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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 Antimony

DEVELOPMENT DOCUMENT

for

EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS

for the

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY

PHASE II

Primary Antimony Supplement

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PRIMARY ANTIMONY SUBCATEGORY

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PRIMARY ANTIMONY 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 antimony subcategory. EPA has never proposed or promulgated effluent limitations or standards for this subcategory. This document and the administrative record provide the technical basis for proposing effluent limitations based on best practicable technology (BPT) and best available technology (BAT) for existing direct dischargers, pretreatment standards for new indirect dischargers (PSNS), and standards of performance for new source direct dischargers (NSPS).

The primary antimony subcategory is comprised of eight plants. Of the eight plants, one discharges directly to a river, four plants achieve zero discharge of process wastewater, and three plants generate no process wastewater.

EPA first studied the primary antimony 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, two subdivisions have been identified for this subcategory that warrant separate effluent limitations. These include:

- Sodium antimonate autoclave wastewater, and
- Fouled anolyte.

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

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

After examining the various treatment technologies, the Agency has identified BPT to represent the average of the best existing technology. Metals removal based on chemical precipitation and sedimentation technology is the basis for the BPT limitations. To meet the BPT effluent limitations based on this technology, the primary antimony subcategory is expected to incur an estimated capital cost of $34,200 and an annual cost of $17,300.

For BAT, filtration is added an an effluent polishing step to the BPT end-of-pipe treatment scheme. To meet the BAT effluent limitations based on this technology, the primary antimony subcategory is estimated to incur a capital cost of $41,250 and an annual cost of $21,183.

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

PSES is not being proposed for this subcategory because there are no existing indirect dischargers in the primary antimony subcategory. For PSNS, the Agency selected end-of-pipe treatment technology equivalent to BAT.

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

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

PRIMARY ANTIMONY SUBCATEGORY

SECTION II

RECOMMENDATIONS

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

   (a) Sodium antimonate autoclave wastewater, and
   (b) Fouled anolyte.

2. BPT is proposed based on the performance achievable by the application of chemical precipitation and sedimentation technology. The following BPT effluent limitations are proposed:

BPT LIMITATIONS FOR THE PRIMARY ANTIMONY SUBCATEGORY

(a) Sodium Antimonate Autoclave Wastewater

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of antimony contained in sodium antimonate product		
Antimony	20.360	9.079
Arsenic	14.820	6.596
Lead	2.979	1.419
Mercury	1.773	0.709
Total suspended solids	290.800	138.300
pH	Within the range of 7.5 to 10.0 at all times	

BPT LIMITATIONS FOR THE PRIMARY ANTIMONY SUBCATEGORY

(b) Fouled Anolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of antimony metal produced by electrowinning		
Antimony	20.360	9.079
Arsenic	14.820	6.596
Lead	2.979	1.419
Mercury	1.773	0.709
Total suspended solids	290.800	138.300
pH	Within the range of 7.5 to 10.0 at all times	

3. BAT is proposed based on the performance achievable by the application of chemical precipitation, sedimentation, and multimedia filtration technology. The following BAT effluent limitations are proposed:

BAT LIMITATIONS FOR THE PRIMARY ANTIMONY SUBCATEGORY

(a) Sodium Antimonate Autoclave Wastewater

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of antimony contained in sodium antimonate product		
Antimony	13.690	6.100
Arsenic	9.859	4.398
Lead	1.986	0.922
Mercury	1.064	0.426

BAT LIMITATIONS FOR THE PRIMARY ANTIMONY SUBCATEGORY

(b) Fouled Anolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of antimony metal produced by electrowinning		
Antimony	13.690	6.100
Arsenic	9.859	4.398
Lead	1.986	0.922
Mercury	1.064	0.426

4. NSPS are proposed based on the performance achievable by the application of chemical precipitation, sedimentation, and multimedia filtration technology. The following effluent standards are proposed for new sources:

NSPS FOR THE PRIMARY ANTIMONY SUBCATEGORY

(a) Sodium Antimonate Autoclave Wastewater

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of antimony contained in sodium antimonate product		
Antimony	13.690	6.100
Arsenic	9.859	4.398
Lead	1.986	0.922
Mercury	1.064	0.426
Total suspended solids	106.400	85.120
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE PRIMARY ANTIMONY SUBCATEGORY

(b) Fouled Anolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of antimony metal produced by electrowinning		
Antimony	13.690	6.100
Arsenic	9.859	4.398
Lead	1.986	0.922
Mercury	1.064	0.426
Total suspended solids	106.400	85.120
pH	Within the range of 7.5 to 10.0 at all times	

5. PSES is not being proposed for the primary antimony subcategory at this time because there are no existing indirect dischargers in the primary antimony subcategory.

6. PSNS are proposed based on the performance achievable by the application of chemical precipitation, sedimentation, and multimedia filtration technology. The following pretreatment standards are proposed for new sources:

PSNS FOR THE PRIMARY ANTIMONY SUBCATEGORY

(a) Sodium Antimonate Autoclave Wastewater

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of antimony contained in sodium antimonate product		
Antimony	13.690	6.100
Arsenic	9.859	4.398
Lead	1.986	0.922
Mercury	1.064	0.426

PSNS FOR THE PRIMARY ANTIMONY SUBCATEGORY

(b) Fouled Anolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of antimony metal produced by electrowinning		
Antimony	13.690	6.100
Arsenic	9.859	4.398
Lead	1.986	0.922
Mercury	1.064	0.426

7. EPA is not proposing BCT at this time for the primary antimony subcategory.

PRIMARY ANTIMONY SUBCATEGORY

SECTION III

INDUSTRY PROFILE

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

Although there are about 112 minerals of antimony, the principal ore mineral is stibnite, the sulfide of antimony. Antimony also occurs in other metal ores, including gold-quartz deposits and copper-lead-zinc deposits. The major use of antimony metal is as an alloying constituent which increases the strength and inhibits the corrosion of lead and other metals.

Industrial applications of antimony are primarily as an alloying agent and include use as a hardener in lead storage batteries, tank linings, and chemical pumps and pipes. Of the many antimony compounds available commercially, the most important is antimony trioxide (Sb_2O_3). Antimony trioxide is used for flameproofing plastics, paints, vinyls, fabrics, and chemicals. It is also used in the ceramics industry to impart hardness and acid resistance to enamel coverings.

DESCRIPTION OF PRIMARY ANTIMONY PRODUCTION

There are two general types of methods of manufacturing antimony and its compounds: hydrometallurgical methods and pyrometallurgical methods. Antimony metal is produced from antimony minerals or ore by smelting. Antimony trioxide is produced from antimony metal or ore concentrates by roasting or burning. These pyrometallurgical processes, practiced at five of the eight antimony plants identified in this subcategory, generate no process wastewater.

Hydrometallurgical processing, practiced at the remaining three antimony plants, can be used to produce antimony metal, antimony trioxide, and sodium antimonate ($NaSbO_3$). Hydrometallurgical processing can be divided into four distinct stages: leaching, autoclaving, electrowinning, and conversion to antimony trioxide. The actual processes used at each plant vary with the type and purity of the raw materials used as well as with the type of antimony product manufactured. The primary antimony production processes, both pyrometallurgical and hydrometallurgical, are presented in Figures III-1 and III-2 and described below.

RAW MATERIALS

The principal source of antimony is the sulfide ore mineral stibnite. Stibnite, the sulfide of antimony together with its oxidized equivalents, is mined in several countries including Mexico, China, Peru, Yugoslavia, and Algeria. Virtually all domestic production of primary antimony metal is a by-product of the refining of base metal and silver ores. Antimony trioxide is produced from imported ores, antimony metal, and crude antimony oxide from South Africa.

PYROMETALLURGICAL PROCESSES

Antimony metal can be produced by smelting antimony minerals or ore with appropriate fluxes. Metal of 99 percent purity can be manufactured by this process with no generation of wastewater.

Antimony trioxide can be produced by burning or roasting ore concentrates or antimony metal. Burning converts the sulfide ore to volatile antimony trioxide. Evaporation separates the slag from the trioxide which two plants reported is collected in a baghouse and packaged for sale. One plant practices wet air pollution control to recover antimony from the gases leaving the baghouse. Because the scrubber liquor from this product recovery step is completely recycled in order to recovery antimony, the final emissions scrubber is not considered to be a wastewater source in this subcategory. No plants in this subcategory reported sulfur dioxide (SO_2) emissions from the trioxide production process.

LEACHING

A variety of antimony compounds can be produced from ore concentrates by hydrometallurgical processes. Leaching of the concentrate is conducted batchwise in a heated, pressurized vat. Some concentrates are blended with coke, sodium sulfate, and sodium carbonate and melted in a furnace before leaching with sodium hydroxide. Other concentrates are combined with sodium sulfide and sulfur and leached with sodium hydroxide without prior melting. In either case, the leaching process produces soluble Na_3SbS_3 and Na_3AsS_3. Because of the coke used as a raw material in the furnace, EPA is considering the possibility that several organic pollutants are present in the wastewater

Solids are separated from the leaching solution by thickening and filtration. The residue, which contains compounds such as pyrite, silica, stibnite, soluble arsenic, and $NaAsS_3$, is either disposed of or further processed to recover other metals. Antimony is recovered from the leaching solution either by autoclaving or by electrowinning, depending on the product desired.

AUTOCLAVING

Sodium antimonate ($NaSbO_3$) is produced by autoclaving the antimony-bearing solution from the leaching process with oxygen. Autoclaving consists of heating the solution under pressure in the presence of oxygen. The elevated temperature and pressure drive the oxidation reaction resulting in the formation of insoluble sodium antimonate which is separated from the remaining liquid. After drying, the product is packaged and sold. The autoclave discharge is the only wastewater generated by this process.

ELECTROWINNING

Antimony metal is recovered from the pregnant solution from the leaching process by electrowinning. Antimony is deposited on the cathode as a brittle, non-adherent layer which is periodically stripped and washed. It is then either sold or further processed to antimony trioxide. The wash water is not discharged.

Because the products of oxidation at the anode interfere with the deposition of antimony at the cathode, two different and physically separated solutions are used. The catholyte, which in this case is the pregnant solution from the leaching process, surrounds the cathode and the anolyte surrounds the anode. Intermingling of the two solutions is minimized by a canvas barrier. Small pores in the canvas allow the solutions to contact; this maintains the integrity of the electrical circuit and permits current to flow.

After the antimony has been removed, the barren catholyte is recycled to the process using one of two methods. At the plant which reports melting of the ore before leaching, spent electrolyte is spray dried. The dried salts are captured in a baghouse and recycled to the blending step. At the two plants which leach concentrates without first melting them, barren catholyte solution is recycled directly to the leaching process. One of those two plants removes the fouled anolyte and treats it by autoclaving to recover sodium antimonate for recycle to the leaching process. The fouled anolyte discharge is the only wastewater generated by the electrowinning process. The subsequent autoclaving of this stream is considered to be a preliminary wastewater treatment process and is distinguished from autoclaving to produce sodium antimonate as a final product.

CONVERSION TO ANTIMONY TRIOXIDE

Antimony metal produced by electrowinning or purchased antimony metal can be converted to antimony trioxide in a fuming furnace. The product of this process is captured in a baghouse and sold. There is no generation of wastewater during this conversion process.

PROCESS WASTEWATER SOURCES

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

1. Sodium antimonate autoclave wastewater, and
2. Fouled anolyte.

OTHER WASTEWATER SOURCES

There are other waste streams associated with the primary antimony 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-3 shows the location of the eight primary antimony plants operating in the United States. The plants are geographically scattered, located in seven states across the country.

Table III-1 shows the relative age and discharge status of the antimony plants. The oldest plant was built in the 1880's, and three others are more than 30 years old. Two new plants have been built within the last 10 years. From Table III-2, it can be seen that six of the seven plants that provided production information produced less than 300 kkg/yr of antimony and antimony compounds. The one remaining plant produced more than 2,000 kkg/yr of antimony in the form of antimony trioxide.

Table III-3 provides a summary of the number of plants using specific manufacturing processes and the number of plants generating wastewater for the streams associated with those processes.

Table III-1

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

Type of Plant	Initial Operating Year (Range) (Plant Age in Years) 1982-1973 (0-10)	1972-1963 (11-20)	1962-1953 (21-30)	1952-1943 (31-40)	1942-1933 (41-50)	1932-1923 (51-60)	Before 1923 (60+)	Total*
Direct	0	0	0	0	0	1	0	1
Zero	1	1	0	1	0	0	0	3
Dry	1	0	0	0	1	0	1	3
TOTAL*	2	1	0	1	1	1	1	7

*One plant in this subcategory did not provide initial operating year information.

Table III-2

PRODUCTION RANGES FOR THE PRIMARY ANTIMONY SUBCATEGORY

Type of Plant	Antimony Production Range for 1982 0-100 (kkg/yr)	101-200 (kkg/yr)	201-300 (kkg/yr)	301-1,000 (kkg/yr)	1,001-2,500 (kkg/yr)	Total Number of Plants*
Direct	0	0	1	0	0	1
Zero	1	0	1**	0	1†	3
Dry	1	1†	1	0	0	3
TOTAL	2	1	3	0	1	7

*One plant in this subcategory did not provide production information.

**Production value includes Sb_2O_3 and $NaSbO_3$ produced.

†Production value includes Sb_2O_3 produced.

Table III-3

SUMMARY OF PRIMARY ANTIMONY SUBCATEGORY PROCESSES AND ASSOCIATED WASTE STREAMS

Process or Waste Stream	Number of Plants With Process or Waste Stream	Number of Plants Reporting Generation of Wastewater*
Pyrometallurgical processes	5	
Leaching	3	
Autoclaving	2	
- Sodium antimonate autoclave wastewater	2	1
Electrowinning	3	
- Fouled anolyte	3	1
Conversion to antimony trioxide	2	

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

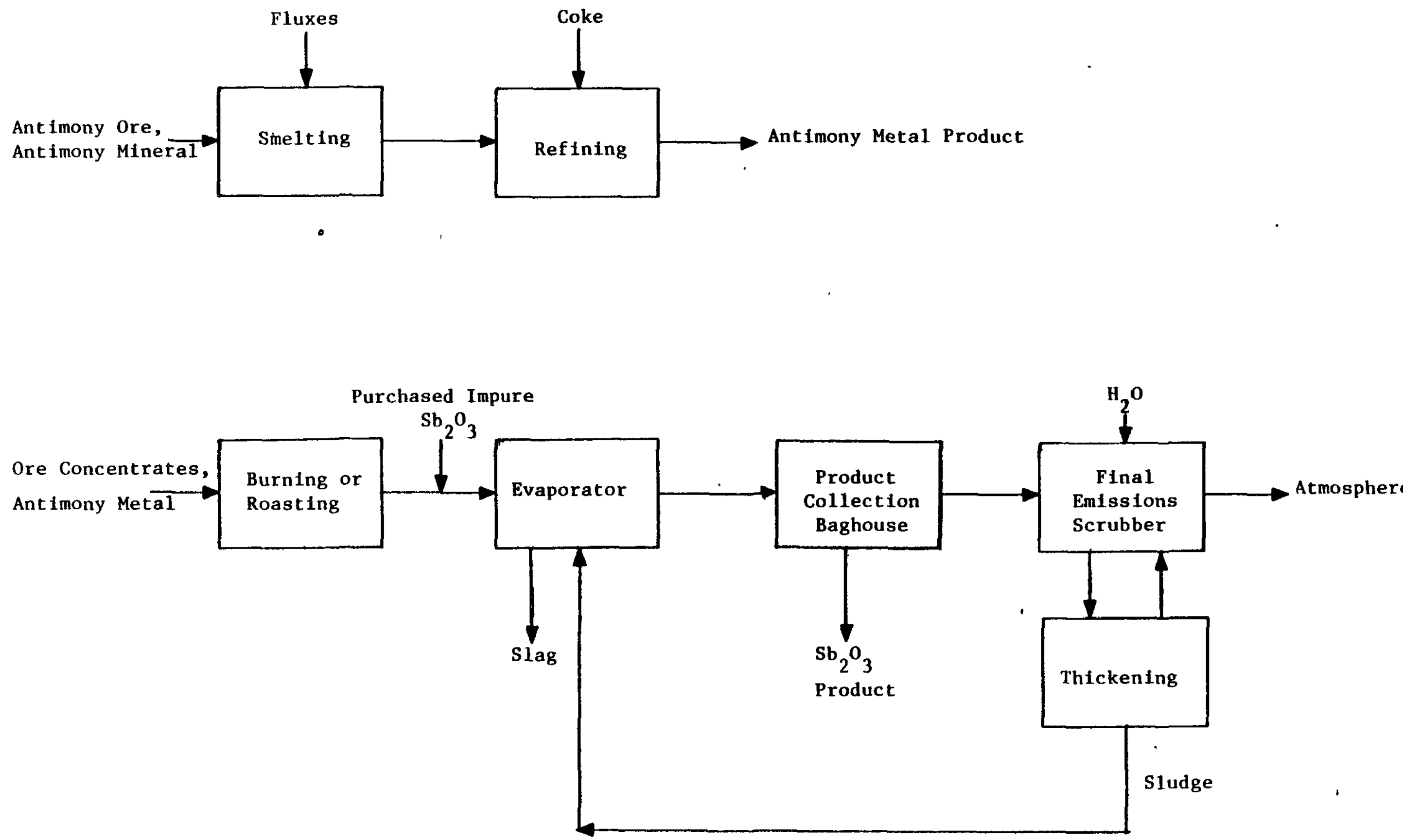

Figure III-1

PRIMARY ANTIMONY PRODUCTION PROCESS (PYROMETALLURGICAL)

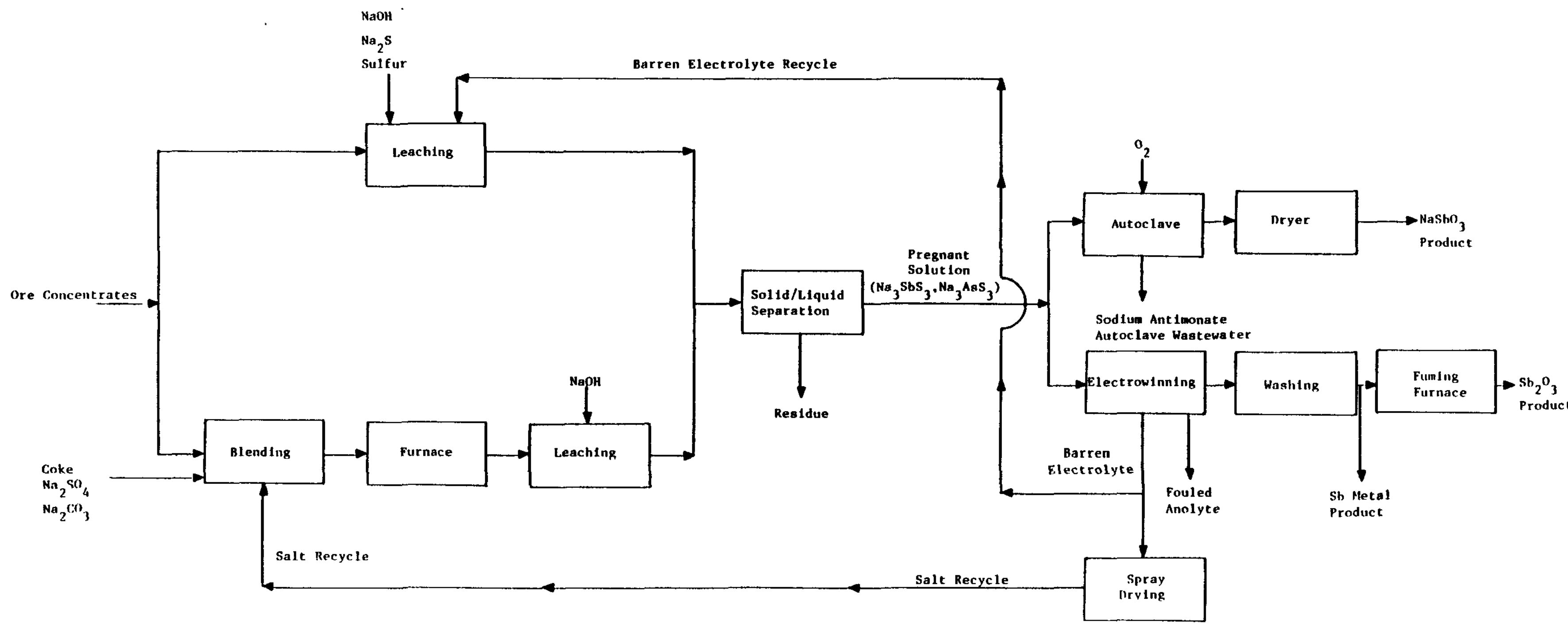

Figure III-2
PRIMARY ANTIMONY PRODUCTION PROCESS (HYDROMETALLURGICAL)

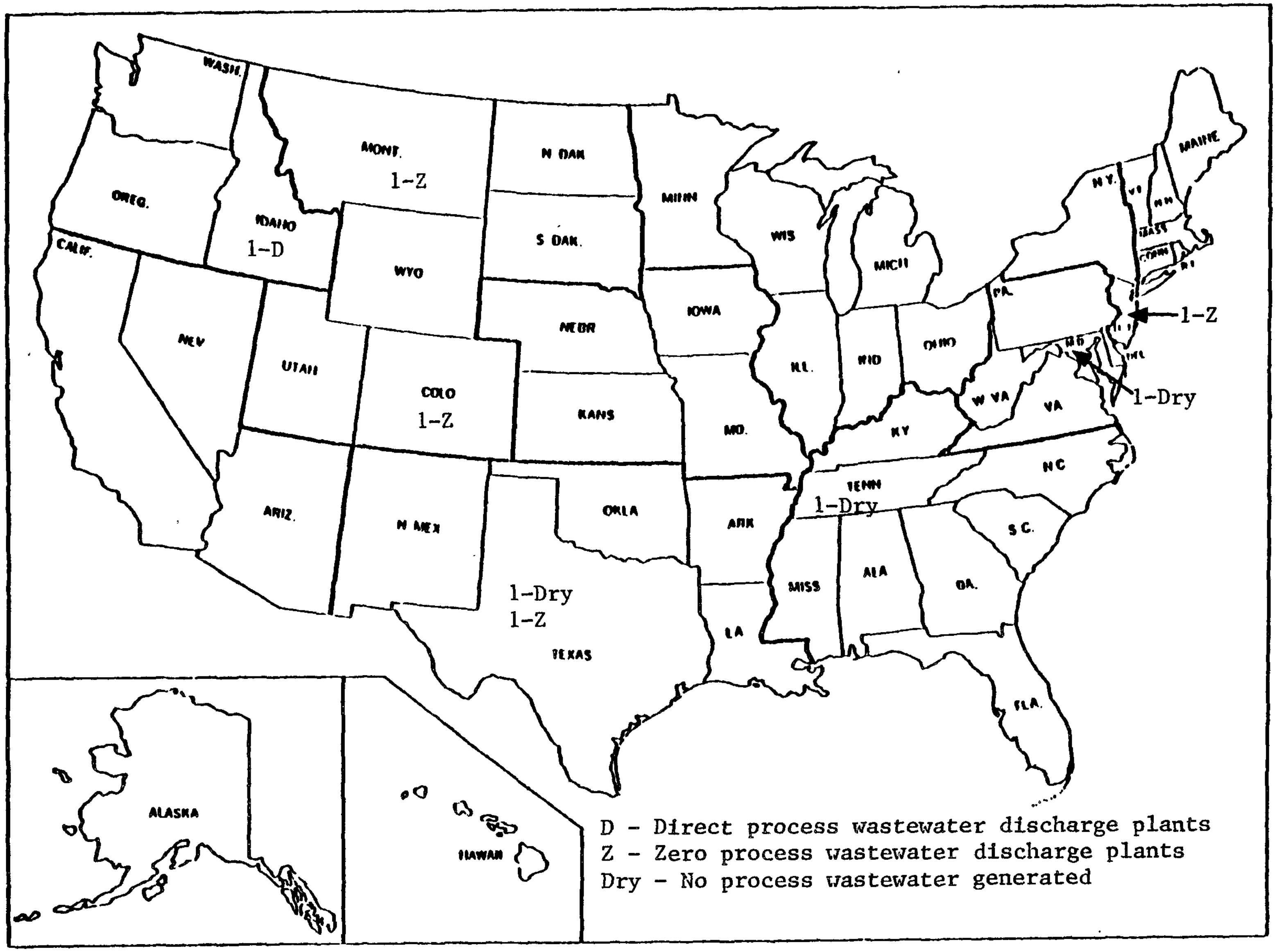

Figure III-3

GEOGRAPHIC LOCATIONS OF THE PRIMARY ANTIMONY SUBCATEGORY PLANTS

PRIMARY ANTIMONY 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 antimony subcategory and its related subdivisions. Production normalizing parameters for each subdivision will also be discussed.

FACTORS CONSIDERED IN SUBCATEGORIZATION

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

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

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

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

FACTORS CONSIDERED IN SUBDIVIDING THE PRIMARY ANTIMONY SUBCATEGORY

The factors listed previously were each evaluated when considering subdivision of the primary antimony 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 antimony subcategory is based primarily on differences in the producton 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 antimony 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. Sodium antimonate autoclave wastewater, and
2. Fouled anolyte.

These subdivisions represent the only reported sources of wastewater in this subcategory and follow directly from differerces in the production stages of primary antimony.

The plant which manufactures sodium antimonate autoclaves the antimony bearing solution from the leaching process. The first subdivision is associated with the wastewater discharged from this autoclaving operation.

When fouled anolyte is removed from the electrowinning operation and autoclaved for sodium antimonate recovery, a wastewater stream is produced at one plant. Other plants recycle the electrolyte with no reported wastewater discharge. Thus, the second subdivision accounts for operational differences in the electrowinning stage of antimony production.

OTHER FACTORS

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

PRODUCTION NORMALIZING PARAMETERS

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

In general, for each production process which has a wastewater associated with it, the mass of antimony contained in the product will be used as the PNP. Thus, the PNPs for the two subdivisions are as follows:

Subdivision	PNP
1. Sodium antimonate autoclave wastewater	antimony contained in sodium antimonate product
2. Fouled anolyte	antimony metal produced by electrowinning

PRIMARY ANTIMONY SUBCATEGORY

SECTION V

WATER USE AND WASTEWATER CHARACTERISTICS

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

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

In order to conduct an analysis of the primary antimony subcategory waste streams and quantify the pollutant discharge from plants in this subcategory, the levels of toxic pollutants in the wastewaters must be known. Although data were not obtained by sampling a primary antimony plant, one plant submitted sampling data of their wastewater in the dcp. The data consist of analyses for two classes of pollutants: toxic metal pollutants, and conventional pollutants. Samples were not analyzed for toxic organic pollutants because there was no reason to believe that organic pollutants would be present in wastewaters generated by the primary antimony subcategory. (Because the analytical standard for TCDD was judged to be too hazardous to be made generally available, samples were never analyzed for this pollutant. Samples were also not analyzed for asbestos or cyanide. There is no reason to expect that TCDD, asbestos, or cyanide would be present in primary antimony wastewater.)

As described in Section IV of this supplement, the primary antimony subcategory has been split into two subdivisions or wastewater sources, so that the proposed regulation contains mass discharge limitations and standards for two 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. Sodium antimonate autoclave wastewater, and
2. Fouled anolyte.

WASTEWATER FLOW RATES

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

The production normalized discharge flows were compiled by stream type. These production normalized water use and discharge flows are presented by subdivision in Tables V-1 and V-2 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 antimony production come from two sources: data collection portfolios and analytical data from field sampling.

DATA COLLECTION PORTFOLIOS

In the data collection portfolios, the antimony plants that generate wastewater were asked to specify the presence of toxic pollutants in their wastewater. Of the five primary antimony plants that generate wastewater, three responded to this portion of the questionnaire. No plant responding to the questionnaire reported the presence of any toxic organic pollutants. The responses for the toxic metals and cyanide are summarized below.

Pollutant	Known Present	Believed Present (Based on Raw Materials and Process Chemicals Used)
Antimony	2	0
Arsenic	2	1
Beryllium	0	0
Cadmium	1	0
Chromium	0	0
Copper	0	0
Cyanide	0	0
Lead	1	0
Mercury	1	0
Nickel	0	0
Selenium	1	0
Silver	0	0
Thallium	1	0
Zinc	1	0

FIELD SAMPLING DATA

Sampling data for the primary antimony subcategory were provided by one company in its dcp. No other field sampling programs were conducted.

Raw wastewater data are summarized in Table V-3 at the end of this section. Analytical results for eight samples of the fouled anolyte autoclave discharge were provided in one dcp. The data included results for several toxic metals and two conventional pollutant parameters. No toxic organic, cyanide or source water data were provided.

Several points regarding the data tables should be noted. First, Table V-3 includes some samples measured at concentrations considered not quantifiable. The detection limits shown on the data tables are not the same in all cases as the published detection limits for these pollutants by the same analytical methods. The detection limits used were reported with the analytical data and hence are the appropriate limits to apply to the data. Detection limit variation can occur as a result of a number of laboratory-specific, equipment-specific, and daily operator-specific factors. These factors can include day-to-day differences in machine calibration, variation in stock solutions, and variation in operators.

Second, the analysis of data includes some samples measured at concentrations considered not quantifiable. If a pollutant is reported as not detected, a value of zero is used in calculating the average. Toxic metal values reported as less than a certain value are considered as not quantifiable and a value of zero is used in the calculation of the average.

WASTEWATER CHARACTERISTICS AND FLOWS BY SUBDIVISION

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

SODIUM ANTIMONATE AUTOCLAVE WASTEWATER

Sodium antimonate ($NaSbO_3$) is produced by autoclaving the antimony-bearing solution from the leaching process with oxygen. The autoclave wastewater is discharged. The production normalized water use and discharge rates for sodium antimonate autoclave wastewater are given in Table V-1 in liters per metric ton of antimony contained in sodium antimonate product.

The one company which reports this wastewater stream did not provide flow rate information. It is assumed that the amount of wastewater generated by autoclaving the leaching solution is the same as the amount of wastewater generated by electrowinning a solution containing the same amount of antimony. Therefore, the production normalized discharge flow for sodium antimonate autoclave discharge water is assumed to be equal to that for the fouled anolyte using the antimony content of the product as the production normalizing parameter.

No sampling data are available for this stream, but it is expected to be similar in composition to the fouled anolyte autoclave discharge for which data are present in Table V-3. The fouled anolyte wastewater is essentially the same as the sodium antimonate autoclave wastewater except that the influent to the fouled anolyte autoclave has had much of the antimony removed. The sodium antimonate autoclave wastewater is therefore expected to contain treatable concentrations of suspended solids and toxic metals, including antimony, arsenic, and mercury. Also, EPA is considering the possibility that toxic organic pollutants are present in the wastewater, because of the coke used as a raw material in the smelting furnace.

FOULED ANOLYTE

Antimony metal is produced by electrowinning the pregnant solution from the leaching process. Barren electrowinning solution is recycled to the process by various means at three plants. One of those plants removes a portion of the barren electrolyte, referred to as the fouled anolyte, and treats it by autoclaving with oxygen to recover sodium antimonate. The production normalized water use and discharge rates for the fouled anolyte are given in Table V-2 in liters per metric ton of antimony metal produced by electrowinning.

No sampling data are available for this stream, but it is expected to be similar in composition to the fouled anolyte autoclave discharge for which data are presented in Table V-3. Autoclaving is used as a treatment process to remove antimony as sodium antimonate from the fouled anolyte, but it is not expected to greatly affect other components of the wastewater. The fouled anolyte stream is therefore expected to be characterized by treatable concentrations of suspended solids and toxic metals, including antimony, arsenic, and mercury. Also, EPA is considering the possibility that toxic organic pollutants are present in the wastewater, because of the coke used as a raw material in the smelting furnace.

Table V-1

WATER USE AND DISCHARGE RATE FOR
SODIUM ANTIMONATE AUTOCLAVE WASTEWATER

(l/kkg of antimony contained in sodium antimonate product)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1157	NR	NR	7,093*

NR = Data not reported in dcp.

*Assumed value (see Text).

Table V-2

WATER USE AND DISCHARGE RATE FOR
FOULED ANOLYTE

(l/kkg of antimony metal produced by electrowinning)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1159	NR	NR	7,093

NR = Data not reported in dcp.

Table V-3

PRIMARY ANTIMONY SAMPLING DATA
FOULED ANOLYTE AUTOCLAVE DISCHARGE
RAW WASTEWATER

Pollutant	Concentrations (mg/l) Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Toxic Pollutants						
114. antimony	28.6	110	15.4 14.5	12.5 3.7	120	20
115. arsenic	1,680	3,093	260 262	3,700 3,100	882	2,845
118. cadmium	<0.005	<0.01	<0.002 <0.002	<0.01 <0.01	0.30	0.210
120. copper	0.40	0.30	0.50 0.30	0.30 0.20	0.8	0.33
122. lead	<0.01	<0.10	<0.10 <0.10	<0.10 <0.10	<0.10	3.05
123. mercury		6.0	2.90 1.23	7.0 0.015	12.6	7.32
128. zinc	0.01	0.10	<0.10 <0.10	<0.10 <0.10	<0.1	0.27
Conventional Pollutants						
total suspended solids (TSS)	1,050	775		370 0	348	1,256
pH (standard units)	12.85	12.95	13.25 13.40	13.05 13.05	13.10	13.00

†Sample Type: Unknown

PRIMARY ANTIMONY SUBCATEGORY

SECTION VI

SELECTION OF POLLUTANT PARAMETERS

Section V of this supplement presented data from primary antimony sampling 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 pollutants and pollutant parameters for effluent limitations. Also described is the analysis that was performed to select or exclude toxic pollutants for further consideration for limitations and standards. Pollutants will be considered for limitation if they are present in concentrations treatable by the technologies considered in this analysis. The treatable concentrations used for the toxic metals were the long-term performance values achievable by chemical precipitation, sedimentation, and filtration. The treatable concentrations used for the toxic organics were the long-term performance values achievable by carbon adsorption (see Section VII of the General Development Document - Combined Metals Data Base).

CONVENTIONAL AND NONCONVENTIONAL POLLUTANT PARAMETERS

This study examined samples from the primary antimony subcategory for two conventional pollutant parameters (total suspended solids and pH).

CONVENTIONAL POLLUTANT PARAMETERS SELECTED

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

total suspended solids (TSS)
pH

Nonconventional pollutant parameters were not selected for limitation in this subcategory.

TSS concentrations ranging from 348 to 1,256 mg/l were observed in the five raw waste samples analyzed for TSS in this study. All five concentrations were well above the 2.6 mg/l treatability concentration. Most of the specific methods used to remove toxic metals from a wastewater do so by converting them to precipitates. Meeting a limit on total suspended solids ensures that removal of these precipitated toxic metals has been effective. For this reason, total suspended solids are selected for limitation in this subcategory.

The eight pH values observed during this study ranged from 12.85 to 13.40, all outside the 7.5 to 10.0 range considered desirable for discharge to receiving waters. Effective removal of toxic metals by chemical 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 raw wastewater samples is presented in Table VI-1. Table VI-1 is based on the raw wastewater data provided for the fouled anolyte autoclave discharge (see Section V). These data provide the basis for the categorization of specific pollutants, as discussed below.

TOXIC POLLUTANTS NEVER DETECTED

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

1. acenaphthene*
2. acrolein*
3. acrylonitrile*
4. benzene*
5. benzidine*
6. carbon tetrachloride (tetrachloromethane)*
7. chlorobenzene*
8. 1,2,4-trichlorobenzene*
9. hexachlorobenzene*
10. 1,2-dichloroethane*
11. 1,1,1-trichloroethane*
12. hexachloroethane*
13. 1,1-dichloroethane*
14. 1,1,2-trichloroethane*
15. 1,1,2,2-tetrachloroethane*
16. chloroethane*

17. bis (chloromethyl) ether (DELETED)*
18. bis (2-chloroethyl) ether*
19. 2-chloroethyl vinyl ether (mixed)*
20. 2-chloronaphthalene*
21. 2,4,6-trichlorophenol*
22. parachlorometa cresol*
23. chloroform (trichloromethane)*
24. 2-chlorophenol*
25. 1,2-dichlorobenzene*
26. 1,3-dichlorobenzene*
27. 1,4-dichlorobenzene*
28. 3,3'-dichlorobenzidine*
29. 1,1-dichloroethylene*
30. 1,2-trans-dichloroethylene*
31. 2,4-dichlorophenol*
32. 1,2-dichloropropane*
33. 1,2-dichloropropylene (1,3-dichloropropene)*
34. 2,4-dimethylphenol*
35. 2,4-dinitrotoluene*
36. 2,6-dinitrotoluene*
37. 1,2-diphenylhydrazine*
38. ethylbenzene*
39. fluoranthene*
40. 4-chlorophenyl phenyl ether*
41. 4-bromophenyl phenyl ether*
42. bis (2-chloroisopropyl) ether*
43. bis (2-choroethoxy) methane*
44. methylene chloride (dichloromethane)*
45. methyl chloride (chloromethane)*
46. methyl bromide (bromomethane)*
47. bromoform (tribromomethane)*
48. dichlorobromomethane*
49. trichlorofluoromethane (DELETED)*
50. dichlorofluoromethane (DELETED)*
51. chlorodibromomethane*
52. hexachlorobutadiene*
53. hexachlorocyclopentadiene*
54. isophorone*
55. naphthalene*
56. nitrobenzene*
57. 2-nitrophenol*
58. 4-nitrophenol*
59. 2,4-dinitrophenol*
60. 4,6-dinitro-o-cresol*
61. N-nitrosodimethylamine*
62. N-nitrosodiphenylamine*
63. N-nitrosodi-n-propylamine*
64. pentachlorophenol*
65. phenol*
66. bis(2-ethylhexyl) phthalate*

67. butyl benzyl phthalate*
68. di-n-butyl phthalate*
69. di-n-octyl phthalate*
70. diethyl phthalate*
71. dimethyl phthalate*
72. benzo (a)anthracene (1,2-benzanthracene)*
73. benzo (a)pyrene (3,4-benzopyrene)*
74. 3,4-benzofluoranthene*
75. benzo(k)fluoranthane (11,12-benzofluoranthene)*
76. chrysene*
77. acenaphthylene*
78. anthracene*
79. benzo(ghi)perylene (1,11-benzoperylene)*
80. fluorene*
81. phenanthrene*
82. dibenzo (a,h)anthracene (1,2,5,6-dibenzanthracene)*
83. indeno (1,2,3-cd)pyrene (w,e,-o-phenylenepyrene)*
84. pyrene*
85. tetrachloroethylene*
86. toluene*
87. trichloroethylene*
88. vinyl chloride (chloroethylene)*
89. aldrin*
90. dieldrin*
91. chlordane (technical mixture and metabolites)*
92. 4,4'-DDT*
93. 4,4'-DDE(p,p'DDX)*
94. 4,4'-DDD(p,p'TDE)*
95. Alpha-endosulfan*
96. Beta-endosulfan*
97. endosulfan sulfate*
98. endrin*
99. endrin aldehyde*
100. heptachlor*
101. heptachlor epoxide*
102. Alpha-BHC*
103. Beta-BHC*
104. Gamma-BHC (lindane)*
105. Delta-BHC*
106. PCB-1242 (Arochlor 1242)*
107. PCB-1254 (Arochlor 1254)*
108. PCB-1221 (Arochlor 1221)*
109. PCB-1232 (Arochlor 1232)*
110. PCB-1248 (Arochlor 1248)*
111. PCB-1260 (Arochlor 1260)*
112. PCB-1016 (Arochlor 1016)*
113. toxaphene*
116. asbestos (Fibrous)
117. beryllium*
119. chromium (Total)*

121. cyanide (Total)*
124. nickel*
125. selenium*
126. silver*
127. thallium*
129. 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)

*We did not analyze for these pollutants in samples of raw wastewater from this subcategory. These pollutants are not believed to be present based on the Agency's best engineering judgement which includes consideration of raw materials and process operations.

TOXIC POLLUTANTS SELECTED FOR FURTHER CONSIDERATION IN ESTABLISHING LIMITATIONS AND STANDARDS

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

114. antimony
115. arsenic
118. cadmium
120. copper
122. lead
123. mercury
128. zinc

Antimony was found in eight samples at concentrations ranging from 3.7 to 120 mg/l. All eight concentrations were above the 0.47 mg/l concentration considered achievable by identified treatment technology. Therefore, antimony is selected for further consideration for limitation in this subcategory.

Arsenic was detected in eight samples at concentrations ranging from 260 to 3,700 mg/l. All eight concentrations were above the 0.34 mg/l treatability concentration. Therefore, arsenic is selected for further consideration for limitation.

Cadmium was detected in quantifiable concentrations in two of eight samples (0.21 and 0.30 mg/l). Both of these samples were above the 0.049 mg/l treatability concentration. Therefore, cadmium is selected for further consideration for limitation.

Copper was detected in eight samples at concentrations ranging from 0.20 to 0.8 mg/l. Three of those samples were above the 0.39 mg/l treatability concentration. Therefore, copper is selected for further consideration for limitation.

Lead was found in one of eight samples above quantification, at a concentration of 3.05 mg/l. That sample was above the 0.08 mg/l treatability concentration. Furthermore, antimony is often recovered from lead-copper-zinc ores. Therefore, lead is selected for further consideration for limitation.

Mercury was detected in seven samples at concentrations ranging from 0.015 to 12.6 mg/l. Six of those samples were above the 0.036 mg/l treatability concentration. Therefore, mercury is selected for further consideration for limitation.

Zinc was found in two of eight samples at quantifiable concentrations (0.10 and 0.27 mg/l). One of those samples was above the 0.23 mg/l concentration considered achievable by identified treatment technology. Furthermore, antimony is often recovered from copper-lead-zinc ores. Therefore, zinc is selected for further consideration for limitation in this subcategory.

Table VI-1

FREQUENCY OF OCCURRENCE OF TOXIC POLLUTANTS
PRIMARY ANTIMONY
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
114. antimony	0.100	0.47	1	8				8
115. arsenic	0.010	0.34	1	8				8
117. beryllium	0.010	0.20	0					
118. cadmium	0.002	0.049	1	8		6		2
119. chromium	0.005	0.07	0					
120. copper	0.009	0.39	1	8			5	3
121. cyanide (c)	0.02	0.047	0					
122. lead	0.020	0.08	1	8		7		1
123. mercury	0.0001	0.036	1	7			1	6
124. nickel	0.005	0.22	0					
125. selenium	0.01	0.20	0					
126. silver	0.02	0.07	0					
127. thallium	0.100	0.34	0					
128. zinc	0.050	0.23	1	8		6	1	1

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

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

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

PRIMARY ANTIMONY SUBCATEGORY

SECTION VII

CONTROL AND TREATMENT TECHNOLOGIES

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

CURRENT CONTROL AND TREATMENT PRACTICES

Control and treatment technologies are discussed in general in Section VII of the General Development Document. The basic principles of these technologies and the applicability to wastewater similar to that found in this subcategory are presented there. This section presents a summary of the control and treatment technologies that are currently being applied to each of the sources generating wastewater in this subcategory. As discussed in Section V, wastewater associated with the primary antimony subcategory is characterized by the presence of the toxic metal pollutants and suspended solids. Generally, these pollutants are present at concentrations above treatability. This analysis is supported by the raw (untreated) wastewater presented in Section V. These wastewater streams may be combined to allow plants to take advantage of economies of scale. The options selected for consideration for BPT, BAT, BDT, and pretreatment based on combined treatment of these compatible waste streams will be summarized toward the end of this section.

SODIUM ANTIMONATE AUTOCLAVE WASTEWATER

Sodium antimonate ($NaSbO_3$) is manufactured by autoclaving the antimony-bearing solution from the leaching process with oxygen. The autoclave wastewater is expected to contain treatable concentrations of suspended solids and toxic metals, and it may also contain toxic organic pollutants. One plant which manufactures sodium antimonate achieves zero discharge of this stream using evaporation ponds.

Another plant recovers sodium antimonate for recycle to leaching from spent electrowinning solution by autoclaving. That process for product recovery is considered to be a wastewater treatment step and is distinguished from autoclaving to produce sodium antimonate as a product.

FOULED ANOLYTE

Antimony metal is produced by electrowinning the pregnant solution from the leaching process. All three of the plants which practice electrowinning recycle barren electrolyte to leaching. One plant reports total recycle of the spent electrowinning solution. The second plant spray dries the solution and recycles the dried salts. The third plant recycles some of the electrolyte but discharges the fouled anolyte portion. That fouled anolyte contains toxic metals and suspended solids. Sodium antimonate is recovered from the stream by autoclaving, and the autoclave wastewater is discharged to a tailings pond where settling occurs before discharge to a river.

CONTROL AND TREATMENT OPTIONS

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

OPTION A

The Option A treatment scheme for the primary antimony subcategory consists of chemical precipitation and sedimentation of both waste streams. Chemical precipitation and sedimentation consists of lime addition to precipitate metals followed by gravity sedimentation for the removal of suspended solids, including the metal precipitates. Vacuum filtration is used to dewater the sludge.

OPTION C

Option C for the primary antimony subcategory consists of all control and treatment requirements of Option A (chemical precipitation and sedimentation) plus multimedia filtration technology added at the end of the Option A treatment scheme. Multimedia filtration is used to remove suspended solids, including precipitates of 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, would perform satisfactorily.

Also, the Agency is considering the need to incorporate some measure of toxic organic pollutant removal under both Options A and C, such as activated carbon adsorption, if further investigation shows a need for such measure.

PRIMARY ANTIMONY SUBCATEGORY

SECTION VIII

COSTS, ENERGY, AND NONWATER QUALITY ASPECTS

This section presents a summary of compliance costs for the primary antimony subcategory and a description of the treatment options and subcategory-specific assumptions used to develop these estimates. Together with the estimated pollutant removal performance presented in Sections X 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 antimony subcategory.

TREATMENT OPTIONS FOR EXISTING SOURCES

As discussed in Section VII, two treatment options have been developed and considered in proposing limitations and standards for the primary antimony subcategory. These options are summarized below and schematically presented in Figures X-1 and X-2.

OPTION A

The Option A treatment scheme consists of chemical precipitation and sedimentation technology.

OPTION C

Option C for the primary antimony subcategory consists of all control and treatment requirements of Option A (chemical precipitation and sedimentation) plus multimedia filtration technology added at the end of the Option A treatment scheme.

Also, the Agency is considering the need to incorporate some measure of toxic organic pollutant removal under both Options A and C, such as activated carbon adsorption, if further investigation shows a need for such measure.

COST METHODOLOGY

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

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

NONWATER QUALITY ASPECTS

A general discussion of the nonwater quality aspects of the control and treatment options considered for the nonferrous metals category is contained in Section VIII of the General Development Document. Nonwater quality impacts specific to the primary antimony 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 11,900 kWh/yr, and for Option C the estimated requirement is 14,600 kWh/yr. Option C energy requirements increase over those for Option A because filtration is being added as an end-of-pipe treatment technology. The energy requirements of both options represent less than one percent of the total energy presently consumed at the discharging plant. It is, therefore, concluded that the energy requirements of the treatment options considered will have no significant impact on total plant energy consumption.

SOLID WASTE

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

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

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

It is estimated that the primary antimony subcategory will generate 33 metric tons of sludge per year when implementing the proposed BPT treatment technology. 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.

AIR POLLUTION

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

Table VIII-1

COST OF COMPLIANCE FOR THE PRIMARY ANTIMONY SUBCATEGORY

DIRECT DISCHARGERS

(March, 1982 Dollars)

Option	Total Required Capital Cost	Total Annual Cost
A	$34,200	$17,300
C	$41,250	$21,183

PRIMARY ANTIMONY 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 antimony 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 portfolios, and specific plants were sampled and the wastewaters analyzed. In making technical assessments of data, reviewing manufacturing processes, and assessing wastewater treatment technology options, both indirect and direct dischargers have been considered as a single group. An examination of plants and processes did not indicate any process differences based on the type of discharge, whether it be direct or indirect.

As explained in Section IV, the primary antimony subcategory has been subdivided into two 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 two subdivisions.

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

Production normalized flows for each subdivision were then analyzed to determine the flow to be used as part of the basis for BPT mass limitations. The selected flow (sometimes referred to as 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 throughout the nonferrous metals manufacturing industry, the current control and treatment technologies consist of chemical precipitation and sedimentation (lime and settle) technology.

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 antimony 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-1 shows the pollutant removal estimates for each treatment option for direct dischargers. Compliance costs for direct dischargers are presented in Table X-2.

BPT OPTION SELECTION

The technology basis for the BPT limitations is Option A, chemical precipitation and sedimentation technology to remove metals and solids from combined wastewaters and to control pH. These technologies are not in-place at the one discharger in this subcategory. The BPT treatment scheme is presented in Figure IX-1. The Agency is also considering the possibility of requiring activated carbon adsorption as an effluent polishing step to control the discharge of toxic organic pollutants. Toxic organic pollutants may be present due to the coke used as a raw material in the smelting furnace.

Implementation of the proposed BPT limitations will remove annually an estimated 2,642 kg of toxic metals and 965 kg of TSS over estimated current discharge, which is equal to the raw waste generated because no treatment is in-place. The Agency projects a capital cost of approximately $34,200 and an annualized cost of approximately $17,300 for achieving proposed BPT.

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 data collection portfolios. 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 two 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 product which is produced by the process associated with the waste stream in question. These production normalizing parameters, or PNPs, are also listed in Table IX-1.

Section V of this document further describes the discharge flow rates and presents the water use and discharge flow rates for each plant by subdivision in Tables V-1 and V-2.

SODIUM ANTIMONATE AUTOCLAVE WASTEWATER

The BPT wastewater discharge allowance for sodium antimonate autoclave wastewater is 7,093 l/kkg (1,704 gal/ton) of antimony contained in sodium antimonate product. This rate is allocated to any plant which produces sodium antimonate from a pregnant leaching solution by an autoclaving operation. No allowance is given when sodium antimonate is recovered for recycling by autoclaving fouled anolyte because in that case, autoclaving is considered to be a wastewater treatment step for product recovery.

No recycle or reuse of this wastewater is reported at the one plant that generates this stream. Because that plant did not provide flow rate information in the dcp, the BPT discharge allowance for sodium antimonate autoclave wastewater was assumed to be equal to the BPT discharge allowance for fouled anolyte using the antimony content of the product as the production normalizing parameter.

FOULED ANOLYTE

The BPT wastewater discharge allowance for fouled anolyte is 7,093 l/kkg (1,704 gal/ton) of antimony metal produced by electrowinning. This rate is allocated to any plant which recovers antimony by electrowinning it from a pregnant leaching solution. The BPT allowance is based on the discharge rate at the only plant that reported this stream. That plant recycles some of the spent electrowinnning solution, but did not provide flow rate information for the recycled stream. That plant also recovers and recycles sodium antimonate from the fouled anolyte before disposal.

REGULATED POLLUTANT PARAMETERS

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

114. antimony
115. arsenic
122. lead
123. mercury
     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 ANTIMONY SUBCATEGORY

Wastewater Stream	BPT Normalized Discharge Rate l/kkg	BPT Normalized Discharge Rate gal/ton	Production Normalized Parameter
Sodium antimonate autoclave wastewater	7,093	1,704	Antimony contained in sodium antimonate product
Fouled anolyte	7,093	1,704	Antimony metal produced by electrowinning

Table IX-2

BPT MASS LIMITATIONS FOR THE
PRIMARY ANTIMONY SUBCATEGORY

(a) Sodium Antimonate Autoclave Wastewater

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of antimony contained in sodium antimonate product		
Antimony	20.360	9.079
Arsenic	14.820	6.596
Lead	2.979	1.419
Mercury	1.773	0.709
Total suspended solids	290.800	138.300
pH	Within the range of 7.5 to 10.0 at all times	

(b) Fouled Anolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of antimony metal produced by electrowinning		
Antimony	20.360	9.079
Arsenic	14.820	6.596
Lead	2.979	1.419
Mercury	1.773	0.709
Total suspended solids	290.800	138.300
pH	Within the range of 7.5 to 10.0 at all times	

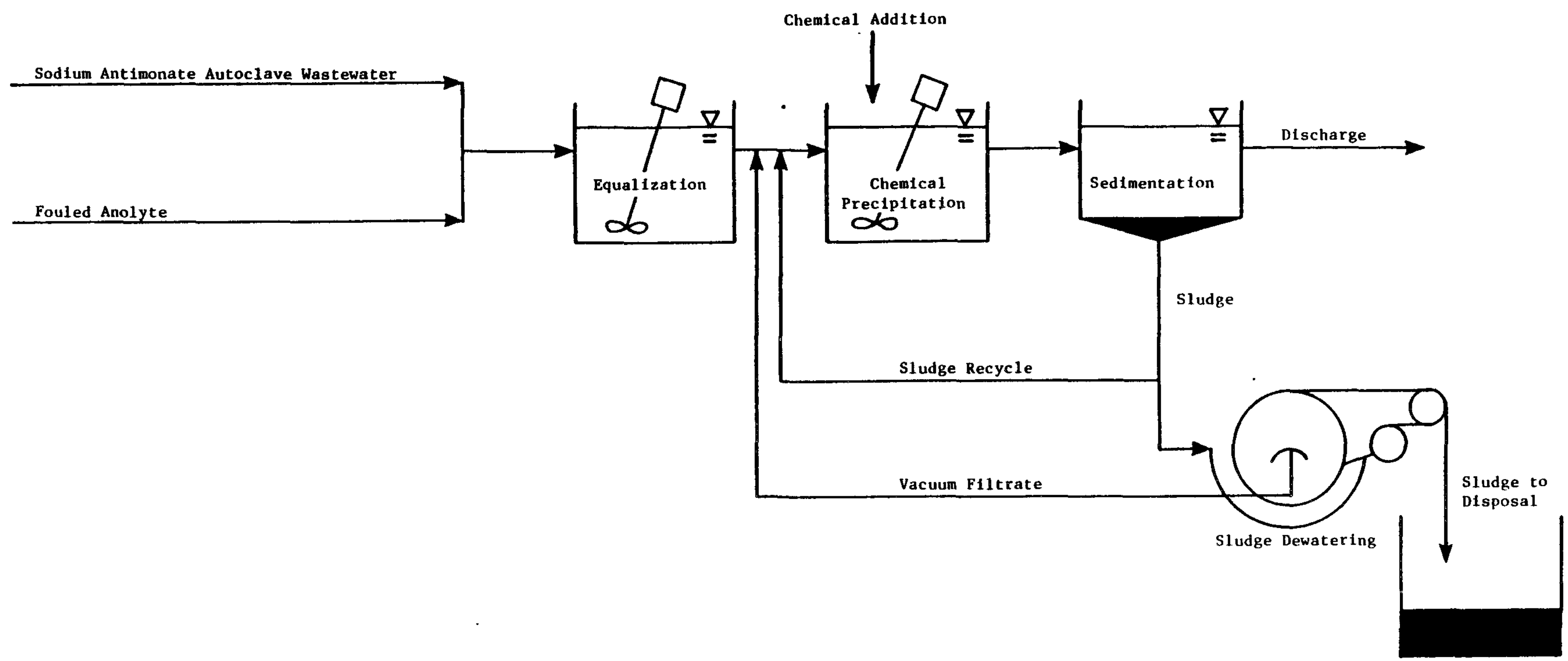

Figure IX-1

BPT TREATMENT SCHEME FOR THE PRIMARY ANTIMONY SUBCATEGORY

PRIMARY ANTIMONY 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 removals (see Weyerhaeuser v. Costle, 11 ERC 2149 (D.C. Cir. 1978)). However, in assessing the proposed BAT, the Agency has given substantial weight to the economic achievability of the technology.

TECHNICAL APPROACH TO BAT

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

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

The treatment technologies considered for BAT are summarized below:

Option A (Figure X-1):

- Chemical precipitation and sedimentation

Option C (Figure X-2):

- Chemical precipitation and sedimentation
- Multimedia filtration

The two 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 second option represents substantial progress toward the reduction of pollutant discharges above and beyond the progress achievable by BPT.

OPTION A

Option A for the primary antimony subcategory is equivalent to the control and treatment technologies which were analyzed for BPT in Section IX (see Figure X-1). The BPT end-of-pipe treatment scheme includes chemical precipitation and sedimentation (see Figure IX-1). The discharge rates for Option A are equal to the discharge rates allocated to each stream as a BPT discharge flow. As discussed earlier, EPA is also considering the possibility of activated carbon adsorption for controlling toxic organic pollutants.

OPTION C

Option C for the primary antimony subcategory consists of all control and treatment requirements of Option A (chemical precipitation and sedimentation) plus multimedia filtration technology added at the end of the Option A treatment scheme (see Figure X-2). Multimedia filtration is used to remove suspended solids, including precipitates of toxic metals, beyond the concentrations attainable by gravity sedimentation. The filter suggested is of the gravity, mixed media type, although other forms of filters, such as rapid sand filters or pressure filters, would perform satisfactorily. As discussed earlier, EPA is also considering the possibility of activated carbon adsorption for controlling toxic organic pollutants.

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 sampling data was production normalized for each unit operation (i.e., mass of pollutant generated per mass of product manufactured). This value, referred to as the raw waste, was used to estimate the mass of toxic pollutants generated within the primary antimony 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 them summing these values for each pollutant for every stream generated by the plant.

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

COMPLIANCE COSTS

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

BAT OPTION SELECTION

EPA has selected Option C which includes chemical precipitation, sedimentation, and multimedia filtration. The estimated capital cost of proposed BAT is 41,250 dollars (1982 dollars) and the annual cost is 21,183 dollars (1982 dollars). The end-of-pipe treatment configuration for Option C is presented in Figure X-2. As discussed earlier, EPA is also considering the possibility of activated carbon adsorption for controlling toxic organic pollutants.

EPA is proposing multimedia filtration as part of the BAT technology because this technology results in additional removal of toxic metals. Filtration is also presently demonstrated at 25 plants throughout the nonferrous metals manufacturing category. Filtration adds reliability to the treatment system by making it less susceptible to operator error and to sudden changes in raw wastewater flow and concentrations.

Implementation of the control and treatment technologies of Option C would remove annually an estimated 2,644 kilograms of toxic metal pollutants, which is 1.3 kilograms of toxic metal pollutants over the estimated BPT removal.

WASTEWATER DISCHARGE RATES

A BAT discharge rate was calculated for each subdivision based upon the flows of the existing plants, as determined from analysis of the data collection portfolios. The discharge rate is used with the achievable treatment concentrations to determine BAT effluent limitations. Since the discharge rate may be different for each wastewater source, separate production normalized discharge rates for each of the two wastewater sources were determined and are summarized in Table X-3. The discharge rates are normalized on a production basis by relating the amount of wastewater generated to the mass of product which is produced by the process associated with the waste stream in question. These production normalizing parameters, or PNPs, are also listed in Table X-3.

The BAT discharge rates reflect no flow reduction requirements as compared to the BPT option flows. In-process flow reduction was not considered achievable for any waste streams in this subcategory. Consequently, the BAT and BPT production normalized discharge flows are identical.

REGULATED POLLUTANT PARAMETERS

In implementing the terms of the Consent Agreement in NRDC v. Train, Op. Cit., and 33 U.S.C. 1314(b)(2)(A and B) (1976), the Agency placed particular emphasis on the toxic pollutants. The raw wastewater concentrations from individual operations and the subcategory as a whole were examined to select certain pollutants and pollutant parameters for limitation. This examination and evaluation was presented in Section VI. The Agency, however, has chosen not to regulate all seven toxic pollutants selected for further consideration in this analysis.

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

114. antimony
115. arsenic
122. lead
123. mercury

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

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

The toxic metal pollutants selected for specific limitation in the primary antimony subcategory to control the discharges of toxic metal pollutants are antimony, arsenic, lead, and mercury. The following toxic metal pollutants are excluded from limitation on the basis that they are effectively controlled by the limitations developed for antimony, arsenic, lead, and mercury:

118. cadmium
120. copper
128. zinc

EFFLUENT LIMITATIONS

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

Table X-1

POLLUTANT REMOVAL ESTIMATES FOR DIRECT DISCHARGERS IN THE PRIMARY ANTIMONY SUBCATEGORY

Pollutant	Raw Waste (kg/yr)	Option A Discharge (kg/yr)	Option A Removed (kg/yr)	Option C Discharge (kg/yr)	Option C Removed (kg/yr)
Antimony	53.382	1.198	52.184	0.804	52.578
Arsenic	2,566.971	0.873	2,566.098	0.582	2,566.389
Beryllium	0	0	0	0	0
Cadmium	0.841	0.135	0.706	0.084	0.757
Chromium (total	0	0	0	0	0
Copper	13.257	0.993	12.265	0.667	12.590
Cyanide (total)	0	0	0	0	0
Lead	3.353	0.205	3.148	0.137	3.216
Mercury	6.894	0.103	6.791	0.062	6.832
Nickel	0	0	0	0	0
Selenium	0	0	0	0	0
Silver	0	0	0	0	0
Thallium	0	0	0	0	0
Zinc	1.748	0.565	1.183	0.394	1.354
TOTAL TOXICS	2,646.447	4.072	2,642.375	2.730	2,643.717
TSS	985.314	20.536	964.778	4.450	980.864
TOTAL CONVENTIONALS	985.314	20.536	964.778	4.450	980.864
TOTAL POLLUTANTS	3,631.761	24.608	3,607.152	7.180	3,624.581

Table X-2

COST OF COMPLIANCE FOR THE PRIMARY ANTIMONY SUBCATEGORY

DIRECT DISCHARGERS

Option	Total Required Capital Cost (1982 Dollars)	Total Annual Cost (1982 Dollars)
A	$34,200	$17,300
C	$41,250	$21,183

Table X-3

BAT WASTEWATER DISCHARGE RATES FOR THE PRIMARY ANTIMONY SUBCATEGORY

Wastewater Stream	BAT Normalized Discharge Rate		Production Normalized Parameter
	l/kkg	gal/ton	
Sodium antimonate autoclave wastewater	7,093	1,704	Antimony contained in sodium antimonate product
Fouled anolyte	7,093	1,704	Antimony metal produced by electrowinning

Table X-4

BAT MASS LIMITATIONS FOR THE
PRIMARY ANTIMONY SUBCATEGORY

(a) Sodium Antimonate Autoclave Wastewater

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of antimony contained in sodium antimonate product		
Antimony	13.690	6.100
Arsenic	9.859	4.398
Lead	1.986	0.922
Mercury	1.064	0.426

(b) Fouled Anolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of antimony metal produced by electrowinning		
Antimony	13.690	6.100
Arsenic	9.859	4.398
Lead	1.986	0.922
Mercury	1.064	0.426

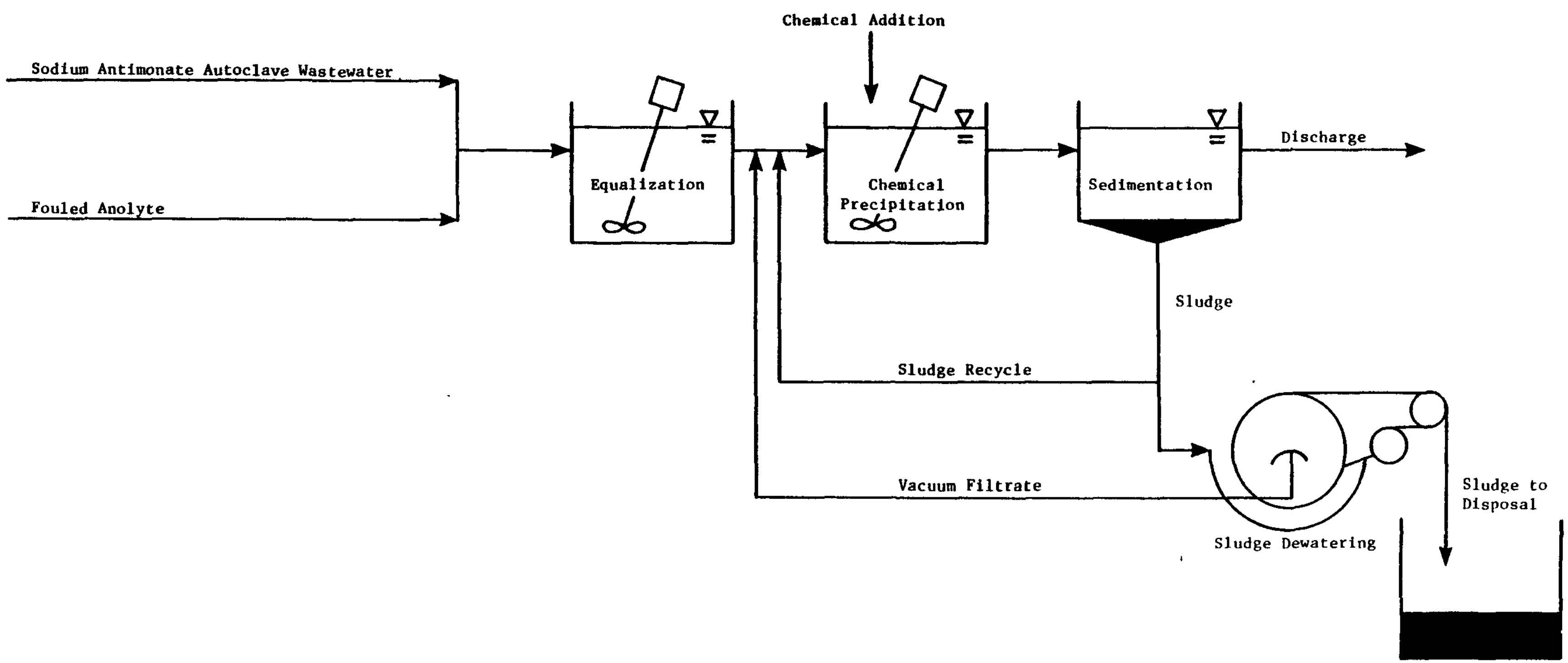

Figure X-1

BAT TREATMENT SCHEME FOR OPTION A

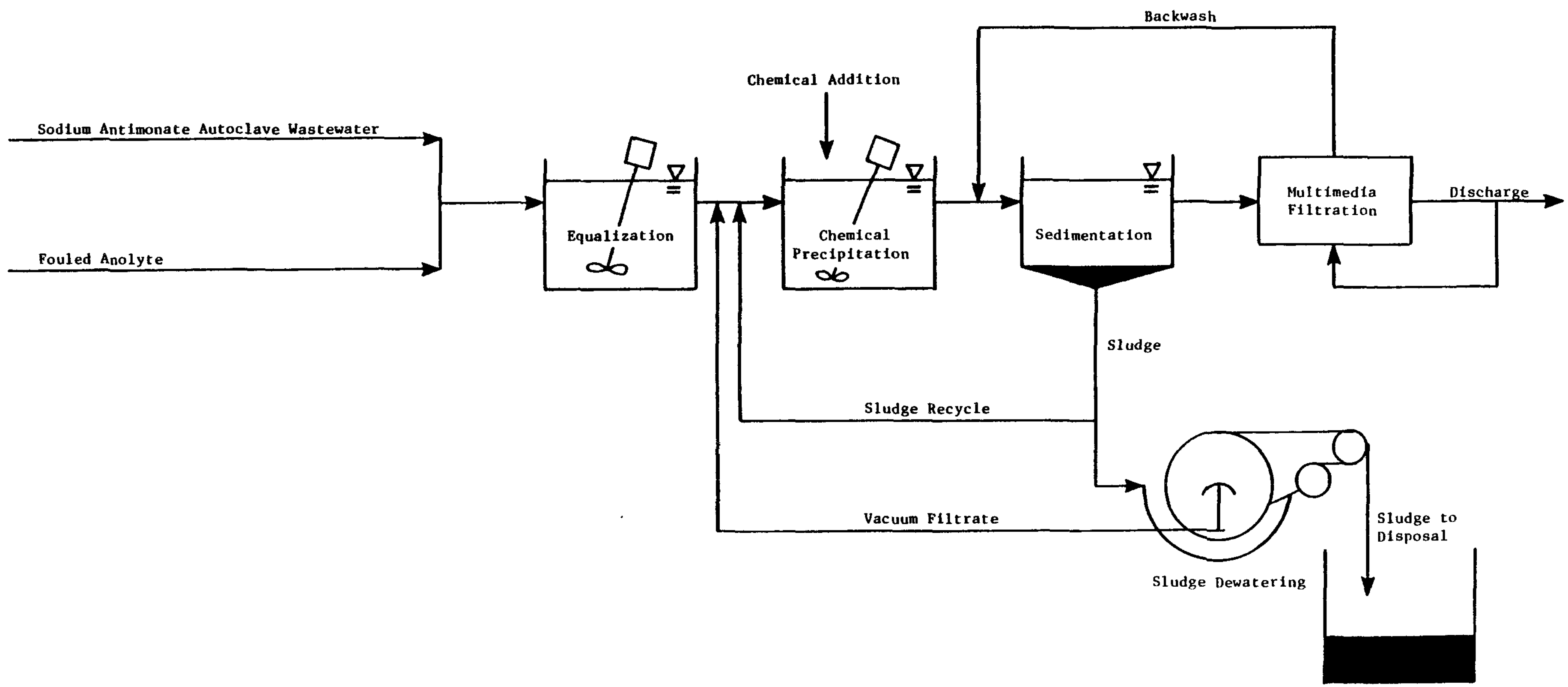

Figure X-2

BAT TREATMENT SCHEME FOR OPTION C

PRIMARY ANTIMONY SUBCATEGORY

SECTION XI

NEW SOURCE PERFORMANCE STANDARDS

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

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

TECHNICAL APPROACH TO NSPS

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

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

OPTION A

- Chemical precipitation and sedimentation

OPTION C

- Chemical precipitation and sedimentation
- Multimedia filtration

NSPS OPTION SELECTION

EPA is proposing that the best available demonstrated technology for the primary antimony subcategory be equivalent to Option C (chemical precipitation, sedimentation, and multimedia filtration). This technology is demonstrated by 25 plants in the nonferrous metals manufacturing category. As discussed earlier, EPA is also considering the possibility of activated carbon adsorption as an effluent polishing step to control the discharge of toxic organic pollutants.

The wastewater flow rates for NSPS are the same as the BAT flow rates. A review of the industry indicates that no new demonstrated technologies that improve on BAT technology exist. EPA does not believe that new plants could achieve any flow reduction beyond the allowances proposed for BAT, therefore, the NSPS allowances are equal to those for BAT.

REGULATED POLLUTANT PARAMETERS

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

NEW SOURCE PERFORMANCE STANDARDS

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

Table XI-1

NSPS WASTEWATER DISCHARGE RATES FOR THE PRIMARY ANTIMONY SUBCATEGORY

Wastewater Stream	NSPS Normalized Discharge Rate l/kkg	NSPS Normalized Discharge Rate gal/ton	Production Normalized Parameter
Sodium antimonate autoclave wastewater	7,093	1,704	Antimony contained in sodium antimonate product
Fouled anolyte	7,093	1,704	Antimony metal produced by electrowinning

Table XI-2

NSPS FOR THE PRIMARY ANTIMONY SUBCATEGORY

(a) Sodium Antimonate Autoclave Wastewater

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of antimony contained in sodium antimonate product		
Antimony	13.690	6.100
Arsenic	9.859	4.398
Lead	1.986	0.922
Mercury	1.064	0.426
Total suspended solids	106.400	85.120
pH	Within the range of 7.5 to 10.0 at all times	

(b) Fouled Anolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of antimony metal produced by electrowinning		
Antimony	13.690	6.100
Arsenic	9.859	4.398
Lead	1.986	0.922
Mercury	1.064	0.426
Total suspended solids	106.400	85.120
pH	Within the range of 7.5 to 10.0 at all times	

PRIMARY ANTIMONY 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, inlcuding 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.

Pretreatment standards for existing sources (PSES) will not be proposed for the primary antimony subcategory because there are no existing indirect dischargers in this subcategory. However, pretreatment standards for new sources (PSNS) will be proposed.

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

TECHNICAL APPROACH TO PRETREATMENT

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

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

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

PRETREATMENT STANDARDS FOR NEW SOURCES

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

OPTION A

- Chemical precipitation and sedimentation

OPTION C

- Chemical precipitation and sedimentation
- Multimedia filtration

PSNS OPTION SELECTION

Option C (chemical precipitation, sedimentation, and multimedia filtration) has been selected as the regulatory approach for pretreatment standards for new sources on the basis that it achieves effective removal of toxic pollutants and is demonstrated by 25 plants throughout the nonferrous metals manufacturing category. As discussed earlier, EPA is considering the possible addition of activated carbon adsorption for the control of toxic organic pollutants.

The wastewater discharge rates for PSNS are identical to the BAT discharge rates for each waste stream. The PSNS discharge rates are shown in Table XII-1. No additional flow reduction measures for PSNS are feasible; EPA does not believe that new plants could achieve flow reduction beyond the allowances proposed for BAT.

REGULATED POLLUTANT PARAMETERS

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

PRETREATMENT STANDARDS FOR NEW SOURCES

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

Table XII-1

PSNS WASTEWATER DISCHARGE RATES FOR THE PRIMARY ANTIMONY SUBCATEGORY

Wastewater Stream	PSNS Normalized Discharge Rate		Production Normalized Parameter
	l/kkg	gal/ton	
Sodium antimonate autoclave wastewater	7,093	1,704	Antimony contained in sodium antimonate product
Fouled anolyte	7,093	1,704	Antimony metal produced by electrowinning

Table XII-2

PSNS FOR THE PRIMARY ANTIMONY SUBCATEGORY

(a) Sodium Antimonate Autoclave Wastewater

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of antimony contained in sodium antimonate product		
Antimony	13.690	6.100
Arsenic	9.859	4.398
Lead	1.986	0.922
Mercury	1.064	0.426

(b) Fouled Anolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of antimony metal produced by electrowinning		
Antimony	13.690	6.100
Arsenic	9.859	4.398
Lead	1.986	0.922
Mercury	1.064	0.426

PRIMARY ANTIMONY SUBCATEGORY

SECTION XIII

BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY

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