subcategory, it is expected that treatable concentrations of titanium are present in the wastewater generated in this subcategory. Titanium is soluble in dilute acid, and acid solutions are commonly used in primary and secondary titanium processing operations. In addition, titanium may be present as suspended particulates from powder cleaning operations. Therefore, titanium is selected for limitation in this subcategory.

The principal source of fluoride in this subcategory is the hydrofluoric acid used in scrap pickling operations. Although no fluoride sampling data are available, the acid pickle and wash water is expected to contain fluoride at a concentration well above the 14.5 mg/l concentration considered achievable by identified treatment technology. Therefore, fluoride is selected for limitation in this subcategory.

The principal sources of oil and grease in this subcategory are the scrap washing and casting operations. Oil and grease concentrations in a total of three samples range from 3.2 to 190 mg/l. Two of the three concentrations are greater than the 10 mg/l concentration considered achievable by identified treatment technology. Thus, oil and grease is selected for limitation.

Total suspended solids (TSS) concentrations in 11 samples range from less than 1 mg/l to 330 mg/l. Nine of the observed concentrations are greater than the 2.6 mg/l concentration considered achievable by identified treatment technology. Most of the methods used to remove toxic metals do so by converting these metals to precipitates. Meeting a limitation on total suspended solids ensures that sedimentation to remove precipitated toxic metals has been effective. For these reasons, total suspended solids are selected for limitation in this subcategory.

The pH values observed ranged from 0.1 to 7.4. Effective removal of toxic metals by precipitation requires careful control of pH. Therefore, pH is selected for limitation in this subcategory.

TOXIC POLLUTANTS

The frequency of occurrence of the toxic pollutants in the wastewater samples taken is presented in Table VI-1. These data provide the basis for the categorization of specific pollutants, as discussed below. Table VI-1 is based on the raw wastewater data from streams 204, 211, 319, and 320 (see Section V) and from data for seven waste streams contained in the confidential record. Treatment plant and source water samples were not considered in this frequency count.

TOXIC POLLUTANTS NEVER DETECTED

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

1. Acenaphthene
2. Acrolein
3. Acrylonitrile
5. Benzidine
6. Carbon tetrachloride (tetrachloromethane)
7. Chlorobenzene
8. 1,2,4-trichlorobenzene
9. Hexachlorobenzene
10. 1,2-dichloroethane
12. Hexachloroethane
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
22. Parachlorometa cresol
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
32. 1,2-dichloropropane
33. 1,2-dichloropropylene (1,3-dichloropropene)
34. 2,4-dimethylphenol
35. 2,4-dinitrotoluene
37. 1,2-diphenylhydrazine
38. Ethylbenzene
39. Fluoranthene
40. 4-chlorophenyl phenyl ether
41. 4-bromophenyl phenyl ether
42. Bis (2-chloroisopropyl) ether
43. Bis (2-chloroethoxy) methane
45. Methyl chloride (dichloromethane)
46. Methyl bromide (bromomethane)
47. Bromoform (tribromomethane)
49. Trichlorofluoromethane (Deleted)
50. Dichlorodifluoromethane (Deleted)
52. Hexachlorobutadiene
53. Hexachloromyclopentadiene
54. Isophorone
55. Naphthalene
56. Nitrobenzene
58. 4-nitrophenol

59. 2,4-dinitrophenol
60. 4,6-dinitro-o-cresol
61. N-nitrosodimethylamine
62. N-nitrosodiphenylamine
63. N-nitrosodi-n-propylamine
72. Benzo(a)anthracene (1,2-benzanthracene)
73. Benzo(a)pyrene (3,4-benzopyrene)
74. 3,4-benzofluroanthene
76. Chrysene
77. Acenaphthylene
78. Anthracene
79. Benzo(ghi)perylene (1, 12-benzoperylene)
80. Fluorene
81. Phenanthene
82. Dibenzo(a,h)anthracene (1,2,5,6-dibenzanthracene)
83. Indeno (1,2,-cd)pyrene (2,3-o-phenylenepyrene)
84. Pyrene
85. Tetrachloroethylene
89. Aldrin
90. Dieldrin
91. Chlordane (technical mixture and metabolities)
92. 4,4'-DDT
93. 4,4'-DDE(p,p'DDX)
96. B-endosulfan-Beta
97. Endoaulfan sulfate
98. Endrin
99. Endrin aldehyde
100. Heptachlor
101. Heptachlor epoxide
104. Gamma - BHC (lindane)
105. Delta - BHC
106. PCB-1242 (Arochlor 1242)
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-tetra chlorodibenzo-p-dioxin (TCDD)

TOXIC POLLUTANTS NEVER FOUND ABOVE THEIR ANALYTICAL QUANTIFICATION CONCENTRATION

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

13. 1,1-dichloroethane
21. 2,4,6-trichlorophenol
23. chloroform (trichloromethane)
31. 2,4-dichlorophenol

36. 2,6-dinitrotoluene
48. dichlorobromomethane
51. chlorodibromomethane
57. 2-nitrophenol
70. diethyl phthalate
71. diemethyl phthalate
75. benzo(k)fluoranthene (11, 12-benzofluoranthene)
88. vinyl chloride (chloroethylene)
107. PCB-1254 (Arochlor 1254)
117. beryllium

TOXIC POLLUTANTS PRESENT BELOW CONCENTRATIONS ACHIEVABLE BY TREATMENT

The pollutant listed below is not selected for consideration in establishing limitations because it was not found in any wastewater samples from this subcategory above concentrations considered achievable by existing or available treatment technologies.

123. Mercury

Mercury was detected above its analytical quantification limit in seven of 14 samples from three plants. These samples were below the 0.036 mg/l concentration considered achievable by identified treatment technology. Therefore, mercury is not selected for limitation.

TOXIC POLLUTANTS DETECTED IN A SMALL NUMBER OF SOURCES

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

4. benzene
11. 1,1,1-trichloroethane
44. methylene chloride
64. pentachlorophenol
65. phenol
66. bis(2-ethylhexyl) phthalate
67. butyl benzyl phthalate
68. di-n-butyl phthalate
69. di-n-octyl phthalate
86. toluene
87. trichloroethylene
94. 4,4'-DDD(p,p'TDE)
95. a-endosulfan-Alpha
102. Alpha - BHC
103. Beta - BHC
115. arsenic
121. cyanide
125. selenium

126. silver

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

Benzene was found above its treatable concentration of 0.01 mg/l in eight of 13 samples. The maximum observed concentration is 0.05 mg/l. The Agency has no reason to believe that treatable concentrations of benzene should be present in primary and secondary titanium wastewaters. For this reason, and because benzene was also detected in the source water, benzene is not selected for limitation.

1,1,1-Trichloroethane was found in concentrations above its analytical quantification limit in three of 13 samples from three plants. All three of these samples were from a single plant and had concentrations above the 0.01 mg/l concentration considered achievable by identified treatment technology. Because it was found at only one plant, indicating that the pollutant is probably site-specific, 1, 1, 1-trichloroethane is not selected for limitation.

Methylene chloride was found above its treatable concentration in 8 of 13 samples from three plants at a maximum concentration of 0.410 mg/l. This pollutant is not attributable to specific materials or processes associated with titanium production. It is, however, a common solvent used in analytical laboratories. Since the possibility of sample contamination is likely, methylene chloride is not selected for limitation.

Pentachlorophenol was found at a concentration above its analytical quantification limit in one of 15 samples from three plants. This sample had a concentration above the 0.01 mg/l concentration considered achievable by identified treatment technology. Because it was found at only one plant, indicating that the pollutant is probably site-specific, pentachlorophenol is not selected for limitation.

Phenol was detected above its treatable concentration of 0.010 mg/l in one out of 15 samples analyzed at a concentration of 0.013 mg/l. Because it was found at a concentration only slightly above treatable, in only one out of fifteen samples, phenol is not selected for regulation.

Bis(2-ethylhexyl) phthalate was found above its treatable concentration of 0.01 mg/l in five of 15 samples from three plants. This compound is a plasticizer commonly used in laboratory and field sampling equipment and is not formed as a by-product in this subcategory. Therefore, bis(2-ethylhexyl) phthalate is not selected for limitation.

Butyl benzyl phthalate was found above its treatable concentration of 0.01 mg/l in two of 15 samples from three plants. This compound is a plasticizer commonly used in laboratory and field sampling equipment and is not formed as a by-product in this subcategory. Therefore, butyl benzyl phthalate is not selected for limitation.

Di-n-butyl phthalate was found above its treatable concentration of 0.01 mg/l in one of 15 samples from three plants. This compound is a plasticizer commonly used in laboratory and field sampling equipment and is not formed as a by-product in this subcategory. Therefore, di-n-butyl phthalate is not selected for limitation.

Di-n-octyl phthalate was found at a concentration above its analytical quantification limit in one of 15 samples from three plants. This sample had a concentration above the 0.01 mg/l concentration considered achievable by identified treatment technology. Because it was found at only one plant, indicating that the pollutant is probably site-specific, di-n-octyl phthalate is not selected for limitation.

Toluene was found in concentrations above its treatable concentration of 0.01 mg/l in three of 13 samples at a maximum concentration of 0.067 mg/l. Because it was detected at a treatable concentration in only three out of thirteen samples, and because it was also detected in the source water, toluene is not selected for limitation.

Trichloroethylene was found in concentrations above its treatable concentration of 0.01 mg/l in three of 13 samples at a maximum concentration of 0.016 mg/l. For this reason trichloroethylene is not selected for limitation.

4,4'-DDD(p,p'TDE) was found at a concentration above its analytical quantification limit in one of 15 samples from three plants. This sample had a concentration above the 0.01 mg/l concentration considered achievable by identified treatment technology. Because it was found at only one plant, indicating that the pollutant is probably site-specific, 4,4'-DDD(p,p'TDE) is not selected for limitation.

a-Endosulfan-Alpha was found at a concentration above its analytical quantification limit in one of 15 samples from three plants. This sample had a concentration above the 0.01 mg/l concentration considered achievable by identified treatment technology. Because it was found at only one plant, indicating that the pollutant is probably site-specific, a-endosulfan-Alpha is not selected for limitation.

a-BHC-Alpha was found at a concentration above its analytical quantification limit in one of 15 samples from three plants. This sample had a concentration above the 0.01 mg/l concentration considered achievable by identified treatment technology. Because it was found at only one plant, indicating that the pollutant is probably site-specific, a-BHC-Alpha is not selected for limitation.

b-BHC-Beta was found at a concentration above its analytical quantification limit in one of 15 samples from three plants. This sample had a concentration above the 0.01 mg/l concentration considered achievable by identified treatment technology. Because it was found at only one plant, indicating that the pollutant is probably site-specific, a-BHC-Beta is not selected for limitation.

Arsenic was found in concentrations above its analytical quantification limit in seven of 14 samples from three plants. Only one of the seven samples had a concentration above the 0.34 mg/l concentration considered achievable by identified treatment technology. Because it was found at only one plant, indicating that the pollutant is probably site-specific, arsenic is not selected for limitation.

Cyanide was found in concentrations above its analytical quantification limit in three of 14 samples from three plants. Two of the samples from two plants had concentrations above the 0.047 mg/l concentration considered achievable by identified treatment technology. A recorded value of 10,000 mg/l for one of these samples is believed to be in error because a sample taken at the same point on the next day had a cyanide concentration of less than 1 mg/l. Because it was found above treatable levels only once in the remaining samples, cyanide is not selected for limitation.

Selenium was found in concentrations above its analytical quantification limit in five of 14 samples from three plants. Only one of the five samples had a concentration above the 0.20 mg/l concentration considered achievable by identified treatment technology. Because it was found at only one plant, indicating that the pollutant is probably site-specific, selenium is not selected for limitation.

Silver was found in concentrations above its analytical quantification limit in three of 14 samples from three plants. Two of the three samples, both of which were from a single plant, had concentrations above the 0.07 mg/l concentration considered achievable by identified treatment technology. Because it was found at only one plant, indicating that the pollutant is probably site-specific, silver is not selected for limitation.

TOXIC POLLUTANTS SELECTED FOR FURTHER CONSIDERATION IN ESTABLISHING LIMITATIONS AND STANDARDS

The toxic pollutants listed below have been detected in quantities above their treatability concentrations. All these pollutants are under consideration to be selected in establishing limitations and standards for this subcategory. The toxic pollutants listed below are each discussed following the list.

114. antimony
118. cadmium
119. chromium (Total)
120. copper
122. lead
124. nickel
127. thallium
128. zinc

Antimony was found above its analytical quantification limit in three of 14 samples from three plants with concentrations ranging from 0.83 to 0.95 mg/l. All three of those samples, representing two plants, were above the 0.47 mg/l treatability concentration. Therefore, antimony is selected for further consideration for limitation.

Cadmium was found above its analytical quantification limit in six of 14 samples from three plants with concentrations ranging from 0.002 to 0.28 mg/l. Five of those samples, representing three plants, were above the 0.049 mg/l treatability concentration. Therefore, cadmium is selected for further consideration for limitation.

Chromium was found above its analytical quantification limit in 12 of 14 samples from three plants with concentrations ranging from 0.008 to 240 mg/l. Eight of those samples, representing three plants, were above the 0.07 mg/l treatability concentration. Therefore, chromium is selected for further consideration for limitation.

Copper was found above its analytical quantification limit in 12 of 14 samples from three plants with concentrations ranging from 0.009 to 2.9 mg/l. Five of those samples, representing three plants, were above the 0.39 mg/l treatability concentration. Therefore, copper is selected for further consideration for limitation.

Lead was found above its analytical quantification limit in eight of 14 samples from three plants with concentrations ranging from 0.043 to 4.0 mg/l. Six of those samples, representing three plants, were above the 0.08 mg/l treatability concentration. Therefore, lead is selected for further consideration for limitation.

Nickel was found above its analytical quantification limit in 14 of 14 samples from three plants with concentrations ranging from 0.010 to 7.2 mg/l. Eight of those samples, representing three plants, were above the 0.22 mg/l treatability concentration.

Therefore, nickel is selected for further consideration for limitation.

Thallium was found above its analytical quantification limit in six of 14 samples from three plants with concentrations ranging from 0.12 to 3.8 mg/l. Five of those samples, representing three plants, were above the 0.34 mg/l treatability concentration. Therefore, thallium is selected for further consideration for limitation.

Zinc was found above its analytical quantification limit in nine of 14 samples from three plants with concentrations ranging from 0.05 to 0.67 mg/l. Six of those samples, representing three plants, were above the 0.23 mg/l treatability concentration. Therefore, zinc is selected for further consideration for limition.

Table VI-1

FREQUENCY OF OCCURRENCE OF TOXIC POLLUTANTS
PRIMARY AND SECONDARY TITANIUM
RAW WASTEWATER

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

Table VI-1 (Continued)

FREQUENCY OF OCCURRENCE OF TOXIC POLLUTANTS PRIMARY AND SECONDARY TITANIUM RAW WASTEWATER

Pollutant	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentration (mg/l)(b)	Number of Streams Analyzed	Number of Samples Analyzed	ND	Detected Below Quantification Concentration	Detected Below Treatable Concentration	Detected Above Treatable Concentration
35. 2,4-dinitrotoluene	0.010	0.01	12	15	15			
36. 2,6-dinitrotoluene	0.010	0.01	12	15	14	1		
37. 1,2-diphenylhydrazine	0.010	0.01	12	15	15			
38. ethylbenzene	0.010	0.01	12	13	13			
39. fluoranthene	0.010	0.01	12	15	15			
40. 4-chlorophenyl phenyl ether	0.010	0.01	12	15	15			
41. 4-bromophenyl phenyl ether	0.010	0.01	12	15	15			
42. bis(2-chloroisopropyl) ether	0.010	0.01	12	15	15			
43. bis(2-chloroethoxy) methane	0.010	0.01	12	15	15			
44. methylene chloride	0.010	0.01	12	13	1	4		8
45. methyl chloride	0.010	0.01	12	13	13			
46. methyl bromide	0.010	0.01	12	13	13			
47. bromoform	0.010	0.01	12	13	13			
48. dichlorobromomethane	0.010	0.01	12	13	12	1		
49. trichlorofluoromethane	0.010	0.01	12	13	13			
50. dichlorodifluoromethane	0.010	0.01	12	13	13			
51. chlorodibromomethane	0.010	0.01	12	13	12	1		
52. hexachlorobutadiene	0.010	0.01	12	15	15			
53. hexachlorocyclopentadiene	0.010	0.01	12	15	15			
54. isophorone	0.010	0.01	12	15	15			
55. naphthalene	0.010	0.01	12	15	15			
56. nitrobenzene	0.010	0.01	12	15	15			
57. 2-nitrophenol	0.010	0.01	12	15	14	1		
58. 4-nitrophenol	0.010	0.01	12	15	15			
59. 2,4-dinitrophenol	0.010	0.01	12	15	15			
60. 4,6-dinitro-o-cresol	0.010	0.01	12	15	15			
61. N-nitrosodimethylamine	0.010	0.01	12	15	15			
62. N-nitrosodiphenylamine	0.010	0.01	12	15	15			
63. N-nitrosodi-n-propylamine	0.010	0.01	12	15	15			
64. pentachlorophenol	0.010	0.01	12	15	13	1		1
65. phenol	0.010	0.01	12	15	6	7	1	1
66. bis(2-ethylhexyl) phthalate	0.010	0.01	12	15	3	7		5

Table VI-1 (Continued)

FREQUENCY OF OCCURRENCE OF TOXIC POLLUTANTS PRIMARY AND SECONDARY TITANIUM RAW WASTEWATER

Pollutant	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentration (mg/l)(b)	Number of Streams Analyzed	Number of Samples Analyzed	ND	Detected Below Quantification Concentration	Detected Below Treatable Concentration	Detected Above Treatable Concentration
67. butyl benzyl phthalate	0.010	0.01	12	15	11	2		2
68. di-n-butyl phthalate	0.010	0.01	12	15	5	9		1
69. di-n-octyl phthalate	0.010	0.01	12	15	14			1
70. diethyl phthalate	0.010	0.01	12	15	10	5		
71. dimethyl phthalate	0.010	0.01	12	15	14	1		
72. benzo(a)anthracene	0.010	0.01	12	15	15			
73. benzo(a)pyrene	0.010	0.01	12	15	15			
74. 3,4-benzofluoranthene	0.010	0.01	12	15	15			
75. benzo(k)fluoranthene	0.010	0.01	12	15	14	1		
76. chrysene	0.010	0.01	12	15	15			
77. acenaphthylene	0.010	0.01	12	15	15			
78. anthracene (c)	0.010	0.01	12	15	15			
79. benzo(ghi)perylene	0.010	0.01	12	15	15			
80. fluorene	0.010	0.01	12	15	15			
81. phenanthrene (c)	0.010	0.01	12	15	15			
82. dibenzo(a,h)anthracene	0.010	0.01	12	15	15			
83. indeno(1,2,3-cd)pyrene	0.010	0.01	12	15	15			
84. pyrene	0.010	0.01	12	15	15			
85. tetrachloroethylene	0.010	0.01	12	13	13			
86. toluene	0.010	0.01	12	13	1	9		3
87. trichloroethylene	0.010	0.01	12	13	9	1		3
88. vinyl chloride	0.010	0.01	12	13	12	1		
89. aldrin	0.005	0.01	12	15	15			
90. dieldrin	0.005	0.01	12	15	15			
91. chlordane	0.005	0.01	12	15	15			
92. 4,4'-DDT	0.005	0.01	12	15	15			
93. 4,4'-DDE	0.005	0.01	12	15	15			
94. 4,4'-DDD	0.005	0.01	12	15	14			1
95. alpha-endosulfan	0.005	0.01	12	15	14			1
96. beta-endosulfan	0.005	0.01	12	15	15			
97. endosulfan sulfate	0.005	0.01	12	15	15			
98. endrin	0.005	0.01	12	15	15			
99. endrin aldehyde	0.005	0.01	12	15	15			
100. heptachlor	0.005	0.01	12	15	15			
101. heptachlor epoxide	0.005	0.01	12	15	15			

Table VI-1 (Continued)

FREQUENCY OF OCCURRENCE OF TOXIC POLLUTANTS PRIMARY AND SECONDARY TITANIUM RAW WASTEWATER

Pollutant		Analytical Quantification Concentration (mg/l)(a)	Treatable Concentration (mg/l)(b)	Number of Streams Analyzed	Number of Samples Analyzed	ND	Detected Below Quantification Concentration	Detected Below Treatable Concentration	Detected Above Treatable Concentration
102. alpha-BHC		0.005	0.01	12	15	13	1		1
103. beta-BHC		0.005	0.01	12	15	13	1		1
104. gamma-BHC		0.005	0.01	12	15	15			
105. delta-BHC		0.005	0.01	12	15	15			
106. PCB-1242	(d)	0.005	0.01	12	15	15			
107. PCB-1254	(d)	0.005	0.01	12	15	14	1		
108. PCB-1221	(d)	0.005	0.01	12	15	15			
109. PCB-1232	(e)	0.005	0.01	12	15	15			
110. PCB-1248	(e)	0.005	0.01	12	15	15			
111. PCB-1260	(e)	0.005	0.01	12	15	15			
112. PCB-1016	(e)	0.005	0.01	12	15	15			
113. toxaphene		0.005	0.01	12	15	15			
114. antimony		0.100	0.47	11	14		11		3
115. arsenic		0.010	0.34	11	14		7	6	1
116. asbestos				0					
117. beryllium		0.010	0.20	11	14		14		
118. cadmium		0.002	0.049	11	14		8	1	5
119. chromium		0.005	0.07	11	14		2	4	8
120. copper		0.009	0.39	11	14		2	7	5
121. cyanide	(f)	0.02	0.047	11	14		11	1	2
122. lead		0.020	0.08	11	14		6	2	6
123. mercury		0.0001	0.036	11	14		7	7	
124. nickel		0.005	0.22	11	14			6	8
125. selenium		0.01	0.20	11	14		9	4	1
126. silver		0.02	0.07	11	14		11	1	2
127. thallium		0.100	0.34	11	14		8	1	5
128. zinc		0.050	0.23	11	14		5	3	6
129. 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)				0					

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

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

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

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

SECTION VII

CONTROL AND TREATMENT TECHNOLOGIES

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

CURRENT CONTROL AND TREATMENT PRACTICES

Control and treatment technologies are discussed in general in Section VII of the General Development Document. The basic principles of these technologies and the applicability to wastewater similar to that found in this subcategory are presented there. This section presents a summary of the control and treatment technologies that are currently applied to each of the sources generating wastewater in this subcategory. As discussed in Section V, wastewater associated with the primary and secondary titanium subcategory is characterized by the presence of the toxic metal pollutants, suspended solids, and oil and grease. This analysis is supported by the raw (untreated) wastewater data presented for specific sources 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. Five plants in this subcategory currently have combined treatment systems, two of which consist of lime precipitation and sedimentation. Three options have been selected for consideration for BPT, BAT, NSPS, and pretreatment in this subcategory, based on combined treatment of these compatible waste streams.

CHLORINATION OFF-GAS WET AIR POLLUTION CONTROL

After rutile ore is chlorinated, titanium tetrachloride is recovered from the chlorination off-gases by fractional distillation using a series of condensers. Wet air pollution control equipment is used at two plants to remove chlorine gas and particulates. One of these plants achieves zero discharge of this stream by reuse in other processes. The other plant discharges this stream to a sewer after pH adjustment and sedimentation. That plant does not recycle this wastewater.

CHLORINATION AREA-VENT WET AIR POLLUTION CONTROL

Ventilation vapors from the chlorination area are routed to wet air pollution control equipment before being released to the atmosphere. At the one plant that reports a separate waste stream for area vent scrubbers, the wastewater generated is discharged to a sewer after pH adjustment and sedimentation. That plant does not recycle this wastewater.

$TiCl_4$ HANDLING WET AIR POLLUTION CONTROL

Of the four plants that use titanium tetrachloride as a raw material in titanium production, one reports wet air pollution control for the handling operations. Although not clearly specified in the dcp, there is reason to believe that this plant recycles the scrubber water. The existing treatment for this waste stream consists of pH adjustment and sedimentation before direct discharge.

REDUCTION AREA WET AIR POLLUTION CONTROL

The reduction of $TiCl_4$ to titanium metal is accomplished by a batch process using either sodium or magnesium as the reducing agent. No air pollution control was reported for reduction by sodium, but in the four plants which practice magnesium reduction in an inert atmosphere, a waste stream is generated by the water scrubbers used to treat vent tap vapors. None of those four plants report recycle or reuse of this scrubber water which contains treatable concentrations of metals and chloride. One plant discharges this stream without treatment. The existing treatment at the other three plants consists of pH adjustment or lime addition followed by sedimentation.

MELT CELL WET AIR POLLUTION CONTROL

During the reduction of $TiCl_4$ by magnesium, molten magnesium chloride is tapped off as formed and transferred to electrolytic cells for magnesium recovery. In one plant, during periods of rapid $MgCl_2$ formation, excess $MgCl_2$ is stored in a melt cell before continuing on to the electrolytic cell. Vapors from the melt cell are collected and converted to hydrochloric acid in a water scrubber. That plant does not recycle the scrubber water before discharging it. The existing treatment for this wastewater consists of lime precipitation and sedimentation.

CATHODE GAS WET AIR POLLUTION CONTROL

Three plants report electrolytic recovery of magnesium from the $MgCl_2$ formed during the reduction operation. Depending on the type of electrolytic cell used, a cathode gas may be generated.

This gas is passed through a baghouse and a caustic tower, resulting in a caustic wastewater. Two plants report this stream, one of which does not recycle the scrubber water. Information on water use and recycle at the other plant is not available. Zero discharge of the cathode gas scrubber water is achieved at one plant using evaporation ponds. The existing treatment for this stream at the other plant consists of lime precipitation and sedimentation.

CHLORINE LIQUEFACTION WET AIR POLLUTION CONTROL

The electrolytic reduction of $MgCl_2$ generates chlorine gas which may be returned to the chlorination or reduction processes or liquefied and sold. In one plant, wet air pollution control is provided for the chlorine-saturated air which escapes from the liquefaction process. The wastewater generated is discharged after lime precipitation and sedimentation. That plant does not recycle this wastewater.

SODIUM REDUCTION CONTAINER RECONDITIONING WASH WATER

When the reduction of $TiCl_4$ to titanium metal is complete, the titanium cake is chipped out of the reaction vessel and further processed by crushing and leaching. The reaction container can then be cleaned and returned to the reduction process for reuse. Only the plant using sodium in its reduction process reports a wastewater flow from the container reconditioning operation. The existing treatment for this stream consists of pH adjustment and sedimentation.

CHIP CRUSHING WET AIR POLLUTION CONTROL

The titanium cake formed by reduction and chipped out of the reduction container is crushed to increase the effectiveness of subsequent purification steps. Two plants report wet air pollution control for the crushing operation. One achieves zero discharge using evaporation ponds. The other practices total reuse of this stream in processes unrelated to titanium manufacturing.

ACID LEACHATE AND RINSE WATER

Purification of the crushed titanium chips can be accomplished either by vacuum distillation or by leaching. Vacuum distillation, practiced by one plant, does not result in the production of a wastewater stream. Acid leaching with HCl or HNO_3 followed by a water rinse produces acidic wastewater streams at the four plants reporting this purification process. Two of those four have zero discharge of this stream: one by total reuse and one by evaporation in ponds. The two remaining plants discharge this stream after treatment by pH adjustment or lime addition followed by sedimentation.

SPONGE CRUSHING AND SCREENING WET AIR POLLUTION CONTROL

One plant reports a wastewater flow from a dust control scrubber associated with the crushing, screening, and storage of leached titanium powder. The existing treatment for this stream consists of pH adjustment and sedimentation. The plant does not recycle this wastewater.

ACID PICKLE AND WASH WATER

Three plants report the use of acid pickling to remove surface oxides from massive titanium scrap before alloying and casting. Two plants reporting this waste stream achieve zero discharge: one by contract removal and one by using evaporation ponds. Information on water use and discharge rates at the third plant is not available.

SCRAP MILLING WET AIR POLLUTION CONTROL

Pure titanium scrap and turnings can be alloyed with titanium sponge and cast into ingots. One plant mills the scrap and provides wet air pollution control. That plant achieves zero discharge of this stream without recycle by using evaporation ponds.

SCRAP DETERGENT WASH WATER

Scrap material such as titanium turnings must be washed with a detergent solution to remove oil and dirt being cast into ingots. The resulting oily, caustic waste stream is reported by two plants, one of which achieves zero discharge using evaporation ponds. The other plant discharges this streams after treatment by lime precipitation and sedimentation.

CASTING CRUCIBLE WASH WATER

Two plants report a waste stream from the washing of crucibles used in casting operations. At one plant, this oily wastewater is combined with another stream and treated by oil skimming before being discharged directly. The existing treatment at the other plant consists of lime precipitation and sedimentation.

CASTING CONTACT COOLING WATER

One plant reports the use of contact cooling water from a cooling pond in its casting operations. This waste stream is characterized by treatable concentrations of oil and grease, metals, and solids. The existing treatment for casting contact cooling water consists of lime precipitation and sedimentation.

CONTROL AND TREATMENT OPTIONS

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

OPTION A

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

OPTION B

Option B for the primary and secondary titanium subcategory consists of all treatment requirements of Option A (oil skimming pretreatment where required, chemical precipitation, and sedimentation) plus control technologies to reduce the volume of wastewater discharged. Water recycle and reuse are the principal control mechanisms for flow reduction.

OPTION C

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

SECTION VIII

COSTS, ENERGY, AND NONWATER QUALITY ASPECTS

This section presents a summary of compliance costs for the primary and secondary titanium 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 and secondary titanium subcategory.

TREATMENT OPTIONS FOR EXISTING SOURCES

As discussed in Section VII, three treatment options have been developed for existing primary and secondary titanium sources. The treatment schemes for each option are summarized below and schematically presented in Figures X-1 through X-3.

OPTION A

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

OPTION B

Option B consists of in-process flow reduction measures, oil/water separation preliminary treatment where required, and chemical precipitation and sedimentation end-of-pipe technology. The in-process flow reduction measure consists of the recycle of the following wet air pollution control wastewater streams through holding tanks:

1. Reduction area wet air pollution control,
2. Melt cell wet air pollution,
3. Cathode gas wet air pollution control,
4. Chlorine liquefaction wet air pollution control,
5. Chip crushing wet air pollution control,
6. Sponge crushing and screening wet air pollution control, and
7. Scrap milling wet air pollution control.

OPTION C

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

COST METHODOLOGY

A detailed discussion of the methodology used to develop the compliance costs is presented in Section VIII of the General Development Document. Plant-by-plant compliance costs have been estimated for the nonferrous metals manufacturing category and are presented in the administrative record supporting this regulation. The costs developed for the proposed regulation are presented in Tables VIII-1 and VIII-2 for the direct and indirect dischargers, respectively.

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 assumptions specific to the primary and secondary titanium subcategory are discussed briefly below.

(1) It is assumed that all titanium plants use water for floor washing. A 500 gallon holding tank for recycle of treated water is included in the treatment scheme for plants with continuous operation of chemical precipitation. If batch treatment is used (batch chemical precipitation), a tank is assumed to be unnecessary. For both continuous and batch operation, recycle piping and a recycle pump are provided.

(2) All floor wash water is recycled after chemical precipitation and sedimentation.

(3) Costs for removal of the pollutant titanium are included in the compliance costs. Treatability concentrations for titanium are assumed to be 0.084 mg/l and 0.07 mg/l for the lime and settle, and lime, settle, and filter treatment scheme, respectively.

(4) All chromium in the raw wastewater is assumed to be Cr^{+3}; therefore, chromium reduction treatment is unnecessary.

Because of the nature of the wastewaters produced in the primary and secondary titanium subcategory, the Agency wished to consider different technology standards for the various plants in the subcategory. The discharging plants in the subcategory are therefore divided into two groups known as Level A and Level B. The inclusion of a particular plant in one level or the other is dependent upon the processes present at that plant. Processes producing wastewater whose characteristics result in low additional pollutant removals using Option C technology over the removals obtained at Option B are included in the Level A division. All other plants are placed in Level B. The low levels of pollutant removals in Level A plants are the result of pollutant concentrations in one or several streams that are at or below the treatability levels for lime and settle or lime, settle and filter. For the primary and secondary titanium subcategory, a plant was included in Level A if the plant does not practice electrolytic recovery of magnesium and uses vacuum distillation instead of leaching to purify titanium sponge as the final product. The two groups are considered separately for optimum technology standards. The selection strategy is discussed further in Section X.

In addition to the above analysis, the Agency considered the potential adjustment of production processes at the various plants in the primary and secondary titanium subcategory such that the plant would become subject to the jurisdiction of the other level. For instance, if eletrolytic recovery of magnesium were added to a plant currently included in Level A, that plant would then be subject to inclusion under Level B. To properly account for such circumstances and to predict barriers to moving from one level to the other, costs were required for both levels for both direct and indirect dischargers. Where both types of plants (Level A and Level B) were not in existence for a particular discharge status, costs were generated for existing plants operating under the other level by making an assumption such as the one noted above, i.e. adding a process.

NONWATER QUALITY ASPECTS

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

ENERGY REQUIREMENTS

The methodology used for determining the energy requirements for the various options is discussed in Section VIII of the General Development Document. Energy requirements for Option A are estimated at 1,020,000 kWh/yr. Option B energy requirements decrease over those for Option A because less water is being treated, thus saving energy costs for lime and settle treatment. Option C represents roughly one percent of a typical plant's electrical usage. It is therefore concluded that the energy requirements of the treatment options considered will have no significant impact on total plant energy consumption. Option C, which includes filtration, is estimated to increase energy consumption over Option B by approximately one percent.

SOLID WASTE

Sludge generated in the primary and secondary titanium subcategory is due to the precipitation of metal hydroxides and carbonates using lime. Sludges associated with the primary and secondary titanium subcategory will necessarily contain quantities of toxic metal pollutants. Sludges from primary operations are not subject to regulation as hazardous wastes since wastes generated by primary smelters and refiners are currently exempt from regulation by Act of Congress (Resource Conservation and Recovery Act (RCRA), Section 3001(b)), as interpreted by EPA. Wastes from secondary metal operations can be regulated as hazardous. However, the Agency examined the solid wastes that would be 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. This judgment is based on the results of Extraction Procedure (EP) toxicity tests performed on similar sludges (i.e. toxic-metal-bearing lime sludges) generated by other industries such as the iron and steel industry. A small amount of excess lime was added during treatment, and the sludges subsequently generated passed the toxicity test. See CFR 40 §261.24. Thus, the Agency believes that the wastewater sludges from both primary and secondary operations will not be EP toxic if the recommended technology is applied.

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

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

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

It is estimated that approximately 487 metric tons per year of sludge will be generated as a result of these proposed regulations for the primary and secondary titanium subcategory.

AIR POLLUTION

There is no reason to believe that any substantial air pollution problems will result from implementation of oil skimming, 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 AND SECONDARY TITANIUM SUBCATEGORY DIRECT DISCHARGERS

(March, 1982 Dollars)

Option	Total Required Capital Cost	Total Annual Cost
A	989,000	588,000
B	945,000	543,000
C	1,030,000	585,000

Table VIII-2

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

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

PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

SECTION IX

BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE

This section defines the effluent characteristics attainable through the application of best practicable control technology currently available (BPT), Section 301(b)(a)(A). BPT reflects the existing performance by plants of various sizes, ages, and manufacturing processes within the primary and secondary titanium 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. In general, the BPT level represents the average of the existing performances of plants of various ages, sizes, processes, or other common characteristics. Where existing performance is uniformly inadequate, BPT may be transferred from a different subcategory or category. Limitations based on transfer of technology are supported by a rationale concluding that the technology is, indeed, transferable, and a reasonable prediction that it will be capable of achieving the prescribed effluent limits (see Tanner's Council of America v. Train, 540 F.2d 1188 (4th Cir. 1176). BPT focuses on end-of-pipe treatment rather than process changes or internal controls, except where such practices are common 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 industry using data collection profolios, and specific plants were sampled and the wastewaters analyzed. In making technical assessments of data, reviewing manufacturing processes, and assessing wastewater treatment technology options, both indirect and direct dischargers have been considered as a single group. An examination of plants and processes did not indicate any process differences based on the type of discharge, whether it be direct or indirect.

As explained in Section IV, the primary and secondary titanium subcategory has been subdivided into 16 potential wastewater sources. Since the water use, discharge rates, and pollutant characteristics of each of these wastewaters is potentially unique, effluent limitations will be developed for each of the 16 subdivisions.

For each of the subdivisions, a specific approach was followed for the development of BPT mass limitations. The first requirement to calculate these limitations is to account for production and flow variability from plant to plant. Therefore, a unit of production or production normalizing parameter (PNP) was determined for each waste stream which could then be related to the flow from the process to determine a production normalized flow. Selection of the PNP for each process element is discussed in Section IV. Each plant within the subcategory was then analyzed to determine (1) which subdivisions were present, (2) the specific flow rates generated for each subdivision, and (3) the specific production normalized flows for each subdivision. This analysis is discussed in detail in Section V. Nonprocess wastewater such as rainfall runoff and noncontact cooling water is 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 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-by-stream basis, primarily because plants in this subcategory may perform one or more of the operations in various combinations. The mass loadings (milligrams of pollutant per metric ton of production - mg/kkg) were calculated by multiplying the BPT regulatory flow (l/kkg) by the concentration achievable by the BPT level of treatment technology (mg/l) for each pollutant parameter to be limited under BPT. These mass loadings are published in the Federal Register and in CFR Part 400 as the effluent limitations guidelines.

The mass loadings which are allowed under BPT for each plant will be the sum of the individual mass loadings for the various wastewater sources which are found at particular plants. Accordingly, all the wastewater generated within a plant may be combined for treatment in a single or common treatment system, but the effluent limitations for these combined wastewaters are based on the various wastewater sources which actually contribute to the combined flow. This method accounts for the variety of combinations of wastewater sources and production processes which may be found at primary and secondary titanium 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 BPT. See Weyerhaeuser Company v. Costle, 590 F.2d 1011 (D.C. Cir. 1978).

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

BPT OPTION SELECTION

The technology basis for the proposed BPT limitations is Option A, chemical precipitation and sedimentation technology to remove metals and solids from combined wastewaters and to control pH, and oil skimming preliminary treatment for streams with treatable concentrations of oil and grease. These technologies are already in-place at two of the four direct dischargers in the subcategory. EPA is proposing a two tier regulatory scheme for this subcategory; however, the same technologies apply to both tiers at BPT. The pollutants specifically proposed for regulation at BPT are chromium, lead, nickel, thallium, fluoride, titanium, oil and grease, TSS, and pH. The BPT treatment scheme is presented in Figure IX-1.

Implementation of the proposed BPT limitations will remove annually an estimated 113 kg of toxic metals, 5,791 kg of titanium, and 58,864 kg of TSS. While two plants have the equipment in-place to comply with BPT, we do not believe that the plants are currently achieving the proposed BPT limitations. We project a capital cost of $989,000 and an annualized cost of $588,000 for achieving proposed BPT in all plants.

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 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 metal produced by the process associated with the waste stream in question. These production normalizing parameters, or PNPs, are also listed in Table IX-1.

Section V of this document further describes the discharge flow rates and presents the water use and discharge flow rates for each plant by subdivision in Tables V-1 through V-16.

CHLORINATION OFF-GAS WET AIR POLLUTION CONTROL

The BPT wastewater discharge allowance for chlorination off-gas wet air pollution control is 936 l/kkg (225 gal/ton) of $TiCl_4$ produced. This rate is allocated only for those plants which convert TiO_2 to $TiCl_4$ by direct chlorination and employ wet scrubbers to control chlorine gas and particulates in the $TiCl_4$ product gases prior to condensation and purification. Two plants report this waste stream, but data for water use rates is supplied by only one facility. The BPT allowance is based on this water use rate. The second plant achieves zero discharge of this stream by reuse in other processes.

CHLORINATION AREA-VENT WET AIR POLLUTION CONTROL

The BPT wastewater discharge allowance for chlorination area-vent wet air pollution control is 1,040 l/kkg (250 gal/ton) of $TiCl_4$ produced. This rate is allocated only for those plants which route the cleaned gas from the chlorination off-gas scrubbers to a chlorination area scrubbing system where it is combined with ventilation vapors from the $TiCl_4$ purification operations. This allowance is based on the water use rate at the only plant that reports this stream. That plant does not recycle this wastewater.

$TiCl_4$ HANDLING WET AIR POLLUTION CONTROL

The BPT wastewater discharge allowance for $TiCl_4$ wet air pollution control is 187 l/kkg (45 gal/ton) of $TiCl_4$ handled. This rate is allocated only for those plants which use $TiCl_4$ as a raw material and employ wet scrubbers to control particulate emissions from raw material handling. This allowance is based on the discharge rate at the only plant that reports this stream. Although not clearly specified in the dcp, there is reason to believe that this plant practices greater than 90 percent recycle of this wastewater.

REDUCTION AREA WET AIR POLLUTION CONTROL

The BPT wastewater discharge allowance for reduction area wet air pollution control is 41,303 l/kkg (9,913 gal/ton) of titanium produced. This rate is allocated only for those plants which practice magnesium reduction in an inert atmosphere and employ wet scrubbers to cleanse vapors from the reduction vessel. Four plants report this waste stream. At one plant (plant 1044), the reduction area wet air pollution control also is used in the production of metals other than titanium. Information from this plant was not considered when choosing the BPT allowance because it was not possible to determine the amount of flow attributable to titanium production alone. The BPT discharge allowance is based on the average of the water use rates at the remaining three plants which discharge this stream. None of those plants report recycle of this wastewater.

MELT CELL WET AIR POLLUTION CONTROL

The BPT wastewater discharge allowance for melt cell wet air pollution control is 21, 254 l/kkg (5,101 gal/ton) of titanium produced. This rate is allocated only for those plants which store excess $MgCl_2$ slag from magnesium reduction in a melt cell prior to recovering the magnesium by electrolysis, and pass the vapors collected in the melt cell through wet scrubbers before venting them to the atmosphere. This allowance is based on the water use rate at the only plant that reports this stream. That plant does not recycle this wastewater.

CATHODE GAS WET AIR POLLUTION CONTROL

The BPT wastewater discharge allowance for cathode gas wet air pollution control is 6,147 l/kkg (1,475 gal/ton) of titanium produced. This rate is allocated only for those plants which recover magnesium from $MgCl_2$ slag by electrolysis and use wet air pollution control to scrub any gases arising from the cathode during electrolysis. This allowance is based on the average of the discharge rates at the two plants that report this waste stream. Since there is no reason to believe that the second plant practices any recycle of cathode gas scribber liquor, it is reasonable to base the allowance on the average of the discharge rates at the two plants.

CHLORINE LIQUEFACTION WET AIR POLLUTION CONTROL

The BPT wastewater discharge allowance for chlorine liquefaction wet air pollution control is 297,559 l/kkg (71,414 gal/ton) of titanium produced. This rate is allocated only for those plants which liquefy chlorine gas derived from electrolysis of $MgCl_2$ slag, and water-scrub any chlorine vapors that escape from the liquefaction operation. This allowance is based on the water use rate at the only plant which practices chlorine liquefaction. That plant does not recycle this wastewater.

SODIUM REDUCTION CONTAINER RECONDITIONING WASH

The BPT wastewater discharge allowance for sodium reduction container reconditioning wash is 1,282 l/kkg (308 gal/ton) of titanium produced. This rate is allocated only for those plants which reduce $TiCl_4$ to titanium with sodium, and clean the used retort vessel prior to reusing it in the sodium reduction process. This allowance is based on the water use rate reported by the only plant which practices sodium reduction of $TiCl_4$. That plant does not recycle this wastewater.

CHIP CRUSHING WET AIR POLLUTION CONTROL

The BPT wastewater discharge allowance for chip crushing wet air pollution control is 22,922 l/kkg (5,501 gal/ton) of titanium produced. This rate is allocated only for those plants which use wet scrubbers to control particulate emissions from the crushing of titanium cake formed by reduction. Two plants report this stream. One plant practices total reuse of this stream in processes unrelated to titanium manufacturing. The other plant achieve zero discharge of this stream using evaporation ponds. Information on water use and recycle at the second plant is not available. The BPT flow rate is based on the production normalized water use at the one facility which reported a value.

ACID LEACHATE AND RINSE WATER

The BPT wastewater discharge allowance for acid leachate and rinse water is 11,840 l/kkg (2,842 gal/ton) of titanium produced. This rate is allocated only for those plants which acid leach and rinse with water the crushed titanium cake formed by reduction in order to remove Mg and $MgCl_2$ impurities. Four plants report this waste stream. Two of those four have zero discharge of this stream: one by total reuse and one by evaporation in ponds. Of the two remaining plants, one discharges this stream directly and one discharges it to a POTW. The BPT allowance is based on the discharge rate at the only plant that discharges this stream directly. The reported flow for plant 1075 was disregarded because it included only the acid leaching portion of the waste stream. The other two flows were not incorporated into the BPT wastewater discharge allowance because the Agency does not believe that they represent the optimum water use practices possible in this industry. No recycle of the acid leachate and rinse water is reported at any of the plants.

SPONGE CRUSHING AND SCREENING WET AIR POLLUTION CONTROL

The BPT wastewater discharge allowance for sponge crushing and screening wet air pollution control is 6,470 l/kkg (1,553 gal/ton) of titanium produced. This rate is allocated for those plants which operate a wet dust control scrubber associated with the crushing, screening, and storage of acid-leached titanium powder. This allowance is based on the water use rate at the only plant that reports this stream. That plant does not recycle this wastewater.

ACID PICKLE AND WASH WATER

The BPT wastewater discharge allowance for acid pickle and wash water is 61 l/kkg (15 gal/ton) of titanium which is acid cleaned. This rate is allocated for those plants which acid pickle and wash with water titanium scrap used in alloying and casting operations. Two plants reporting this waste stream achieve zero discharge: one by contract removal and one by using evaporation ponds. Information on water use and discharge rates at the third plant is not available. The BPT flow rate is based on the average of the production normalized flow rates reported by the two facilities which supplied information on this stream. Since there is no reason to believe that plant 1017 practices recycle of acid pickle and wash water, it is reasonable to base the flow allowance on the average of the discharge rates at the two plants.

SCRAP MILLING WET AIR POLLUTION CONTROL

The BPT wastewater discharge allowance for scrap milling wet air pollution control is 2,261 l/kkg (543 gal/ton) of titanium scrap milled. This rate is allocated only for those plants which provide wet air pollution control when milling titanium scrap and turnings that can be alloyed and cast with titanium sponge. The only plant which reports this waste stream currently achieves zero discharge using evaporation ponds. That plant does not recycle this wastewater. The BPT flow rate is based on the production normalized water use at the one facility reporting this stream.

SCRAP DETERGENT WASH WATER

The BPT wastewater discharge allowance for scrap detergent wash water is 18,064 l/kkg (4,335 gal/ton) of scrap washed. This rate is allocated only for those plants which wash scrap titanium material to remove oil and dirt prior to alloying and casting. Two plants report this waste stream, one of which achieves zero discharge using evaporation ponds. The rate reported by the zero discharge plant was not considered in determining the BPT wastewater discharge allowance because the Agency believes that since this plant has the capability to use evaporation ponds, it does not necessarily employ the optimum water use practices available to the industry. The BPT allowance is based on the discharge rate at the only plant that discharges this stream directly. Neither of the plants which use scrap detergent washes practice recycle of this stream.

CASTING CRUCIBLE WASH WATER

The BPT wastewater discharge allowance for casting crucible wash water is 477 l/kkg (114 gal/ton) of titanium cast. This rate is allocated only for those plants which wash crucibles used in casting operations. Crucible washes are reported at two plants. The BPT allowance is based on the discharge rate at the only plant which provided flow and production information. No recycle of this stream is practiced at that plant.

CASTING CONTACT COOLING WATER

The BPT wastewater discharge allowance for casting contact cooling water is 729,730 l/kkg (175,136 gal/ton) of titanium cast. This rate is allocated only for those plants which use direct contact cooling water in casting operations. This allowance is based on the discharge rate at the only plant that reports this stream. Information on water recycle at that plant is not available.

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 nine pollutants or polltuant parameters are selected for limitation under BPT and are listed below:

119. chromium (total)
122. lead
124. nickel
127. thallium
- titanium
- fluoride
- oil and grease

TSS
pH

EFFLUENT LIMITATIONS

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

Table IX-1

BPT WASTEWATER DISCHARGE RATES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

Wastewater Stream	BPT Normalized Discharge Rate		Production Normalizing Parameter (kkg)
	l/kkg	gal/ton	
Chlorination off-gas wet air pollution control	936	225	$TiCl_4$ produced
Chlorination area-vent wet air pollution control	1,040	250	$TiCl_4$ produced
$TiCl_4$ handling wet air pollution control	187	45	$TiCl_4$ produced
Reduction area wet air pollution control	41,303	9,913	Titanium produced
Melt cell wet air pollution control	21,254	5,101	Titanium produced
Cathode gas wet air pollution control	6,147	1,475	Titanium produced
Chlorine liquefaction wet air pollution control	297,559	71,414	Titanium produced
Sodium reduction container reconditioning wash water	1,282	308	Titanium produced
Chip crushing wet air pollution control	22,922	5,501	Titanium produced
Acid leachate and rinse water	11,840	2,842	Titanium produced

Table IX-1 (Continued)

BPT WASTEWATER DISCHARGE RATES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

Wastewater Stream	BPT Normalized Discharge Rate 1/kkg	BPT Normalized Discharge Rate gal/ton	Production Normalizing Parameter (kkg)
Sponge crushing and screening wet air pollution control	6,470	1,553	Titanium produced
Acid pickle and wash water	61	15	Titanium pickled
Scrap milling wet air pollution control	2,261	543	Scrap milled
Scrap detergent wash water	18,064	4,335	Scrap washed
Casting crucible wash water	477	114	Titanium cast
Casting contact cooling water	729,730	175,136	Titanium cast

Table IX-2

BPT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

A. Level A

(a) Chlorination Off-Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.412	0.169
Lead	0.393	0.187
Nickel	1.797	1.189
Thallium	1.919	0.852
Fluoride	32.760	18.720
Titanium	0.412	0.168
Oil and Grease	18.720	11.230
Total suspended solids	38.380	18.250
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (continued)

BPT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(b) Chlorination Area-Vent Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.458	0.187
Lead	0.437	0.208
Nickel	1.997	1.321
Thallium	2.132	0.946
Fluoride	36.400	20.800
Titanium	0.458	0.187
Oil and Grease	20.800	12.480
Total suspended solids	42.640	20.280
pH	Within the range of 7.5 to 10.0 at all times	

(c) TiCl4 Handling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ handled		
Chromium (total)	0.082	0.034
Lead	0.079	0.037
Nickel	0.359	0.238
Thallium	0.383	0.170
Fluoride	6.545	3.740
Titanium	0.082	0.034
Oil and Grease	3.740	2.244
Total suspended solids	7.667	3.647
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (continued)

BPT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(d) Sponge Crushing and Screening Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	2.847	1.165
Lead	2.718	1.294
Nickel	12.420	8.217
Thallium	13.260	5.888
Fluoride	226.500	129.400
Titanium	2.847	1.165
Oil and Grease	129.400	77.640
Total suspended solids	265.300	126.200
pH	Within the range of 7.5 to 10.0 at all times	

B. Level B

(a) Chlorination Off-Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.412	0.169
Lead	0.393	0.187
Nickel	1.797	1.189
Thallium	1.919	0.852
Fluoride	32.760	18.720
Titanium	0.412	0.168
Oil and Grease	18.720	11.230
Total suspended solids	38.380	18.250
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (continued)

BPT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(b) Chlorination Area-Vent Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.458	0.187
Lead	0.437	0.208
Nickel	1.997	1.321
Thallium	2.132	0.946
Fluoride	36.400	20.800
Titanium	0.458	0.187
Oil and Grease	20.800	12.480
Total suspended solids	42.640	20.280
pH	Within the range of 7.5 to 10.0 at all times	

(c) $TiCl_4$ Handling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ handled		
Chromium (total)	0.082	0.034
Lead	0.079	0.037
Nickel	0.359	0.238
Thallium	0.383	0.170
Fluoride	6.545	3.740
Titanium	0.082	0.034
Oil and Grease	3.740	2.244
Total suspended solids	7.667	3.647
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (continued)

BPT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(d) Reduction Area Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	18.180	7.435
Lead	17.350	8.261
Nickel	79.300	52.460
Thallium	84.670	37.590
Fluoride	1,446.000	826.100
Titanium	18.170	7.435
Oil and Grease	826.100	495.700
Total suspended solids	1,694.000	805.400
pH	Within the range of 7.5 to 10.0 at all times	

(e) Melt Cell Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	9.352	3.826
Lead	8.927	4.251
Nickel	40.810	26.990
Thallium	43.570	19.340
Fluoride	743.900	425.100
Titanium	9.352	3.826
Oil and Grease	425.100	255.100
Total suspended solids	871.400	414.500
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (continued)

BPT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(f) Cathode Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	2.705	1.107
Lead	2.582	1.230
Nickel	11.800	7.807
Thallium	12.600	5.594
Fluoride	215.200	123.000
Titanium	2.705	1.106
Oil and Grease	123.000	73.770
Total suspended solids	252.000	119.900
pH	Within the range of 7.5 to 10.0 at all times	

(g) Chlorine Liquefaction Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	130.900	53.560
Lead	125.000	59.510
Nickel	571.300	377.900
Thallium	610.000	270.800
Fluoride	10,420.000	5,951.000
Titanium	130.900	53.560
Oil and Grease	5,951.000	3,571.000
Total suspended solids	12,200.000	5,803.000
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (continued)

BPT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(h) Sodium Reduction Container Reconditioning Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.564	0.231
Lead	0.539	0.256
Nickel	2.462	1.628
Thallium	2.628	1.167
Fluoride	44.870	25.640
Titanium	0.564	0.231
Oil and Grease	25.640	15.390
Total suspended solids	52.560	25.000
pH	Within the range of 7.5 to 10.0 at all times	

(i) Chip Crushing Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	10.090	4.126
Lead	9.627	4.584
Nickel	44.010	29.110
Thallium	46.990	20.860
Fluoride	802.300	458.400
Titanium	10.090	4.126
Oil and Grease	458.400	275.100
Total suspended solids	939.800	447.000
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (continued)

BPT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(j) Acid Leachate and Rinse Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	5.210	2.131
Lead	4.973	2.368
Nickel	22.730	15.040
Thallium	24.270	10.770
Fluoride	414.400	236.800
Titanium	5.210	2.131
Oil and Grease	236.800	142.100
Total suspended solids	485.500	230.900
pH	Within the range of 7.5 to 10.0 at all times	

(k) Sponge Crushing and Screening Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	2.847	1.165
Lead	2.718	1.294
Nickel	12.420	8.217
Thallium	13.260	5.888
Fluoride	226.500	129.400
Titanium	2.847	1.165
Oil and Grease	129.400	77.640
Total suspended solids	265.300	126.200
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (continued)

BPT MASS LIMITATIONS FOR THE PRIMARY
AND SECONDARY TITANIUM SUBCATEGORY

(l) Acid Pickle and Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium pickled		
Chromium (total)	0.027	0.011
Lead	0.026	0.012
Nickel	0.117	0.077
Thallium	0.125	0.056
Fluoride	2.135	1.220
Titanium	0.027	0.011
Oil and Grease	1.220	0.732
Total suspended solids	2.501	1.190
pH	Within the range of 7.5 to 10.0 at all times	

(m) Scrap Milling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of scrap milled		
Chromium (total)	0.995	0.407
Lead	0.950	0.452
Nickel	4.341	2.871
Thallium	4.635	2.058
Fluoride	79.140	45.220
Titanium	0.995	0.407
Oil and Grease	45.220	27.130
Total suspended solids	92.700	44.090
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (continued)

BPT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(n) Scrap Detergent Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of scrap washed		
Chromium (total)	7.948	3.252
Lead	7.587	3.613
Nickel	34.680	22.940
Thallium	37.030	16.440
Fluoride	632.300	361.300
Titanium	7.948	3.251
Oil and Grease	361.300	216.800
Total suspended solids	740.600	352.300
pH	Within the range of 7.5 to 10.0 at all times	

(o) Casting Crucible Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium cast		
Chromium (total)	0.210	0.086
Lead	0.200	0.095
Nickel	0.916	0.606
Thallium	0.978	0.434
Fluoride	16.700	9.540
Titanium	0.210	0.086
Oil and Grease	9.540	5.724
Total suspended solids	19.560	9.302
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (continued)

BPT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(p) Casting Contact Cooling Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium cast		
Chromium (total)	321.100	131.400
Lead	306.500	146.000
Nickel	1,401.000	926.800
Thallium	1,496.000	664.100
Fluoride	25,540.000	14,600.000
Titanium	321.900	131.400
Oil and Grease	14,600.000	8,757.000
Total suspended solids	29,920.000	14,230.000
pH	Within the range of 7.5 to 10.0 at all times	

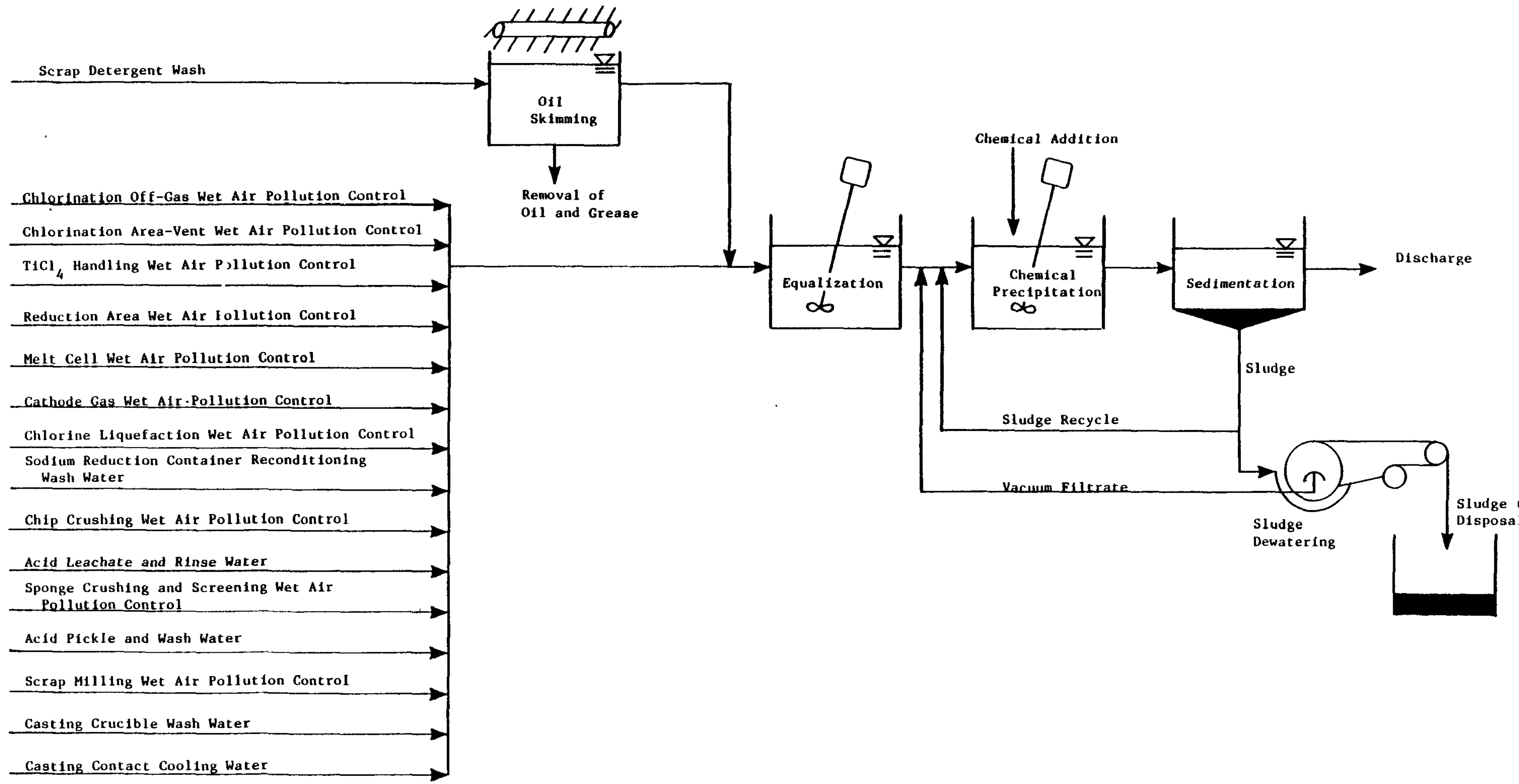

Figure IX-1

BPT TREATMENT SCHEME FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

SECTION X

BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE

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

The factors considered in assessing best available technology economically achievable (BAT) include the age of equipment and facilities involved, the process used, process changes, nonwater quality environmental impacts (including energy requirements), and the costs of application of such technology (Section 304(b)(2)(B) of the Clean Water Act). At a minimum, BAT 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 removal benefits (see Weyerhaeuser v. Costle, 11 ERC 2149 (D.C. Cir. 1978)). However, in assessing the proposed BAT, the Agency has given substantial weight to the economic achievability of the technology.

TECHNICAL APPROACH TO BAT

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

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

The treatment technologies considered for BAT are summarized below:

Option A (Figure X-1):

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

Option B (Figure X-2):

- Preliminary treatment by oil skimming (where required)
- Chemical precipitation and sedimentation
- Flow reduction

Option C (Figure X-3):

- Preliminary treatment by oil skimming (where required)
- Chemical precipitation and sedimentation
- Flow reduction
- Multimedia filtration

The three technology options examined for BAT are discussed in greater detail below. The first option considered (Option A) is the same as the BPT treatment and control technology which was presented in the previous section. The last two options each represent substantial progress toward preventing pollution of the environment above and beyond the progress achievable by BPT.

OPTION A

Option A for the primary and secondary titanium subcategory is equivalent to the control and treatment technologies selected as the basis for BPT in Section IX. The BPT end-of-pipe treatment scheme includes chemical precipitation and sedimentation, with oil skimming preliminary treatment of wastewaters containing treatable concentrations of oil and grease (see Figure X-1). The discharge allowances for Option A are equal to the discharge allowances allocated to each stream at BPT.

OPTION B

Option B for the primary and secondary titanium subcategory achieves lower pollutant discharge by building upon the Option A end-of-pipe treatment technology. Option B consists of chemical precipitation, sedimentation, oil skimming preliminary treatment of wastewaters containing treatable concentrations of oil and grease, and in-process flow reduction (see Figure X-2). Flow reduction measures, including in-process changes, result in the elimination of some wastewater streams and the concentration of pollutants in other effluents. Treatment of a more concentrated ffluent allows achievement of a greater net pollutant removal nd introduces the possible economic benefits associated with reating a lower volume of wastewater.

ethods used in Option B to reduce process wastewater generation r discharge rates through flow reduction are discussed below:

ecycle of Water Used in Wet Air pollution Control

'here are seven wastewater sources associated with wet air ollution control that are regulated under these effluent imitations for which recycle is considered feasible:

- Reduction area wet air pollution control,
- Melt cell wet air pollution control,
- Cathode gas wet air pollution control,
- Chlorine liquefaction wet air pollution control,
- Chip crushing wet air pollution control
- Sponge crushing and screening wet air pollution control, and
- Scrap milling wet air pollution control.

:ach of these waste streams is reported by one or more plants in :he primary and secondary titanium subcategory. Table X-1 resents the number of plants reporting wastewater use with these ources, the number of plants practicing recycle of scrubber iquor, and the range of recycle values being used. Presently :here is no reported recycle or reuse of these scrubber liquors n any of the plants; however, reduction of flow through recycle r reuse represents the best available technology economically chievable for these streams.

lecycle or Reuse of Casting Contact Cooling Water

)ne plant reports this waste stream without providing information n current water reuse and recycle practices. EPA believes that low reduction can be achieved by recycle with a cooling tower or casting contact cooling water.

)PTION C

)ption C for the primary and secondary titanium subcategory :onsists of all control and treatment requirements of Option B chemical precipitation, sedimentation, oil skimming where equired, and in-process flow reduction) plus multimedia iltration technology added at the end of the Option B treatment scheme (see Figure X-3). Multimedia filtration is used to remove suspended solids, including precipitates of toxic metals, beyond :he concentration attainable by gravity sedimentation. The ilter suggested is of the gravity, mixed media type, although other filters, such as rapid sand filters or pressure filters, vould 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 the General Development Document. In short, sampling data collected during the field sampling program were used to characterize the major waste streams considered for regulation. At each sampled facility, the data was production normalized for each unit operation (i.e., mass of pollutant generated per mass of product manufactured). This value, referred to as the raw waste, was used to estimate the mass of toxic pollutants generated within the primary and secondary titanium subcategory. The pollutant removal estimates were calculated for each plant by first estimating the total mass of each pollutant in the untreated wastewater. This was calculated by first multiplying the raw waste values by the corresponding production value for that stream and then summing these values for each pollutant for every stream generated by the plant.

Next, the volume of wastewater discharged after the application of each treatment option was estimated for each operation at each plant by comparing the actual discharge to the regulatory flow. The smaller of the two values was selected and summed with the other plant flows. The mass of pollutant discharged was then estimated by multiplying the achievable concentration values attainable with the option (mg/l) by the estimated volume of process wastewater discharged by the subcategory. The mass of pollutant removed is the difference between the estimated mass of pollutant generated by each plant in the subcategory and the mass of pollutant discharged after application of the treatment option. The pollutant removal estimates for direct dischargers in the primary and secondary titanium subcategory are presented in Table X-2.

COMPLIANCE COSTS

In estimating subcategory-wide compliance costs, the first step was to develop a cost estimation model, relating the total costs associated with installation and operation of wastewater treatment technologies to plant process wastewater discharge. EPA applied the model to each plant. The plant's investment and operating costs are determined by what treatment it has in place and by its individual process wastewater discharge flow. As discussed above, this flow is either the actual or the BAT regulatory flow, whichever is lesser. The final step was to nnualize the capital costs, and to sum the annualized capital osts, and the operating and maintenance costs for each plant, ielding the cost of compliance for the subcategory. The ompliance costs associated with the various options are resented in Table X-3 for direct dischargers in the primary and econdary titanium subcategory. Compliance costs for indirect ischargers are shown in Section XII. These costs were used in ssessing economic achievability.

AT OPTION SELECTION

e are proposing Level A BAT limitations for titanium plants hich do not practice electrolytic recovery of magnesium and hich use vacuum distillation instead of leaching to purify itanium sponge as the final product based on chemical recipitation, sedimentation, and oil skimming (BPT technology) lus in-process wastewater flow reduction. Level B BAT imitations are proposed for all other titanium plants based on hemical precipitation, sedimentation, and oil skimming retreatment where required, (BPT technology) plus flow eduction, and filtration. Flow reduction is based on 90 percent ecycle of scrubber effluent through holding tanks and 90 percent ecycle of casting contact cooling water through cooling towers. he Agency considered applying the same technology levels to this ntire subcategory but decided to propose this two tiered egulatory scheme because there was little additional pollutant emoval from the Level A wastewater streams when treated by the dded Level B technology.

he pollutants specifically limited under BAT are chromium, lead, ickel, thallium, titanium, and fluoride. The toxic pollutants ntimony, cadmium, copper and zinc were also considered for egulation because they were found at treatable concentrations in he raw wastewaters from this subcategory. These pollutants were ot selected for specific regulation because they will be dequately treated when the regulated toxic metals are treated to he concentrations achievable by the model BAT technology.

here are currently no direct discharging Level A plants in this ubcategory. It is estimated that if the four existing direct lischarging Level B plants in this subcategory became Level A lischargers they would incur a capital cost of approximately 641,000 and an annualized cost of $325,000; 135 kilograms of oxic pollutants would be removed.

mplementation of the proposed Level B BAT limitations would emove annually an estimated 298 kg of toxic pollutants. stimated capital cost for achieving proposed BAT is $1,030,000, nd annualized cost is $585,000.

ASTEWATER 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 16 wastewater sources were determined and are summarized in Table X-4. The discharge rates are normalized on a production basis by relating the amount of wastewater generated to the mass of metal 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.

The BAT discharge rates reflect the flow reduction requirements of the selected BAT option. For this reason, the casting contact cooling water and the scrubber waters which were targeted for flow reduction through recycle for BAT have lower flow rates than the corresponding BPT flows. A discussion of these wastewaters is presented below.

REDUCTION AREA WET AIR POLLUTION CONTROL

The BAT wastewater discharge allowance for reduction area wet air pollution control is 4,130 l/kkg (991 gal/ton) of titanium produced. This waste stream is reported at four plants, one of which does not provide enough information to determine the amount of flow attributable to titanium production (plant 1044). The BAT allowance is based on 90 percent reuse or recycle of the average amount of water used for reduction area wet air pollution control at the remaining three plants. None of these plants currently recycle this wastewater.

MELT CELL WET AIR POLLUTION CONTROL

The BAT wastewater discharge allowance for melt cell wet air pollution control is 2,126 l/kkg (510 gal/ton) of titanium produced. This allowance is based on 90 percent reuse or recycle of the water used for melt cell wet air pollution control at the only plant that reports this stream. That plant currently does not recycle this wastewater.

CATHODE GAS WET AIR POLLUTION CONTROL

The BAT wastewater discharge allowance for cathode gas wet air pollution control is 615 l/kkg (148 gal/ton) of titanium produced. This allowance is based on 90 percent reuse or recycle of the average discharge rates for cathode gas wet air pollution control at the two plants that report this stream. One of these plants currently does not recycle this wastewater. Information on water use and recycle at the other plant is not available.

CHLORINE LIQUEFACTION WET AIR POLLUTION CONTROL

The BAT wastewater discharge allowance for chlorine liquefaction wet air pollution control is 29,756 l/kkg (7,141 gal/ton) of titanium produced. This allowance is based on 90 percent reuse or recycle of the water used for chlorine liquefaction wet air pollution control at the only plant that reports this scrubber. That plant currently does not recycle this wastewater.

CHIP CRUSHING WET AIR POLLUTION CONTROL

The BAT wastewater discharge allowance for chip crushing wet air pollution control is 2,292 l/kkg (550 gal/ton) of titanium produced. This allowance is based on 90 percent recycle of the water use at the one facility which reported water use and zero percent recycle. The other facility reporting this stream did not supply information concerning water use and recycle practices.

SPONGE CRUSHING AND SCREENING WET AIR POLLUTION CONTROL

The BAT wastewater discharge allowance for sponge crushing and screening wet air pollution control is 647 l/kkg (155 gal/ton) of titanium produced. This allowance is based on 90 percent reuse or recycle of the water used for sponge crushing and screening wet air pollution control at the one plant that reports this stream. That plant currently does not recycle this wastewater.

SCRAP MILLING WET AIR POLLUTION CONTROL

The BAT wastewater discharge allowance for scrap milling wet air pollution control is 227 l/kkg (55 gal/ton) of titanium scrap milled. This allowance is based on 90 percent recycle of the production normalized water use at the one facility reporting this waste stream. That facility currently practices no recycle of this stream.

CASTING CONTACT COOLING WATER

The BAT wastewater discharge allowance for casting contact cooling water is 72,973 l/kkg (17,514 gal/ton) of titanium cast. This allowance is based on 90 percent reuse or recycle with a cooling tower of the water used for casting contact cooling at the only plant that reports this stream. Information on current water reuse and recycle practices at that plant is not available.

<u>REGULATED POLLUTANT PARAMETERS</u>

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

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

119. chromium (total)
122. lead
124. nickel
127. thallium
titanium
fluoride

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

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

The following toxic pollutants are excluded from limitation on the basis that they are effectively controlled by the limitations developed for chromium, lead, nickel, and thallium:

114. antimony
118. cadmium
120. copper
128. zinc

EFFLUENT LIMITATIONS

The effluent concentrations achievable by the application of the BAT treatment technology are discussed in Section VII of the General Development Document and summarized there in Table

'III-19. The treatable concentrations (both one-day maximum and onthly average values) are multiplied by the BAT normalized ischarge flows summarized in Table X-4 to calculate the mass of ›ollutants allowed to be discharged per mass of product. The 'esults of these calculations in milligrams of pollutant per :ilogram of product represent the BAT effluent limitations and re presented in Table X-5 for each individual waste stream.

Table X-1

CURRENT RECYCLE PRACTICES WITHIN THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

	Number of Plants With Wastewater	Number of Plants Practicing Recycle	Range of Recycle Values (%)
Reduction area wet air pollution control	4	0	0
Melt cell wet air pollution control	1	0	0
Cathode gas wet air pollution control	1	0	0
Chlorine liquefaction wet air pollution control	1	0	0
Chip crushing wet air pollution control	1	0	0
Sponge crushing and screening wet air pollution control	1	0	0
Scrap milling wet air pollution control	1	0	0

Table X-2

POLLUTANT REMOVAL ESTIMATES FOR DIRECT DISCHARGERS IN THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

Pollutant	Raw Waste (kg/yr)	Option A Discharge (kg/yr)	Option A Removed (kg/yr)	Option B Discharge (kg/yr)	Option B Removed (kg/yr)	Option C Discharge (kg/yr)	Option C Removed (kg/yr)
Antimony	6.11	6.03	0.08	5.73	0.38	5.56	0.55
Arsenic	4.91	4.88	0.03	4.57	0.34	4.44	0.47
Cadmium	4.00	3.94	0.06	3.62	0.37	2.62	1.37
Chromium (total)	53.17	48.44	4.73	37.75	15.42	35.54	17.63
Copper	51.81	48.52	3.30	40.32	11.49	34.17	17.64
Cyanide (total)	8.82	8.79	0.03	8.39	0.43	8.13	0.69
Lead	73.30	21.77	51.53	14.02	59.28	11.10	62.20
Mercury	0.19	0.17	0.02	0.11	0.08	0.11	0.08
Nickel	157.41	147.32	10.09	100.97	56.43	53.30	104.11
Selenium	4.70	4.53	0.17	4.18	0.52	4.10	0.60
Silver	3.84	3.83	0.01	3.66	0.18	3.44	0.40
Thallium	47.34	44.69	2.66	26.58	20.77	17.90	29.44
Zinc	97.53	83.04	14.49	45.81	51.71	34.16	63.37
TOTAL TOXICS	513.11	425.93	87.18	295.72	217.39	214.56	298.56
Titanium	7,140.55	1,349.54	5,791.00	944.23	6,196.31	899.23	6,241.32
Fluoride	0.71	0.71	0	0.33	0.38	0.31	0.40
TOTAL NONCONVENTIONALS	7,141.26	1,350.25	5,791.00	944.56	6,196.69	899.54	6,241.72
TSS	75,096.11	10,650.10	64,446.01	5,720.60	69,375.50	4,693.71	70,402.40
Oil and Grease	34,220.19	16,874.23	17,345.95	10,751.68	23,468.51	10,414.11	23,806.08
TOTAL CONVENTIONALS	109,316.29	27,524.33	81,791.96	16,472.28	92,844.01	15,107.82	94,208.48
TOTAL POLLUTANTS	116,970.66	29,300.51	87,670.15	17,712.56	99,258.10	16,221.91	100,748.75

Table X-3

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

(March, 1982 Dollars)

Option	Total Required Capital Cost	Total Annual Cost
A	989,000	588,000
B	945,000	543,000
C	1,030,000	585,000

Table X-4

BAT WASTEWATER DISCHARGE RATES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

Wastewater Stream	BAT Normalized Discharge Rate l/kkg	BAT Normalized Discharge Rate gal/ton	Production Normalizing Parameter (kkg)
Chlorination off-gas wet air pollution control	936	225	$TiCl_4$ produced
Chlorination area-vent wet air pollution control	1,040	250	$TiCl_4$ produced
$TiCl_4$ handling wet air pollution control	187	45	$TiCl_4$ produced
Reduction area wet air pollution control	4,130	991	Titanium produced
Melt cell wet air pollution control	2,126	510	Titanium produced
Cathode gas wet air pollution control	615	148	Titanium produced
Chlorine liquefaction wet air pollution control	29,756	7,141	Titanium produced
Sodium reduction container reconditioning wash water	1,282	308	Titanium produced
Chip crushing wet air pollution control	2,292	550	Titanium produced
Acid leachate and rinse water	11,840	2,842	Titanium produced

Table X-4 (Continued)

BAT WASTEWATER DISCHARGE RATES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

Wastewater Stream	BAT Normalized Discharge Rate		Production Normalizing Parameter (kkg)
	l/kkg	gal/ton	
Sponge crushing and screening wet air pollution control	647	155	Titanium produced
Acid pickle and wash water	61	15	Titanium pickled
Scrap milling wet air pollution control	227	55	Scrap milled
Scrap detergent wash water	18,064	4,335	Scrap washed
Casting crucible wash water	477	114	Titanium cast
Casting contact cooling water	72,973	17,514	Titanium cast

Table X-5

BAT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

1. Level A

(a) Chlorination Off-Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.412	0.169
Lead	0.393	0.187
Nickel	1.797	1.189
Thallium	1.919	0.852
Fluoride	32.760	18.720
Titanium	0.412	0.168

(b) Chlorination Area-Vent Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.458	0.187
Lead	0.437	0.208
Nickel	1.997	1.321
Thallium	2.132	0.946
Fluoride	36.400	20.800
Titanium	0.458	0.187

Table X-5 (continued)

BAT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(c) $TiCl_4$ Handling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ handled		
Chromium (total)	0.082	0.034
Lead	0.079	0.037
Nickel	0.359	0.237
Thallium	0.383	0.170
Fluoride	6.545	3.740
Titanium	0.082	0.034

(d) Sponge Crushing and Screening Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.285	0.116
Lead	0.272	0.129
Nickel	1.242	0.822
Thallium	1.326	0.589
Fluoride	22.650	12.940
Titanium	0.285	0.116

Table X-5 (continued)

BAT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

B. Level B

(a) Chlorination Off-Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.346	0.140
Lead	0.262	0.122
Nickel	0.515	0.346
Thallium	1.310	0.571
Fluoride	32.760	18.720
Titanium	0.346	0.140

(b) Chlorination Area-Vent Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.385	0.156
Lead	0.291	0.135
Nickel	0.572	0.385
Thallium	1.456	0.634
Fluoride	36.400	20.800
Titanium	0.385	0.156

(c) $TiCl_4$ Handling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ handled		
Chromium (total)	0.069	0.028
Lead	0.052	0.024
Nickel	0.103	0.069
Thallium	0.262	0.114
Fluoride	6.545	3.740
Titanium	0.069	0.028

Table X-5 (continued)

BAT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(d) Reduction Area Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	1.528	0.620
Lead	1.157	0.537
Nickel	2.272	1.528
Thallium	5.782	2.519
Fluoride	144.600	82.600
Titanium	1.528	0.620

(e) Melt Cell Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.787	0.319
Lead	0.595	0.276
Nickel	1.170	0.787
Thallium	2.976	1.297
Fluoride	74.410	42.520
Titanium	0.787	0.319

(f) Cathode Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.228	0.092
Lead	0.172	0.080
Nickel	0.338	0.228
Thallium	0.861	0.375
Fluoride	21.530	12.300
Titanium	0.228	0.092

Table X-5 (continued)

BAT MASS LIMITATIONS FOR THE PRIMARY
AND SECONDARY TITANIUM SUBCATEGORY

g) Chlorine Liquefaction Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	11.010	4.464
Lead	8.332	3.868
Nickel	16.370	11.010
Thallium	41.660	18.150
Fluoride	1,042.000	595.100
Titanium	11.010	4.463

h) Sodium Reduction Container Reconditioning Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.474	0.192
Lead	0.359	0.167
Nickel	0.705	0.474
Thallium	1.795	0.782
Fluoride	44.870	25.640
Titanium	0.474	0.192

i) Chip Crushing Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.848	0.344
Lead	0.642	0.298
Nickel	1.261	0.848
Thallium	3.209	1.398
Fluoride	80.220	45.840
Titanium	0.848	0.344

Table X-5 (continued)

BAT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(j) Acid Leachate and Rinse Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	4.381	1.776
Lead	3.315	1.539
Nickel	6.512	4.381
Thallium	16.580	7.222
Fluoride	414.400	236.800
Titanium	4.381	1.776

(k) Sponge Crushing and Screening Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.239	0.097
Lead	0.181	0.084
Nickel	0.356	0.239
Thallium	0.906	0.365
Fluoride	22.650	12.940
Titanium	0.239	0.097

(l) Acid Pickle and Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium pickled		
Chromium (total)	0.023	0.009
Lead	0.017	0.008
Nickel	0.034	0.023
Thallium	0.085	0.037
Fluoride	2.135	1.220
Titanium	0.023	0.009

Table X-5 (continued)

BAT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

m) Scrap Milling Wet Air Pollution Control

ollutant or ollutant Property	Maximum for Any One Day	Maximum for Monthly Average
g/kg (lb/million lbs) of scrap milled		
hromium (total)	0.084	0.034
ead	0.064	0.030
ickel	0.125	0.084
hallium	0.318	0.138
luoride	7.945	4.540
itanium	0.084	0.034

n) Scrap Detergent Wash Water

ollutant or ollutant Property	Maximum for Any One Day	Maximum for Monthly Average
g/kg (lb/million lbs) of scrap washed		
hromium (total)	6.684	2.710
ead	5.058	2.349
ickel	9.935	6.684
hallium	25.290	11.020
luoride	632.300	361.300
itanium	6.684	2.710

o) Casting Crucible Wash Water

ollutant or ollutant Property	Maximum for Any One Day	Maximum for Monthly Average
g/kg (lb/million lbs) of titanium cast		
hromium (total)	0.177	0.072
ead	0.134	0.062
ickel	0.262	0.177
hallium	0.668	0.291
luoride	16.700	9.540
itanium	0.176	0.067

Table X-5 (continued)

BAT MASS LIMITATIONS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(p) Casting Contact Cooling Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium cast		
Chromium (total)	27.000	10.950
Lead	20.430	9.487
Nickel	40.140	27.000
Thallium	102.200	44.510
Fluoride	2,554.000	1,460.000
Titanium	8.500	3.446

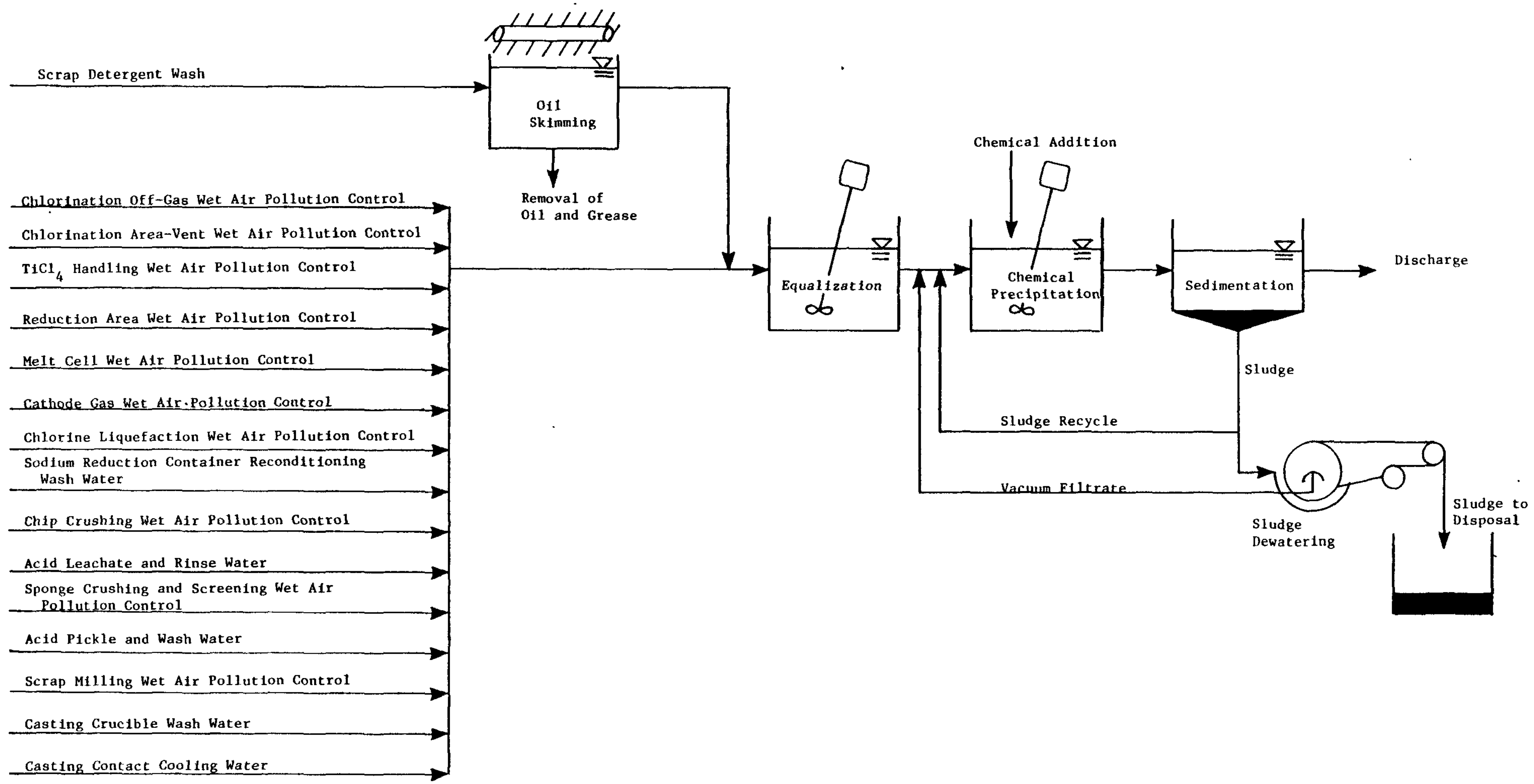

Figure X-1

BAT TREATMENT SCHEME FOR OPTION A

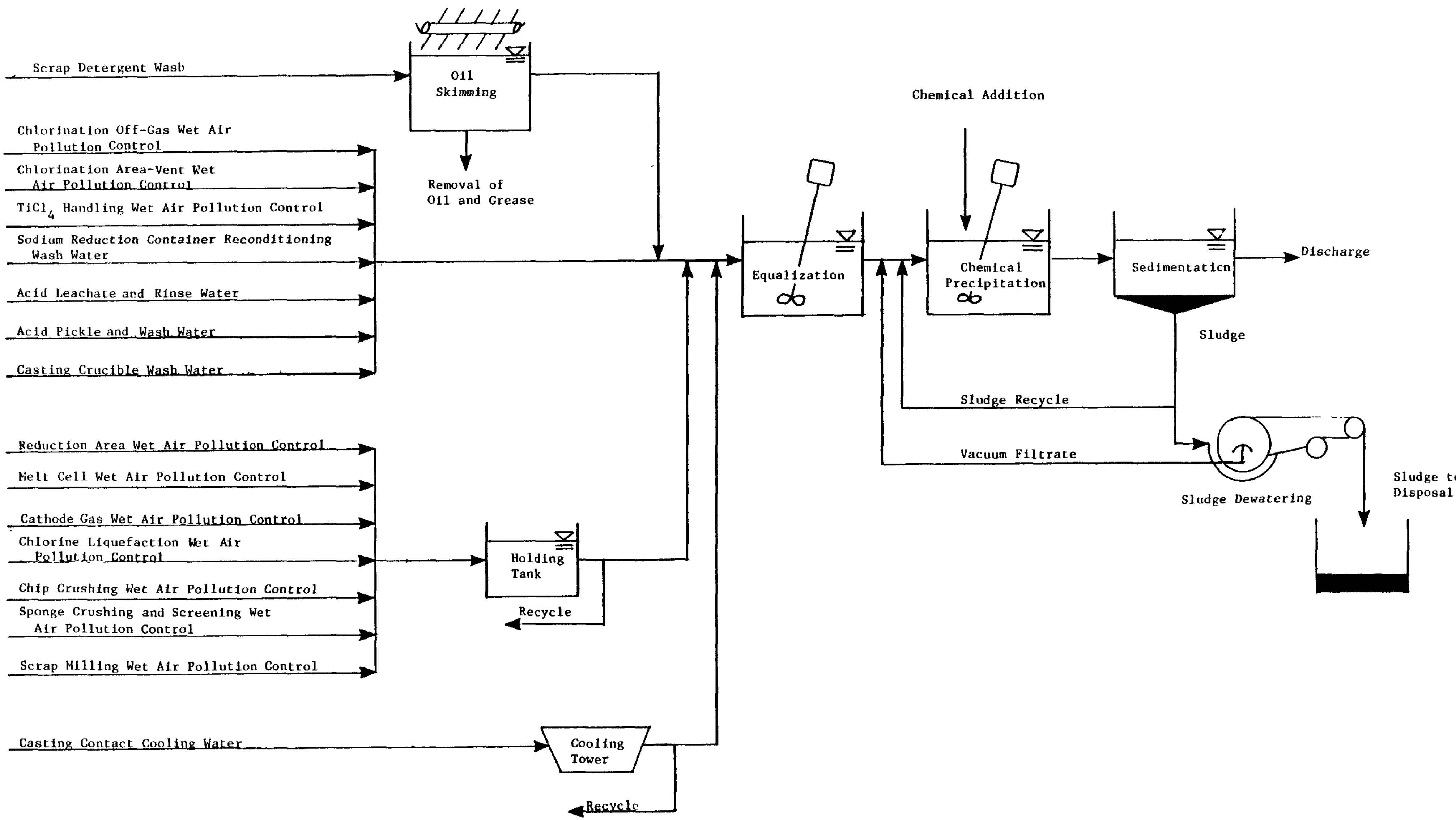

Figure X-2

BAT TREATMENT SCHEME FOR OPTION B

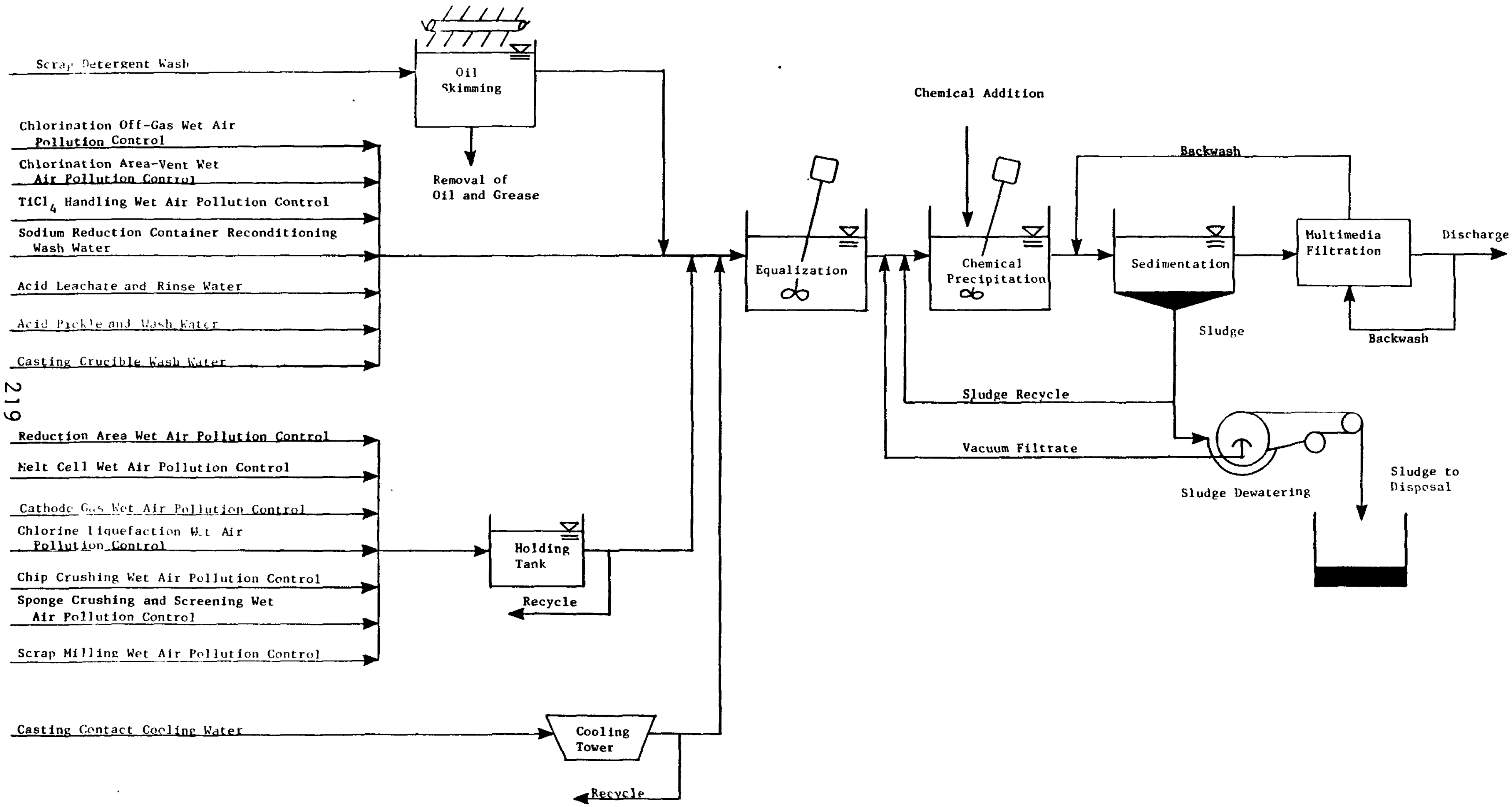

Figure X-3

BAT TREATMENT SCHEME FOR OPTION C

PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

SECTION XI

NEW SOURCE PERFORMANCE STANDARDS

'he basis for new source performance standards (NSPS) under ;ection 306 of the Act is the best available demonstrated .echnology (BDT). New plants have the opportunity to design the ·est and most efficient production processes and wastewater .reatment technologies without facing the added costs and ·estrictions encountered in retrofitting an existing plant. 'herefore, Congress direct EPA to consider the best demonstrated ·rocess changes, in-plant controls, and end-of-pipe treatment .echnologies which reduce pollution to the maximum extent :easible.

'his section describes the technologies for treatment of ·astewater from new sources and presents mass discharge standards :or regulatory pollutants for NSPS in the primary and secondary :itanium subcategory, based on the selected treatment technology.

'ECHNICAL APPROACH TO NSPS

ew source performance standards are generally equivalent to the ›est available technology (BAT) selected for currently existing ›lants. This is a consequence of careful review by the Agency of . wide range of technical options for new source treatment ;ystems which is discussed in Section XI of the General)evelopment Document. This review of the primary and secondary :ianium subcategory, however, found new and economically :easible, demonstrated technologies which are considered an .mprovement over those chosen for consideration for BAT. These ıew technologies are based on dry scrubbing and by-product :ecovery of a salable product. Additionally, there was nothing :ound to indicate that the characteristics of new plants would ıot be similar to those from existing plants, since the processes ısed by new sources are not expected to differ from those used at ›xisting sources. Consequently, BAT production normalized lischarge rates, which are based on the best existing practices ɔf the subcategory, can also be applied to new sources, with the ıdditional flow restrictions for selected waste streams based on lry scrubbing and by-product recovery. These additional flow :eduction measures are further explained in the NSPS Option Selection paragraph on the following page. The NSPS discharge :ates are presented in Table XI-1 at the end of this section.

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

ɔPTION A

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

OPTION B

- Preliminary treatment with oil skimming (where required)
- Chemical precipitation and sedimentation
- In-process flow reduction

OPTION C

- Preliminary treatment with oil skimming (where required)
- Chemical precipitation and sedimentation
- In-process flow reduction
- Multimedia filtration

NSPS OPTION SELECTION

We are proposing that NSPS be equal to BAT plus flow reduction technology with additional flow reduction for four streams. Zero discharge is proposed for chip crushing, sponge crushing and screening, and scrap milling wet air pollution control wastewater based on dry scrubbing. Zero discharge is also proposed for chlorine liquefaction wet air pollution control based on by-product recovery of scrubber liquor as hypochlorous acid. Cost for dry scrubbing air pollution control in a new facility is no greater than the cost for wet scrubbing which was the basis for BAT cost estimates. We believe that the proposed NSPS are economically achievable, and that they 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 oil and grease, TSS, and pH are also selected for limitation.

NEW SOURCE PERFORMANCE STANDARDS

The NSPS discharge flows for each wastewater source are shown in Table XI-1. The mass of pollutant allowed to be discharged per mass of product is calculated by multiplying the appropriate treatable concentration (mg/l) by the production normalized wastewater discharge flows (l/kkg). The treatable concentrations are listed in Table VII-19 of the General Development Document.

he results of these calculations are the production-based new ource performance standards. These standards are presented in able XI-2.

Table XI-1

NSPS WASTEWATER DISCHARGE RATES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

Wastewater Stream	NSPS Normalized Discharge Rate		Production Normalizing Parameter (kkg)
	l/kkg	gal/ton	
Chlorination off-gas wet air pollution control	936	225	$TiCl_4$ produced
Chlorination area-vent wet air pollution control	1,040	250	$TiCl_4$ produced
$TiCl_4$ handling wet air pollution control	187	45	$TiCl_4$ produced
Reduction area wet air pollution control	4,130	991	Titanium produced
Melt cell wet air pollution control	2,126	510	Titanium produced
Cathode gas wet air pollution control	615	148	Titanium produced
Chlorine liquefaction wet air pollution control	0	0	Titanium produced
Sodium reduction container reconditioning wash water	1,282	308	Titanium produced
Chip crushing wet air pollution control	0	0	Titanium produced
Acid leachate and rinse water	11,840	2,842	Titanium produced

Table XI-1 (Continued)

NSPS WASTEWATER DISCHARGE RATES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

Wastewater Stream	NSPS Normalized Discharge Rate		Production Normalizing Parameter (kkg)
	l/kkg	gal/ton	
Sponge crushing and screening wet air pollution control	0	0	Titanium produced
Acid pickle and wash water	61	15	Titanium pickled
Scrap milling wet air pollution control	0	0	Scrap milled
Scrap detergent wash water	18,064	4,335	Scrap washed
Casting crucible wash water	477	114	Titanium cast
Casting contact cooling water	72,973	17,514	Titanium cast

Table XI-2

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

A. Level A

(a) Chlorination Off-Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.412	0.169
Lead	0.393	0.187
Nickel	1.797	1.189
Thallium	1.919	0.852
Fluoride	32.760	18.720
Titanium	0.412	0.168
Total suspended solids	38.380	18.250
Oil and Grease	18.720	11.230
ph	Within the range of 7.5 to 10.0 at all times	

(b) Chlorination Area-Vent Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.458	0.187
Lead	0.437	0.208
Nickel	1.997	1.321
Thallium	2.132	0.946
Fluoride	36.400	20.800
Titanium	0.458	0.187
Total suspended solids	42.640	20.280
Oil and Grease	20.800	12.280
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (continued)

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

c) $TiCl_4$ Handling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ handled		
Chromium (total)	0.082	0.034
Lead	0.079	0.037
Nickel	0.359	0.237
Thallium	0.383	0.170
Fluoride	6.545	3.740
Titanium	0.082	0.034
Total suspended solids	7.667	3.647
Oil and Grease	3.740	2.244
pH	Within the range of 7.5 to 10.0 at all times	

d) Sponge Crushing and Screening Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.000	0.000
Lead	0.000	0.000
Nickel	0.000	0.000
Thallium	0.000	0.000
Fluoride	0.000	0.000
Titanium	0.000	0.000
Total suspended solids	0.000	0.000
Oil and Grease	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (continued)

NSPS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

B. Level B

(a) Chlorination Off-Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.346	0.140
Lead	0.262	0.122
Nickel	0.515	0.346
Thallium	1.310	0.571
Fluoride	32.760	18.720
Titanium	0.346	0.140
Oil and Grease	9.360	9.360
Total suspended solids	14.040	11.230
pH	Within the range of 7.5 to 10.0 at all times	

(b) Chlorination Area-Vent Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.385	0.156
Lead	0.291	0.135
Nickel	0.572	0.385
Thallium	1.456	0.634
Fluoride	36.400	20.800
Titanium	0.385	0.156
Oil and Grease	10.400	10.400
Total suspended solids	15.600	12.480
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (continued)

NSPS FOR THE PRIMARY AND SECONDARY
TITANIUM SUBCATEGORY

c) $TiCl_4$ Handling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ handled		
Chromium (total)	0.069	0.028
Lead	0.052	0.024
Nickel	0.103	0.069
Thallium	0.262	0.114
Fluoride	6.545	3.740
Titanium	0.069	0.028
Oil and Grease	1.870	1.870
Total suspended solids	2.805	2.244
pH	Within the range of 7.5 to 10.0 at all times	

d) Reduction Area Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	1.528	0.620
Lead	1.157	0.537
Nickel	2.272	1.528
Thallium	5.782	2.519
Fluoride	144.600	82.600
Titanium	1.528	0.620
Oil and Grease	41.300	41.300
Total suspended solids	61.950	49.560
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (continued)

NSPS FOR THE PRIMARY AND SECONDARY
TITANIUM SUBCATEGORY

(e) Melt Cell Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.787	0.319
Lead	0.595	0.276
Nickel	1.170	0.787
Thallium	2.976	1.297
Fluoride	74.410	42.520
Titanium	0.787	0.319
Oil and Grease	21.260	21.260
Total suspended solids	31.890	25.510
pH	Within the range of 7.5 to 10.0 at all times	

(f) Cathode Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.228	0.092
Lead	0.172	0.080
Nickel	0.338	0.228
Thallium	0.861	0.375
Fluoride	21.530	12.300
Titanium	0.228	0.092
Oil and Grease	6.150	6.150
Total suspended solids	9.225	7.380
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (continued)

NSPS FOR THE PRIMARY AND SECONDARY
TITANIUM SUBCATEGORY

g) Chlorine Liquefaction Wet Air Pollution Control

ollutant or ollutant Property	Maximum for Any One Day	Maximum for Monthly Average
g/kg (lb/million lbs) of titanium produced		
hromium (total)	0.000	0.000
ead	0.000	0.000
ickel	0.000	0.000
hallium	0.000	0.000
luoride	0.000	0.000
itanium	0.000	0.000
il and Grease	0.000	0.000
otal suspended solids	0.000	0.000
H	Within the range of 7.5 to 10.0 at all times	

h) Sodium Reduction Container Reconditioning Wash

ollutant or ollutant Property	Maximum for Any One Day	Maximum for Monthly Average
g/kg (lb/million lbs) of titanium produced		
hromium (total)	0.474	0.192
ead	0.359	0.167
ickel	0.705	0.474
hallium	1.795	0.782
luoride	44.870	25.640
itanium	0.474	0.192
il and Grease	12.820	12.820
otal suspended solids	19.230	15.390
H	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (continued)

NSPS FOR THE PRIMARY AND SECONDARY
TITANIUM SUBCATEGORY

(i) Chip Crushing Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.000	0.000
Lead	0.000	0.000
Nickel	0.000	0.000
Thallium	0.000	0.000
Fluoride	0.000	0.000
Titanium	0.000	0.000
Oil and Grease	0.000	0.000
Total suspended solids	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

(j) Acid Leachate and Rinse Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	4.381	1.776
Lead	3.315	1.539
Nickel	6.512	4.381
Thallium	16.580	7.222
Fluoride	414.400	236.800
Titanium	4.381	1.776
Oil and Grease	118.400	118.400
Total suspended solids	177.600	142.100
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (continued)

NSPS FOR THE PRIMARY AND SECONDARY
TITANIUM SUBCATEGORY

k) Sponge Crushing and Screening Wet Air Pollution Control

ollutant or ollutant Property	Maximum for Any One Day	Maximum for Monthly Average
g/kg (lb/million lbs) of titanium produced		
hromium (total)	0.000	0.000
ead	0.000	0.000
ickel	0.000	0.000
hallium	0.000	0.000
luoride	0.000	0.000
itanium	0.000	0.000
il and Grease	0.000	0.000
otal suspended solids	0.000	0.000
H	Within the range of 7.5 to 10.0 at all times	

l) Acid Pickle and Wash Water

ollutant or ollutant Property	Maximum for Any One Day	Maximum for Monthly Average
g/kg (lb/million lbs) of titanium pickled		
hromium (total)	0.023	0.009
ead	0.017	0.008
ickel	0.034	0.023
hallium	0.085	0.037
luoride	2.135	1.220
itanium	0.023	0.009
il and Grease	0.610	0.610
otal suspended solids	0.915	0.732
H	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (continued)

NSPS FOR THE PRIMARY AND SECONDARY
TITANIUM SUBCATEGORY

(m) Scrap Milling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of scrap milled		
Chromium (total)	0.000	0.000
Lead	0.000	0.000
Nickel	0.000	0.000
Thallium	0.000	0.000
Fluoride	0.000	0.000
Titanium	0.000	0.000
Oil and Grease	0.000	0.000
Total suspended solids	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

(n) Scrap Detergent Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of scrap washed		
Chromium (total)	6.684	2.710
Lead	5.058	2.349
Nickel	9.935	6.684
Thallium	25.290	11.020
Fluoride	632.300	361.300
Titanium	6.684	2.710
Oil and Grease	180.700	180.700
Total suspended solids	271.000	216.800
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (continued)

NSPS FOR THE PRIMARY AND SECONDARY
TITANIUM SUBCATEGORY

o) Casting Crucible Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
g/kg (lb/million lbs) of titanium cast		
Chromium (total)	0.177	0.072
Lead	0.134	0.062
Nickel	0.262	0.177
Thallium	0.668	0.291
Fluoride	16.700	9.540
Titanium	0.176	0.067
Oil and Grease	4.770	4.770
Total suspended solids	7.155	5.724
pH	Within the range of 7.5 to 10.0 at all times	

p) Casting Contact Cooling Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium cast		
Chromium (total)	27.000	10.950
Lead	20.430	9.487
Nickel	40.140	27.000
Thallium	102.200	44.510
Fluoride	2,554.000	1,460.000
Titanium	8.500	3.446
Oil and Grease	729.800	729.800
Total suspended solids	1,095.000	875.700
pH	Within the range of 7.5 to 10.0 at all times	

PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

SECTION XII

PRETREATMENT STANDARDS

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

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

TECHNICAL APPROACH TO PRETREATMENT

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

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

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

INDUSTRY COST AND POLLUTANT REMOVAL ESTIMATES

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

PRETREATMENT STANDARDS FOR EXISTING AND NEW SOURCES

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

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

Treatment technologies considered for the PSNS and PSES options are:

OPTION A

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

OPTION B

- Preliminary treatment with oil skimming (where required)
- Chemical precipitation and sedimentation
- In-process flow reduction

OPTION C

- Preliminary treatment with oil skimming (where required)
- Chemical precipitation and sedimentation
- In-process flow reduction
- Multimedia filtration

SES OPTION SELECTION

e are proposing PSES equal to BAT for this subcategory. It is ecessary to propose PSES to avoid pass-through of chromium, ead, nickel, thallium, titanium and fluoride. The four toxic ollutants are removed by a well-operated POTW achieving econdary treatment at an average of 14 percent while BAT Level A echnology removes approximately 44 percent and Level B echnology removes approximately 76 percent. Discharge llowances for PSES are the same as BAT allowances, and are shown n Table XII-3.

mplementation of the proposed PSES limitations would remove nnually an estimated 1.7 kg of toxic pollutants and 147 kg of itanium.

'he costs and specific removal data for this subcategory are not resented here because the data on which they are based has been laimed to be confidential. The proposed PSES will not result in dverse economic impacts.

'SNS OPTION SELECTION

Je are proposing Level A and Level B PSNS equivalent to NSPS. 'he technology basis for proposed PSNS is identical to NSPS. The ame pollutants are regulated at PSNS as at PSES and they pass hrough at PSNS as at PSES, for the same reasons. The PSNS and 'SPS flow allowances are based on minimization of process vastewater wherever possible through the use of cooling towers to ecycle contact cooling water and holding tanks for wet scrubbing vastewater. The discharge allowance for pollutants is the same t PSNS and NSPS (See Table XII-4). The discharges are based on 90 percent recycle of these waste streams (see Section IX - Recycle of Wet Scrubber and Contact Cooling Water). As in NSPS, flow reduction beyond BAT is proposed for chip crushing, sponge crushing and screening, and scrap milling wet air pollution control wastewater based on dry scrubbing. Zero discharge is also proposed for chlorine liquefaction wet air pollution control based on by-product recovery of scrubber liquor as hypochlorous acid.

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

REGULATED POLLUTANT PARAMETERS

Pollutants selected for limitation, in accordance with the rationale of Sections VI and X, are identical to those selected for limitation for BAT. It is necessary to propose PSES and PSNS to prevent the pass-through of chromium, lead, nickel, thallium, titanium, and fluoride, which are the limited pollutants.

PRETREATMENT STANDARDS

Pretreatment standards, PSES and PSNS, are based on the treatable concentrations from the selected treatment technology, (Option C), and the discharge rates determined in Section X for BAT, and Section XI for NSPS, respectively. A mass of pollutant per mass of product (mg/kg) allocation is given for each subdivision within the subcategory. This pollutant allocation is based on the product of the treatable concentration from the proposed treatment (mg/l) and the production normalized wastewater discharge rate. The achievable treatment concentrations for BAT are identical to those for PSES and PSNS. These concentrations are listed in Tables VII-19 of the General Development Document. PSES and PSNS are presented in Tables XII-5 and XII-6.

Table XII-1

POLLUTANT REMOVAL ESTIMATES FOR INDIRECT DISCHARGERS IN THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

Pollutant	Raw Waste (kg/yr)	Option A Discharge (kg/yr)	Option A Removed (kg/yr)	Option B Discharge (kg/yr)	Option B Removed (kg/yr)	Option C Discharge (kg/yr)	Option C Removed (kg/yr)
Antimony	0.030	0.029	0.001	0.027	0.002	0.027	0.002
Arsenic	0.028	0.027	0.001	0.026	0.002	0.026	0.002
Cadmium	0.014	0.013	0	0.012	0.001	0.012	0.001
Chromium (total)	1.608	1.564	0.044	1.479	0.130	1.478	0.131
Copper	0.794	0.764	0.029	0.729	0.065	0.729	0.065
Cyanide (total)	0.023	0.022	0.001	0.021	0.002	0.021	0.002
Lead	0.309	0.290	0.019	0.276	0.032	0.276	0.032
Mercury	0.008	0.007	0	0.007	0.001	0.007	0.001
Nickel	2.663	2.560	0.104	2.441	0.223	2.441	0.223
Selenium	0.073	0.071	0.003	0.067	0.006	0.067	0.006
Silver	0.004	0.004	0	0.004	0	0.004	0
Thallium	0.046	0.039	0.006	0.038	0.008	0.037	0.009
Zinc	1.870	1.801	0.069	1.717	0.153	1.717	0.153
TOTAL TOXICS	7.469	7.191	0.278	6.844	0.625	6.842	0.627
Titanium	163.114	20.302	142.812	16.706	146.409	8.778	154.336
Fluoride	0.002	0	0.002	0	0.002	0	0.002
TOTAL NONCONVENTIONALS	163.117	20.302	142.815	16.706	146.412	8.778	154.339
TSS	1,407.727	243.710	1,164.018	200.551	1,207.176	38.058	1,369.669
Oil and Grease	548.610	528.961	19.649	504.362	44.248	504.362	44.248
TOTAL CONVENTIONALS	1,956.337	772.670	1,183.667	704.913	1,251.424	542.420	1,413.917
TOTAL POLLUTANTS	2,126.923	800.164	1,326.759	728.463	1,398.460	558.040	1,568.883

Table XII-2

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

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

Table XII-3

PSES WASTEWATER DISCHARGE RATES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

Wastewater Stream	PSES Normalized Discharge Rate		Production Normalizing Parameter (kkg)
	l/kkg	gal/ton	
Chlorination off-gas wet air pollution control	936	225	$TiCl_4$ produced
Chlorination area-vent wet air pollution control	1,040	250	$TiCl_4$ produced
$TiCl_4$ handling wet air pollution control	187	45	$TiCl_4$ produced
Reduction area wet air pollution control	4,130	991	Titanium produced
Melt cell wet air pollution control	2,126	510	Titanium produced
Cathode gas wet air pollution control	615	148	Titanium produced
Chlorine liquefaction wet air pollution control	29,756	7,141	Titanium produced
Sodium reduction container reconditioning wash water	1,282	308	Titanium produced
Chip crushing wet air pollution control	2,292	550	Titanium produced
Acid leachate and rinse water	11,840	2,842	Titanium produced

Table XII-3 (Continued)

PSES WASTEWATER DISCHARGE RATES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

Wastewater Stream	PSES Normalized Discharge Rate		Production Normalizing Parameter (kkg)
	l/kkg	gal/ton	
Sponge crushing and screening wet air pollution control	647	155	Titanium produced
Acid pickle and wash water	61	15	Titanium pickled
Scrap milling wet air pollution control	227	55	Scrap milled
Scrap detergent wash water	18,064	4,335	Scrap washed
Casting crucible wash water	477	114	Titanium cast
Casting contact cooling water	72,973	17,514	Titanium cast

Table XII-4

PSNS WASTEWATER DISCHARGE RATES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

Wastewater Stream	PSNS Normalized Discharge Rate 1/kkg	gal/ton	Production Normalizing Parameter (kkg)
Chlorination off-gas wet air pollution control	936	225	$TiCl_4$ produced
Chlorination area-vent wet air pollution control	1,040	250	$TiCl_4$ produced
$TiCl_4$ handling wet air pollution control	187	45	$TiCl_4$ produced
Reduction area wet air pollution control	4,130	991	Titanium produced
Melt cell wet air pollution control	2,126	510	Titanium produced
Cathode gas wet air pollution control	615	148	Titanium produced
Chlorine liquefaction wet air pollution control	0	0	Titanium produced
Sodium reduction container reconditioning wash water	1,282	308	Titanium produced
Chip crushing wet air pollution control	0	0	Titanium produced
Acid leachate and rinse water	11,840	2,842	Titanium produced

Table XII-4 (Continued)

PSNS WASTEWATER DISCHARGE RATES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

Wastewater Stream	PSNS Normalized Discharge Rate 1/kkg	PSNS Normalized Discharge Rate gal/ton	Production Normalizing Parameter (kkg)
Sponge crushing and screening wet air pollution control	0	0	Titanium produced
Acid pickle and wash water	61	15	Titanium pickled
Scrap milling wet air pollution control	0	0	Scrap milled
Scrap detergent wash water	18,064	4,335	Scrap washed
Casting crucible wash water	477	114	Titanium cast
Casting contact cooling water	72,973	17,515	Titanium cast

TABLE XII-5

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

.. Level A

a) Chlorination Off-Gas Wet Air Pollution Control

ollutant or ollutant Property	Maximum for Any One Day	Maximum for Monthly Average
g/kg (lb/million lbs) of $TiCl_4$ produced		
hromium (total)	0.412	0.169
ead	0.393	0.187
ickel	1.797	1.189
hallium	1.919	0.852
luoride	32.760	18.720
itanium	0.412	0.168

b) Chlorination Area-Vent Wet Air Pollution Control

ollutant or ollutant Property	Maximum for Any One Day	Maximum for Monthly Average
g/kg (lb/million lbs) of $TiCl_4$ produced		
hromium (total)	0.458	0.187
ead	0.437	0.208
ickel	1.997	1.321
hallium	2.132	0.946
luoride	36.400	20.800
itanium	0.458	0.187

TABLE XII-5 (continued)

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(c) $TiCl_4$ Handling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ handled		
Chromium (total)	0.082	0.034
Lead	0.079	0.037
Nickel	0.359	0.237
Thallium	0.383	0.170
Fluoride	6.545	3.740
Titanium	0.082	0.034

(d) Sponge Crushing and Screening Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.285	0.116
Lead	0.272	0.129
Nickel	1.242	0.822
Thallium	1.326	0.589
Fluoride	22.650	12.940
Titanium	0.285	0.116

TABLE XII-5 (continued)

PSES FOR THE PRIMARY AND SECONDARY
TITANIUM SUBCATEGORY

B. Level B

(a) Chlorination Off-Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.346	0.140
Lead	0.262	0.122
Nickel	0.515	0.346
Thallium	1.310	0.571
Fluoride	32.760	18.720
Titanium	0.346	0.140

(b) Chlorination Area-Vent Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.385	0.156
Lead	0.291	0.135
Nickel	0.572	0.385
Thallium	1.456	0.634
Fluoride	36.400	20.800
Titanium	0.385	0.156

(c) $TiCl_4$ Handling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ handled		
Chromium (total)	0.069	0.028
Lead	0.052	0.024
Nickel	0.103	0.069
Thallium	0.262	0.114
Fluoride	6.545	3.740
Titanium	0.069	0.028

TABLE XII-5 (continued)

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(d) Reduction Area Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	1.528	0.620
Lead	1.157	0.537
Nickel	2.272	1.528
Thallium	5.782	2.519
Fluoride	144.600	82.600
Titanium	1.528	0.620

(e) Melt Cell Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.787	0.319
Lead	0.595	0.276
Nickel	1.170	0.787
Thallium	2.976	1.297
Fluoride	74.410	42.520
Titanium	0.787	0.319

(f) Cathode Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.228	0.092
Lead	0.172	0.080
Nickel	0.338	0.228
Thallium	0.861	0.375
Fluoride	21.530	12.300
Titanium	0.228	0.092

TABLE XII-5 (continued)

PSES FOR THE PRIMARY AND SECONDARY
TITANIUM SUBCATEGORY

(g) Chlorine Liquefaction Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	11.010	4.464
Lead	8.332	3.868
Nickel	16.370	11.010
Thallium	41.660	18.150
Fluoride	1,042.000	595.100
Titanium	11.010	4.463

(h) Sodium Reduction Container Reconditioning Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.474	0.192
Lead	0.359	0.167
Nickel	0.705	0.474
Thallium	1.795	0.782
Fluoride	44.870	25.640
Titanium	0.474	0.192

(i) Chip Crushing Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.848	0.344
Lead	0.642	0.298
Nickel	1.261	0.848
Thallium	3.209	1.398
Fluoride	80.220	45.840
Titanium	0.848	0.344

TABLE XII-5 (continued)

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(j) Acid Leachate and Rinse Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	4.381	1.776
Lead	3.315	1.539
Nickel	6.512	4.381
Thallium	16.580	7.222
Fluoride	414.400	236.800
Titanium	4.381	1.776

(k) Sponge Crushing and Screening Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.239	0.097
Lead	0.181	0.084
Nickel	0.356	0.239
Thallium	0.906	0.395
Fluoride	22.650	12.940
Titanium	0.239	0.097

(l) Acid Pickle and Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium pickled		
Chromium (total)	0.023	0.009
Lead	0.017	0.008
Nickel	0.034	0.023
Thallium	0.085	0.037
Fluoride	2.135	1.220
Titanium	0.023	0.009

TABLE XII-5 (continued)

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

m) Scrap Milling Wet Air Pollution Control

ollutant or ollutant Property	Maximum for Any One Day	Maximum for Monthly Average
g/kg (lb/million lbs) of scrap milled		
hromium (total)	0.084	0.034
ead	0.064	0.030
ickel	0.125	0.084
hallium	0.318	0.138
luoride	7.945	4.540
itanium	0.084	0.034

n) Scrap Detergent Wash Water

ollutant or ollutant Property	Maximum for Any One Day	Maximum for Monthly Average
g/kg (lb/million lbs) of scrap washed		
hromium (total)	6.684	2.710
ead	5.058	2.349
ickel	9.935	6.684
hallium	25.290	11.020
luoride	632.300	361.300
itanium	6.684	2.710

o) Casting Crucible Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
ng/kg (lb/million lbs) of titanium cast		
Chromium (total)	0.177	0.072
Lead	0.134	0.062
Nickel	0.262	0.177
Thallium	0.668	0.291
Fluoride	16.700	9.540
Titanium	0.176	0.067

TABLE XII-5 (continued)

PSES FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(p) Casting Contact Cooling Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium cast		
Chromium (total)	27.000	10.950
Lead	20.430	9.487
Nickel	40.140	27.000
Thallium	102.200	44.510
Fluoride	2,554.000	1,460.000
Titanium	8.500	3.446

Table XII-6

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

A. Level A

(a) Chlorination Off-Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.412	0.169
Lead	0.393	0.187
Nickel	1.797	1.189
Thallium	1.919	0.852
Fluoride	32.760	18.720
Titanium	0.412	0.168

(b) Chlorination Area-Vent Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.458	0.187
Lead	0.437	0.208
Nickel	1.997	1.321
Thallium	2.132	0.946
Fluoride	36.400	20.800
Titanium	0.458	0.187

Table XII-6 (continued)

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(c) $TiCl_4$ Handling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ handled		
Chromium (total)	0.082	0.034
Lead	0.079	0.037
Nickel	0.359	0.237
Thallium	0.383	0.170
Fluoride	6.545	3.740
Titanium	0.082	0.034

(d) Sponge Crushing and Screening Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.000	0.000
Lead	0.000	0.000
Nickel	0.000	0.000
Thallium	0.000	0.000
Fluoride	0.000	0.000
Titanium	0.000	0.000

Table XII-6 (continued)

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

B. Level B

(a) Chlorination Off-Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.346	0.140
Lead	0.262	0.122
Nickel	0.515	0.346
Thallium	1.310	0.571
Fluoride	32.760	18.720
Titanium	0.346	0.140

(b) Chlorination Area-Vent Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ produced		
Chromium (total)	0.385	0.156
Lead	0.291	0.135
Nickel	0.572	0.385
Thallium	1.456	0.634
Fluoride	36.400	20.800
Titanium	0.385	0.156

(c) $TiCl_4$ Handling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of $TiCl_4$ handled		
Chromium (total)	0.069	0.028
Lead	0.052	0.024
Nickel	0.103	0.069
Thallium	0.262	0.114
Fluoride	6.545	3.740
Titanium	0.069	0.028

Table XII-6 (continued)

PSNS FOR THE PRIMARY AND SECONDARY
TITANIUM SUBCATEGORY

(d) Reduction Area Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	1.528	0.620
Lead	1.157	0.537
Nickel	2.272	1.528
Thallium	5.782	2.519
Fluoride	144.600	82.600
Titanium	1.528	0.620

(e) Melt Cell Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.787	0.319
Lead	0.595	0.276
Nickel	1.170	0.787
Thallium	2.976	1.297
Fluoride	74.410	42.520
Titanium	0.787	0.319

(f) Cathode Gas Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.228	0.092
Lead	0.172	0.080
Nickel	0.338	0.228
Thallium	0.861	0.375
Fluoride	21.530	12.300
Titanium	0.228	0.092

Table XII-6 (continued)

PSNS FOR THE PRIMARY AND SECONDARY
TITANIUM SUBCATEGORY

(g) Chlorine Liquefaction Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.000	0.000
Lead	0.000	0.000
Nickel	0.000	0.000
Thallium	0.000	0.000
Fluoride	0.000	0.000
Titanium	0.000	0.000

(h) Sodium Reduction Container Reconditioning Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.474	0.192
Lead	0.359	0.167
Nickel	0.705	0.474
Thallium	1.795	0.782
Fluoride	44.870	25.640
Titanium	0.474	0.192

(i) Chip Crushing Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.000	0.000
Lead	0.000	0.000
Nickel	0.000	0.000
Thallium	0.000	0.000
Fluoride	0.000	0.000
Titanium	0.000	0.000

Table XII-6 (continued)

PSNS FOR THE PRIMARY AND SECONDARY
TITANIUM SUBCATEGORY

(j) Acid Leachate and Rinse Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	4.381	1.776
Lead	3.315	1.539
Nickel	6.512	4.381
Thallium	16.580	7.222
Fluoride	414.400	236.800
Titanium	4.381	1.776

(k) Sponge Crushing and Screening Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium produced		
Chromium (total)	0.000	0.000
Lead	0.000	0.000
Nickel	0.000	0.000
Thallium	0.000	0.000
Fluoride	0.000	0.000
Titanium	0.000	0.000

(l) Acid Pickle and Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium pickled		
Chromium (total)	0.023	0.009
Lead	0.017	0.008
Nickel	0.034	0.023
Thallium	0.085	0.037
Fluoride	2.135	1.220
Titanium	0.023	0.009

Table XII-6 (continued)

PSNS FOR THE PRIMARY AND SECONDARY
TITANIUM SUBCATEGORY

(m) Scrap Milling Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of scrap milled		
Chromium (total)	0.000	0.000
Lead	0.000	0.000
Nickel	0.000	0.000
Thallium	0.000	0.000
Fluoride	0.000	0.000
Titanium	0.000	0.000

(n) Scrap Detergent Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of scrap washed		
Chromium (total)	6.684	2.710
Lead	5.058	2.349
Nickel	9.935	6.684
Thallium	25.290	11.020
Fluoride	632.300	361.300
Titanium	6.684	2.710

(o) Casting Crucible Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium cast		
Chromium (total)	0.177	0.072
Lead	0.134	0.062
Nickel	0.262	0.177
Thallium	0.668	0.291
Fluoride	16.700	9.540
Titanium	0.176	0.067

Table XII-6 (continued)

PSNS FOR THE PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

(p) Casting Contact Cooling Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of titanium cast		
Chromium (total)	27.000	10.950
Lead	20.430	9.487
Nickel	40.140	27.000
Thallium	102.200	44.510
Fluoride	2,554.000	1,460.000
Titanium	8.500	3.446

PRIMARY AND SECONDARY TITANIUM SUBCATEGORY

SECTION XIII

BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY

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