United States
Environmental Protection
Agency

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

EPA-440/1-84/019-b2
July 1984
Suppl 7

Water and Waste Management

EPA

Development Document for Effluent Limitations Guidelines and Standards for the

Proposed

Nonferrous Metals

Point Source Category

Phase II

Supplemental Development Document For:

Secondary Mercury

DEVELOPMENT DOCUMENT

for

EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS

for the

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY

PHASE II

Secondary Mercury Supplement

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July 1984

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SECONDARY MERCURY SUBCATEGORY

TABLE OF CONTENTS

Section		Page
I	SUMMARY AND CONCLUSIONS	1
II	RECOMMENDATIONS	3
	NSPS FOR THE SECONDARY MERCURY SUBCATEGORY	3
	PSNS FOR THE SECONDARY MERCURY SUBCATEGORY	5
III	INDUSTRY PROFILE	7
	DESCRIPTION OF SECONDARY MERCURY PRODUCTION	7
	RAW MATERIALS	7
	SEPARATION OF GROSS IMPURITIES	8
	DISTILLATION	8
	ACID WASHING	8
	PROCESS WASTEWATER SOURCES	9
	OTHER WASTEWATER SOURCES	9
	AGE, PRODUCTION, AND PROCESS PROFILE	9
IV	SUBCATEGORIZATION	15
	FACTORS CONSIDERED IN SUBCATEGORIZATION	15
	FACTORS CONSIDERED IN SUBDIVIDING THE SECONDARY MERCURY SUBCATEGORY	16
	OTHER FACTORS	17
	PRODUCTION NORMALIZING PARAMETERS	17
V	WATER USE AND WASTEWATER CHARACTERISTICS	19
	WASTEWATER FLOW RATES	20
	WASTEWATER CHARACTERISTICS DATA	21
	DATA COLLECTION PORTFOLIO	21
	FIELD SAMPLING DATA	21
	WASTEWATER CHARACTERISTICS AND FLOWS BY SUBDIVISION	22
	SPENT BATTERY ELECTROLYTE	22
	ACID WASH AND RINSE WATER	22
	FURNACE WET AIR POLLUTION CONTROL	22

SECONDARY MERCURY SUBCATEGORY

TABLE OF CONTENTS (Continued)

Section		Page
VI	SELECTION OF POLLUTANT PARAMETERS	27
	CONVENTIONAL POLLUTANT PARAMETERS	27
	CONVENTIONAL POLLUTANT PARAMETERS SELECTED	27
	TOXIC POLLUTANTS	28
	TOXIC POLLUTANTS NEVER DETECTED	28
	TOXIC POLLUTANTS NEVER FOUND ABOVE THEIR ANALYTICAL QUANTIFICATION CONCENTRATION	31
	TOXIC POLLUTANTS PRESENT BELOW CONCENTRATIONS ACHIEVABLE BY TREATMENT	31
	TOXIC POLLUTANTS SELECTED FOR FURTHER CONSIDERATION IN ESTABLISHING LIMITATIONS AND STANDARDS	32
VII	CONTROL AND TREATMENT TECHNOLOGIES	33
	CURRENT CONTROL AND TREATMENT PRACTICES	33
	SPENT BATTERY ELECTROLYTE	33
	ACID WASH AND RINSE WATER	34
	FURNACE WET AIR POLLUTION CONTROL	34
	CONTROL AND TREATMENT OPTIONS	34
	OPTION A	34
	OPTION C	34
VIII	COSTS, ENERGY, AND NONWATER QUALITY ASPECTS	37
	TREATMENT OPTIONS FOR NEW SOURCES	37
	OPTION A	37
	OPTION C	37
	COST METHODOLOGY	38
	NONWATER QUALITY ASPECTS	38
	ENERGY REQUIREMENTS	38
	SOLID WASTE	39
	AIR POLLUTION	40
IX	BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE	43
X	BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE	45

SECONDARY MERCURY SUBCATEGORY

TABLE OF CONTENTS (Continued)

Section		Page
XI	NEW SOURCE PERFORMANCE STANDARDS	47
	TECHNICAL APPROACH TO NSPS	47
	OPTION A	47
	OPTION C	47
	INDUSTRY COST AND POLLUTANT REMOVAL ESTIMATES. .	49
	POLLUTANT REMOVAL ESTIMATES.	49
	COMPLIANCE COSTS	50
	NSPS OPTION SELECTION.	50
	WASTEWATER DISCHARGE RATES	50
	SPENT BATTERY ELECTROLYTE.	51
	ACID WASH AND RINSE WATER.	51
	FURNACE WET AIR POLLUTION CONTROL.	51
	REGULATED POLLUTANT PARAMETERS	51
	NEW SOURCE PERFORMANCE STANDARDS	52
XII	PRETREATMENT STANDARDS	59
	TECHNICAL APPROACH TO PRETREATMENT	59
	PRETREATMENT STANDARDS FOR NEW SOURCES	60
	OPTION A	60
	OPTION C	60
	PSNS OPTION SELECTION.	60
	REGULATED POLLUTANT PARAMETERS	61
	PRETREATMENT STANDARDS FOR NEW SOURCES	61
XIII	BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY .	65

SECONDARY MERCURY SUBCATEGORY

LIST OF TABLES

Number		Page
III-1	INITIAL OPERATING YEAR (RANGE) SUMMARY OF PLANTS IN THE SECONDARY MERCURY SUBCATEGORY BY DISCHARGE TYPE.	10
III-2	PRODUCTION RANGES FOR THE SECONDARY MERCURY SUBCATEGORY.	11
III-3	SUMMARY OF SUBCATEGORY PROCESSES AND ASSOCIATED WASTE STREAMS	12
V-1	WATER USE AND DISCHARGE RATES FOR SPENT BATTERY ELECTROLYTE.	24
V-2	WATER USE AND DISCHARGE RATES FOR ACID WASH AND RINSE WATER.	25
V-3	WATER USE AND DISCHARGE RATES FOR FURNACE WET AIR POLLUTION CONTROL.	26
VIII-1	COST OF COMPLIANCE FOR NEW SOURCE MODEL PLANTS IN THE SECONDARY MERCURY SUBCATEGORY	41
XI-1	POLLUTANT REMOVAL ESTIMATES FOR NEW SOURCE MODEL PLANTS	53
XI-2	COST OF COMPLIANCE FOR NEW SOURCE MODEL PLANTS IN THE SECONDARY MERCURY SUBCATEGORY	54
XI-3	NSPS WASTEWATER DISCHARGE RATES FOR THE SECONDARY MERCURY SUBCATEGORY.	55
XI-4	NSPS FOR THE SECONDARY MERCURY SUBCATEGORY . . .	56
XII-1	PSNS WASTEWATER DISCHARGE RATES FOR THE SECONDARY MERCURY SUBCATEGORY.	62
XII-2	PSNS FOR THE SECONDARY MERCURY SUBCATEGORY . . .	63

SECONDARY MERCURY SUBCATEGORY

LIST OF FIGURES

Number		Page
III-1	SECONDARY MERCURY PRODUCTION PROCESS	13
III-2	GEOGRAPHIC LOCATIONS OF THE SECONDARY MERCURY SUBCATEGORY PLANTS	14
XI-1	NSPS TREATMENT SCHEME FOR OPTION A	57
XI-2	NSPS TREATMENT SCHEME FOR OPTION C	58

SECONDARY MERCURY 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 secondary mercury 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 pretreatment standards for new indirect dischargers (PSNS) and standards of performance for new source direct dischargers (NSPS).

The secondary mercury subcategory is comprised of four plants. Two plants achieve zero discharge of process wastewater, and two plants do not generate process wastewater.

EPA first studied the secondary mercury 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, three subdivisions have been identified for this subcategory that warrant separate effluent limitations. These include:

- Spent battery electrolyte,
- Acid wash and rinse water, and
- Furnace wet air pollution control.

EPA also identified several distinct control and treatment technologies (both in-plant and end-of-pipe) applicable to the secondary mercury 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."

Existing performance of plants in the secondary mercury subcategory is such that no discharge of process wastewater is presently practiced at the plants in this industry. This is achieved by 100 percent recycle on-site or by contractor disposal of process wastewater, or is a result of a production process that generates no process water. Therefore, BPT, BAT, BCT, and PSES are not applicable to this subcategory. BAT and PSES were recommended for exclusion under Paragraph 8 of the Settlement Agreement. The secondary mercury subcategory is regulated under New Source Performance Standards and Pretreatment Standards for New Sources.

After examining the various treatment technologies, the Agency has identified best demonstrated technology, which is the technical basis of NSPS, to represent the best existing technology in the nonferrous metals manufacturing category. Metals removal based on chemical precipitation, sedimentation, and multimedia filtration technology is the basis for the NSPS limitations. In selecting NSPS, EPA recognizes that new plants have the opportunity to implement the best and most efficient manufacturing processes and treatment technologies available.

PSES is not being proposed for this subcategory because there are no existing indirect dischargers in the secondary mercury subcategory. For PSNS, the Agency selected end-of-pipe treatment techniques equivalent to NSPS.

Although the methodology for BCT has not yet been finalized, BCT is not being proposed because there are no direct dischargers.

The mass limitations for NSPS and PSNS are presented in Section II.

SECONDARY MERCURY SUBCATEGORY

SECTION II

RECOMMENDATIONS

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

   (a) Spent battery electrolyte,
   (b) Acid wash and rinse water, and
   (c) Furnace wet air pollution control.

2. BPT is not being proposed because there are no direct dischargers in the secondary mercury subcategory.

3. BAT is not being proposed because there are no direct dischargers in the secondary mercury subcategory.

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 SECONDARY MERCURY SUBCATEGORY

(a) Spent Battery Electrolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury produced from batteries		
Lead	0.030	0.014
Mercury	0.016	0.006
Total suspended solids	1.590	1.272
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE SECONDARY MERCURY SUBCATEGORY

(b) Acid Wash and Rinse Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury washed and rinsed		
Lead	0.00056	0.00026
Mercury	0.00030	0.00012
Total suspended solids	0.030	0.024
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE SECONDARY MERCURY SUBCATEGORY

(c) Furnace Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury processed through furnace		
Lead	0.000	0.000
Mercury	0.000	0.000
Total suspended solids	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

5. PSES are not being proposed because there are no indirect dischargers in the secondary mercury 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 SECONDARY MERCURY SUBCATEGORY

(a) Spent Battery Electrolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury produced from batteries		
Lead	0.030	0.014
Mercury	0.016	0.006

PSNS FOR THE SECONDARY MERCURY SUBCATEGORY

(b) Acid Wash and Rinse Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury washed and rinsed		
Lead	0.00056	0.00026
Mercury	0.00030	0.00012

PSNS FOR THE SECONDARY MERCURY SUBCATEGORY

(c) Furnace Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury processed through furnace		
Lead	0.000	0.000
Mercury	0.000	0.000

7. BCT is not being proposed for the secondary mercury subcategory at this time.

SECONDARY MERCURY SUBCATEGORY

SECTION III

INDUSTRY PROFILE

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

Mercury is used in numerous agricultural, chemical and electrical applications. Mercury is used extensively in the chemical industry, particularly in the production of chlorine and caustic soda. Mercury compounds are also used extensively in paints and as catalysts. Agricultural uses of mercury include germicides for seed protection and weed control, and fungicidal fruit sprays. Electrical applications include low-pressure and high-pressure mercury vapor lamps, power control switches, and dry-cell batteries. Other uses are in barometers, thermometers, as a vibration damper, and as a coolant. Mercury produced from secondary sources is used in many applications, such as those described above.

DESCRIPTION OF SECONDARY MERCURY PRODUCTION

The production of secondary mercury can be divided into three distinct stages: separation of gross impurities, distillation, and acid washing. The actual processes used in each stage vary with the type and purity of the raw material used. The secondary mercury production process is presented schematically in Figure III-1 and is described below.

RAW MATERIALS

Mercury can be reclaimed from a variety of raw materials, including thermometers, switches, filters, controls, zinc and silver amalgams, mercuric oxide battery.cells, and other types of scrap. Secondary mercury annually supplies the United States with approximately 20 percent of domestic requirements. Several plants refining secondary mercury also refine prime virgin mercury. Although prime virgin mercury can be considered to be a primary raw material, its refining is included with secondary mercury, because it is refined on-site with secondary mercury using the same equipment and production processes.

SEPARATION OF GROSS IMPURITIES

Depending on the type of raw material being processed, gross impurities, such as glass from mercury thermometers, or spent electrolyte from mercuric oxide battery cells, may have to be separated from the mercury. The separation of gross impurities must occur prior to distilling the mercury. Raw materials such as thermometers, switches, filters, controls, and zinc and silver amalgams may be separated from their gross impurities by roasting in a furnace. The mercury is separated from impurities by vaporizing it, and then recovering mercury by condensation. The nonvolatilized solids are removed from the furnace after all the mercury has been removed. A water scrubber may be used to control air emissions from the mercury furnace-condenser, and the scrubber may have a discharge from it.

Before mercury can be recovered from mercuric oxide battery cells, the battery electrolyte must be removed. On a small scale, this is most likely accomplished by manually draining the spent electrolyte from each cell. Spent electrolyte removed in this step is a waste stream.

DISTILLATION

Mercury distillation columns, also known as retorts, stills, or kettles, are used to produce high-purity mercury. No wastewater is generated by this process. A typical distillation process consists of charging raw, impure mercury into the bottom of a still and heating the charge to a prescribed temperature, somewhat less than the boiling point of mercury, 356.9°C. While heating the charge, air may be bubbled through the still in order to oxidize metallic impurities, such as lead, zinc, cadmium, copper or tin. When the charge reaches the critical temperature, the mercury begins to vaporize, and the mercury is recovered in an overhead, water cooled condensing system. Mercury distillation may be run batchwise or continuously, and in both cases it can be considered a dry process. None of the water used in the condensing coils contacts the mercury.

Multiple distillation units may be operated in series to produce very high purity (approximately 99.999999 percent) mercury. Like the single distillation process, no wastewater is generated by multiple distillation units.

ACID WASHING

Another method for further purifying mercury is acid washing and rinsing. In this method, a small amount of dilute nitric acid is used to wash the distilled mercury product, and then a small amount of distilled water is used to wash the residual acid from the mercury product. Mercury of 99.9 percent purity can be produced in this manner. The acid wash and rinse water may be discharged from this process as a waste stream.

PROCESS WASTEWATER SOURCES

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

1. Spent battery electrolyte,
2. Acid wash and rinse water, and
3. Furnace wet air pollution control.

OTHER WASTEWATER SOURCES

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

1. Stormwater runoff,
2. Maintenance and cleanup water, and
3. Noncontact cooling water.

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

AGE, PRODUCTION, AND PROCESS PROFILE

Figure III-2 shows the locations of the four secondary mercury plants operating in the United States. Two of the four plants are located near the industrial centers of the Northeast, one is in Illinois, and one in California.

Table III-1 shows the relative age and discharge status of the mercury plants and illustrates that all the plants were built after World War II. The average plant age is 30 years old. From Table III-2, it can be seen that two plants produce between 50 and 100 tons per year of metal, while one plant produces less than 25 tons per year. Mean production is about 55 tons per year.

Table III-3 provides a summary of the number of plants generating wastewater for the waste streams associated with various processes and the number of plants with the process.

Table III-1

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

	Initial Operating Year (Range) (Plant Age in Years)			
Type of Plant	1982-1968 (0-15)	1967-1958 (16-25)	1957-1948 (26-35)	Total
Direct	0	0	0	0
Indirect	0	0	0	0
Zero	0	0	2	2
Dry	0	1	0	2*
TOTAL	0	0	1	4

*One plant did not report initial operating year.

Table III-2

PRODUCTION RANGES FOR THE SECONDARY MERCURY SUBCATEGORY

Type of Plant	Mercury Production Range for 1982 0-25 (tons/yr)	25-50 (tons/yr)	50-100 (tons/yr)	Total Number of Plants
Direct	0	0	0	0
Indirect	0	0	0	0
Zero	1	0	1	2
Dry	0	0	1	2*
				4

*One plant did not report mercury production.

Table III-3

SUMMARY OF 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*
Spent battery electrolyte	1	1
Furnace wet air pollution control	1	0
Distillation	4	0
Acid wash and rinse water	1	1

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

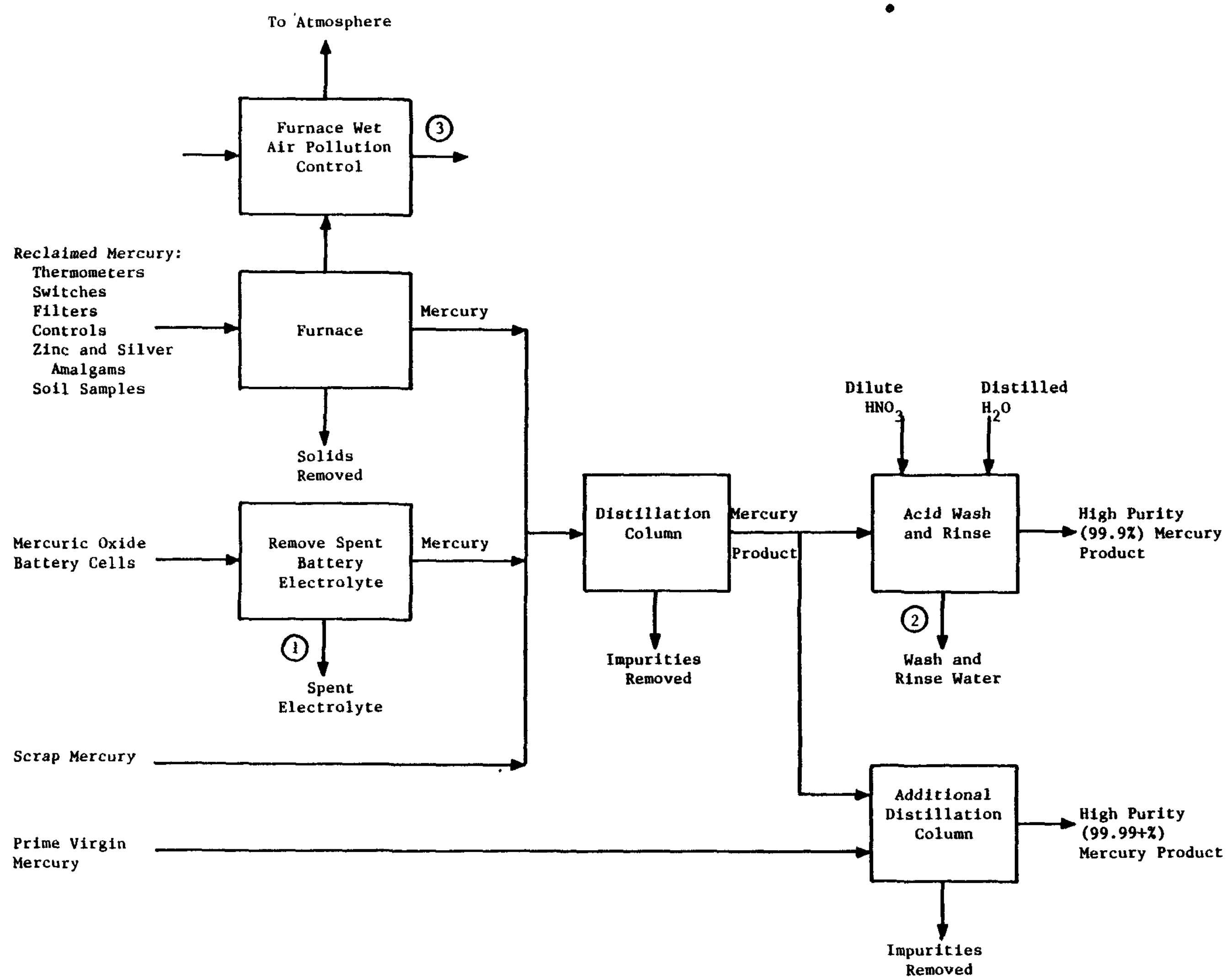

Figure III-1
SECONDARY MERCURY PRODUCTION PROCESS

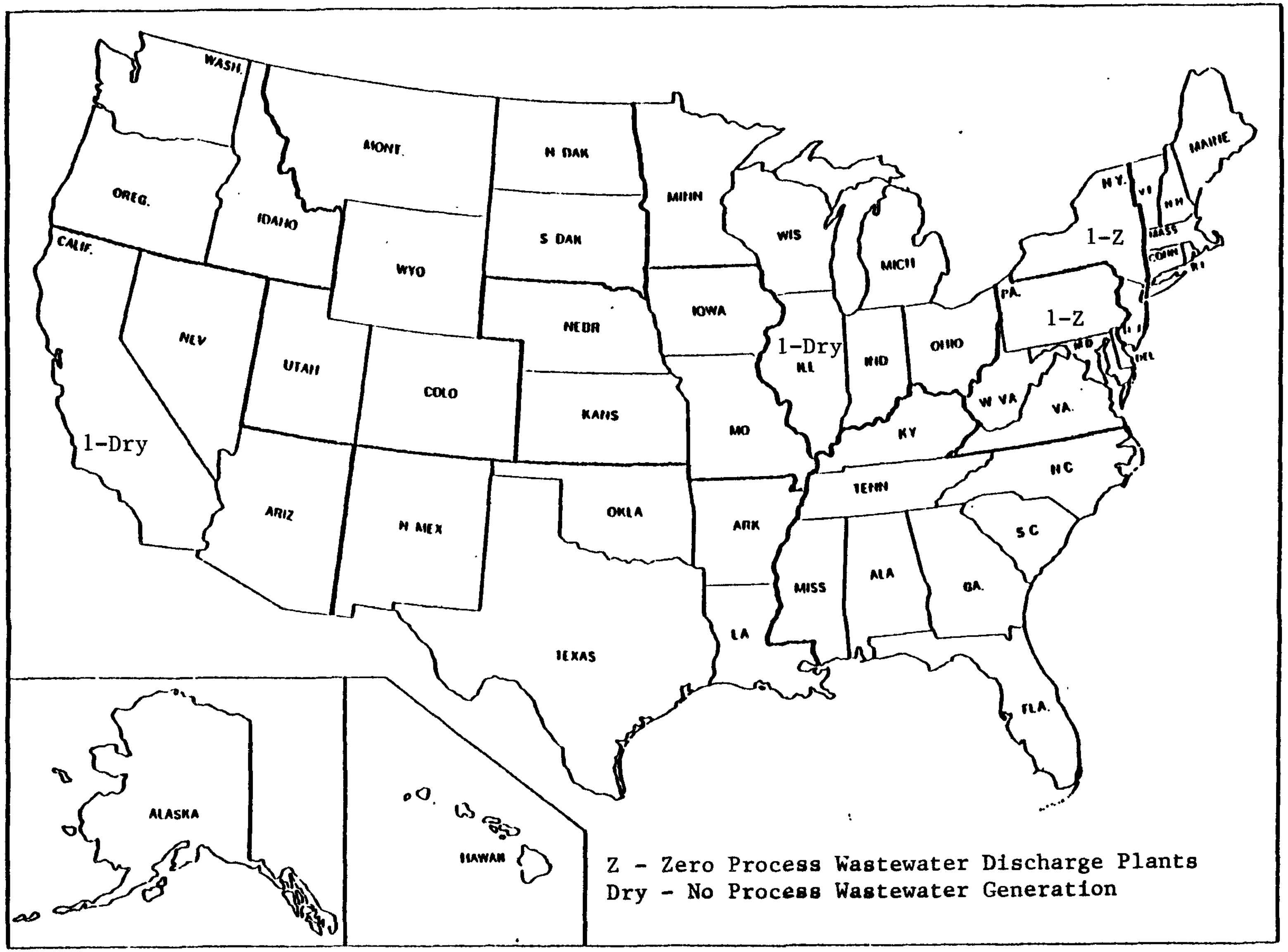

Figure III-2

GEOGRAPHIC LOCATIONS OF THE SECONDARY MERCURY SUBCATEGORY PLANTS

SECONDARY MERCURY 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 secondary mercury 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 secondary mercury 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 secondary mercury.

FACTORS CONSIDERED IN SUBDIVIDING THE SECONDARY MERCURY SUBCATEGORY

The factors listed previously were each evaluated when considering subdivision of the secondary mercury 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 secondary mercury subcategory is based primarily on differences in the production processes and raw materials used. Within this subcategory, a number of different operations are performed, which may or may not have a water use or discharge, and which may require the establishment of separate effluent limitations. While secondary mercury is still considered a single subcategory, a more thorough examination of the production processes has illustrated the need for limitations and standards based on specific flow allowances for the following subdivisions:

1. Spent battery electrolyte,
2. Acid wash and rinse water, and
3. Furnace wet air pollution control.

These subdivisions follow directly from differences within the three distinct production stages of secondary mercury: separation of gross impurities, distillation, and additional purification. A secondary mercury plant may have one, two, or all three of these production stages.

Separation of gross impurities such as spent battery electrolyte or glass from thermometers gives rise to the first and third subdivisions: spent battery electrolyte and furnace wet air pollution control. A plant which recovers mercury from mercuric oxide battery cells must first drain the spent electrolyte from the cells. This wastewater may be discharged. A plant which recovers mercury from recycled thermometers, switches, filters, and amalgams may remove the mercury from the unwanted solids by vaporizing mercury in a furnace. After condensing the product mercury, the air emissions may be controlled with a scrubber. The furnace scrubber may have a discharge, and this creates the need for the third subdivision.

Additional purification of the mercury product gives rise to the second subdivision: acid wash and rinse water. After distilling the mercury, it may be washed with acid and rinsed with water to increase its purity. The acid wash and rinse water may be discharged as a waste stream.

OTHER FACTORS

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

PRODUCTION NORMALIZING PARAMETERS

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

In general, for each production process which has a wastewater associated with it, the actual mass of mercury product or intermediate produced will be used as the PNP. Thus, the PNPs for the three subdivisions are as follows:

Subdivision	PNP
1. Spent battery electrolyte	mercury produced from batteries
2. Acid wash and rinse water	mercury washed and rinsed
3. Furnace wet air pollution control	mercury processed through furnace

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

SECONDARY MERCURY SUBCATEGORY

SECTION V

WATER USE AND WASTEWATER CHARACTERISTICS

This section describes the characteristics of the wastewaters associated with the secondary mercury 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 quantify the pollutant discharge from secondary mercury plants, the levels of toxic pollutants in the wastewaters must be known. Since field sampling was not performed at any plants in the secondary mercury subcategory, analytical data, presented in Section V of the supplement for the primary precious metals and mercury subcategory, were transferred from a primary mercury plant to characterize wastewater in the secondary mercury industry. A complete list of the pollutants considered and a summary of the techniques used in sampling and laboratory analyses are included in Section V of the General Development Document. In general, the samples were analyzed for two classes of pollutants (including 13 of the 126 toxic pollutants): toxic metal pollutants and criteria pollutants (which includes both conventional and nonconventional pollutants). Because the analytical standard for TCDD was judged to be too hazardous to be made generally available, samples were never analyzed for this pollutant. Samples were also never analyzed for asbestos or cyanide. There is no reason to expect that TCDD, asbestos, or cyanide would be present in secondary mercury wastewater.

As described in Section IV of this supplement, the secondary mercury subcategory has been split into three subdivisions or wastewater sources, so that the proposed regulation contains mass discharge limitations and standards for three unit processes discharging process wastewater. Differences in the wastewater characteristics associated with these subdivisions are to be expected. For this reason, wastewater streams corresponding to each subdivision are addressed separately in the discussions that follow. These wastewater sources are:

1. Spent battery electrolyte,
2. Acid wash and rinse water, and
3. Furnace wet air pollution control.

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 mercury product and is therefore based on the sum of recycle and make-up flows to a given process. Wastewater flow discharged after pretreatment or recycle (if these are present) is used in calculating the production normalized flow--the volume of wastewater discharged from a given process to further treatment, disposal, or discharge per mass of mercury 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, acid wash and rinse water flow is related to the amount of mercury washed and rinsed. As such, the discharge rate is expressed in liters of acid wash and rinse water per metric ton of mercury washed and rinsed (gallons of acid wash and rinse water per ton of mercury washed and rinsed).

The production normalized discharge flows were compiled and statistically analyzed by stream type. These production normalized water use and discharge flows are presented by subdivision in Tables V-1 through V-3 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 XI and XII where representative NSPS and pretreatment flows are selected for use in calculating the effluent limitations.

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

WASTEWATER CHARACTERISTICS DATA

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

DATA COLLECTION PORTFOLIOS

In the data collection portfolios, the mercury plants that generate wastewater were asked to specify the presence of toxic pollutants in their wastewater. No plants indicated that any toxic organic pollutants were present. However, one of the two plants stated that they either knew toxic metals to be present or they believed the metals to be present. The responses for the metals and cyanide are summarized below:

Pollutant	Known Present	Believed Present
Antimony	0	0
Arsenic	0	0
Beryllium	0	0
Cadmium	0	0
Chromium	0	0
Copper	0	0
Cyanide	0	0
Lead	0	0
Mercury	1	1
Nickel	0	0
Selenium	0	0
Silver	0	0
Thallium	0	0
Zinc	0	0

FIELD SAMPLING DATA

In order to quantify the concentrations of pollutants present in wastewater from secondary mercury plants, wastewater samples were collected at one primary mercury plant, which roasts mercury ore to produce mercury metal. Analytical data from the primary mercury plant are presented in the supplement for the primary precious metals and mercury subcategory. Primary mercury and secondary mercury field sampling data are expected to show similar characteristics because of similarities in raw materials and production processes. Both plants roast or distill a mercury-containing raw material and use wet scrubbers to control emissions, and also wash their product to increase its purity.

WASTEWATER CHARACTERISTICS AND FLOWS BY SUBDIVISION

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

SPENT BATTERY ELECTROLYTE

One plant recovers mercury from mercuric oxide battery cells. The first step in this recovery is to drain the spent electrolyte from the cells. Spent battery electrolyte may be discharged as a waste stream. Production normalized water use and discharge rates for this waste stream are shown in Table V-1, in liters per metric ton of mercury produced from batteries. This subdivision is similar to spent battery electrolyte from lead batteries (see the battery cracking subdivision of the secondary lead supplement in nonferrous phase I); however, secondary mercury spent electrolyte is not expected to have similar pollutant characteristics nor similar production normalized flows.

Although spent battery electrolyte was not sampled, wastewater from the primary mercury industry should have similar characteristics to this waste stream. Spent battery electrolyte should contain treatable concentrations of toxic metals, total suspended solids, and exhibit a low pH.

ACID WASH AND RINSE WATER

After recovering mercury in a distillation system, the product may be washed with dilute nitric acid and rinsed with distilled water in order to further purify it. Acid washing and water rinsing produces a high-purity (99.9 percent) mercury product, and also generates a wastewater stream which may be discharged. The production normalized water use and discharge rates for acid wash and rinse water are given in Table V-2, in liters per metric ton of mercury washed and rinsed.

Although acid wash and rinse water was not sampled, data from the primary mercury industry should be similar to this waste stream. Acid wash and rinse water should contain treatable concentrations of toxic metals, total suspended solids, and exhibit a low pH.

FURNACE WET AIR POLLUTION CONTROL

One plant recovers mercury from sources such as thermometers, switches, contacts, and amalgams by heating the raw materials in a furnace in order to vaporize the mercury. After condensing the mercury product, air emissions from the furnace may be controlled with a wet scrubber. The furnace scrubber may have a discharge associated with it. Water use and discharge rates for furnace wet air pollution control are presented in Table V-3. Only one plant has this process and operates its scrubber at 100 percent recycle.

Table V-1

WATER USE AND DISCHARGE RATES FOR
SPENT BATTERY ELECTROLYTE

(l/kkg of mercury produced from batteries)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1161	0	106	106

Table V-2

WATER USE AND DISCHARGE RATES FOR
ACID WASH AND RINSE WATER

(l/kkg of mercury washed and rinsed)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1161	0	2.0	2.0

Table V-3

WATER USE AND DISCHARGE RATES FOR FURNACE WET AIR POLLUTION CONTROL

(l/kkg of mercury processed through furnace)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1011	100	Unknown	0

SECONDARY MERCURY SUBCATEGORY

SECTION VI

SELECTION OF POLLUTANT PARAMETERS

Although wastewater from secondary mercury facilities was not sampled, it should have similar characteristics to wastewater from a primary mercury facility. Analytical data from a primary mercury plant are presented in Section V of the supplement for primary precious metals and mercury. 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 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 POLLUTANT PARAMETERS

This study examined samples for the secondary mercury subcategory for three conventional pollutant parameters (oil and grease, 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

None of the nonconventional pollutants or pollutant parameters are selected for limitation in this subcategory.

TSS are expected to be present in secondary mercury wastewaters in concentrations exceeding that achievable by identified treatment technologies (2.6 mg/l). In the primary mercury plant's wastewater, TSS concentrations ranged from 4 mg/l to 3,700 mg/l. Furthermore, most of the specific methods used to remove toxic metals do so by converting these metals to precipitates, and these toxic-metal-containing precipitates should not be discharged. Meeting a limitation on total suspended solids helps ensure that removal of these precipitated toxic metals has been effective. For these reasons, total suspended solids are selected for limitation in this subcategory.

Spent battery electrolyte and acid wash and rinse water are expected to have pH values less than pH 7.5, which is outside the pH 7.5 to 10 range considered desirable for discharge to receiving waters. Four of the six primary mercury wastewater samples had pH values between 2.3 and 2.6. Many deleterious effects are caused by extreme pH values or rapid changes in pH. Also, effective removal of toxic metals by precipitation requires careful control of pH. Since pH control within the desirable limits is readily attainable by available treatment, pH is selected for limitation in this subcategory.

TOXIC POLLUTANTS

Raw wastewater from secondary mercury plants was not sampled, however, raw wastewater samples from the primary mercury industry should be representative of the wastewater from secondary mercury plants. These data provide the basis for the categorization of specific pollutants, as discussed below. Treatment plant samples were not considered in the frequency count.

TOXIC POLLUTANTS NEVER DETECTED

The toxic pollutants listed below were not detected or not analyzed for in any raw wastewater samples; 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. dichlorodifluoromethane (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)
121. cyanide (Total)*
129. 2,3,7,8-tetra chlorodibenzo-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 NEVER FOUND ABOVE THEIR ANALYTICAL QUANTIFICATION CONCENTRATION

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

114. antimony
117. beryllium
119. chromium (Total)
120. copper
124. nickel
125. selenium
126. silver

TOXIC POLLUTANTS PRESENT BELOW CONCENTRATIONS ACHIEVABLE BY TREATMENT

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

115. arsenic
118. cadmium

Arsenic was detected above the quantification concentration but below the treatable concentration in one sample analyzed. The sample contained 0.32 mg/l arsenic which is below the 0.34 mg/l treatable concentration. Therefore, arsenic is not selected for limitation.

Cadmium was detected above the quantification concentration in one sample analyzed. The sample indicated a cadmium concentration of 0.04 mg/l. This is below the 0.049 mg/l treatable concentration, thus cadmium is not selected for limitation.

TOXIC POLLUTANTS SELECTED FOR FURTHER CONSIDERATION IN ESTABLISHING LIMITATIONS AND STANDARDS

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

122. lead
123. mercury
127. thallium
128. zinc

Lead was detected above its treatability of 0.08 mg/l in one sample. This sample indicated a lead concentration of 22 mg/l. Lead is also expected to be present in wastewaters from this industry because it is a contaminant of the raw materials used for mercury recovery. Thus, lead is selected for further consideration for limitation.

Mercury was present above treatable concentrations in the wastewater from this industry. One sample showed a concentration of 360 mg/l of mercury. In the recovery of secondary mercury, mercury contacts various aqueous streams in which it is partially soluble. For these reasons, mercury is selected for further consideration for limitation.

Thallium was detected above its treatability of 0.34 mg/l in one sample. This sample indicated 0.61 mg/l of thallium. Thus, thallium is selected for consideration for limitation.

Zinc was detected above treatable concentrations in one sample indicating 0.73 mg/l. Treatability for zinc is 0.23 mg/l. Zinc is also expected to be present in wastewaters from this industry because it is present in batteries which are used as raw materials for secondary mercury recovery. Therefore, zinc is selected for further consideration for limitation.

SECONDARY MERCURY SUBCATEGORY

SECTION VII

CONTROL AND TREATMENT TECHNOLOGIES

The preceding sections of this supplement discussed the sources, flows, and characteristics of the wastewaters from secondary mercury plants. This section summarizes the description of these wastewaters and indicates the treatment technologies which are currently practiced in the secondary mercury subcategory for each waste stream. Secondly, this section presents the control and treatment technology options which were examined by the Agency for possible application to the secondary mercury 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 secondary mercury subcategory is characterized by the presence of the toxic metal pollutants and suspended solids. This analysis is supported by the raw (untreated) wastewater data presented for primary mercury sources as well as raw materials and production processes as shown in Section VI. Generally, these pollutants are present in each of the waste streams at concentrations above treatability, and these waste streams are commonly combined for treatment. Construction of one wastewater treatment system for combined treatment allows plants to take advantage of economic scale and in some instances to combine streams of different alkalinity to reduce treatment chemical requirements. No plants in this subcategory currently treat their wastewater. One plant employs contractor disposal of their wastewater, and one plant employs 100 percent recycle of scrubber liquor. The options selected for consideration for NSPS and pretreatment based on combined treatment of these compatible waste streams will be summarized toward the end of this section.

SPENT BATTERY ELECTROLYTE

Mercury may be reclaimed from recycled mercuric oxide battery cells. Before distilling the mercury contained in the battery, the spent electrolyte must be drained. One plant processes recycled batteries, and has their spent battery electrolyte hauled away by an approved contractor.

ACID WASH AND RINSE WATER

After recovering mercury from recycled batteries by distillation, the mercury product may be further purified. Purification is effected by washing the mercury with dilute nitric acid, and then rinsing it with water. One plant generates an acid wash and rinse water waste stream in this manner, and disposes of it by having a contractor haul it away.

FURNACE WET AIR POLLUTION CONTROL

Mercury may be reclaimed from scrap such as thermometers, switches, filters, controls, amalgams, and soil samples by vaporizing the mercury in a furnace. After recovering the vaporized mercury by condensation, the air emissions from the furnace may be controlled with a wet scrubber. One plant practices furnace wet air pollution control, and recycles 100 percent of the scrubber liquor. There is no liquid effluent from this process.

CONTROL AND TREATMENT OPTIONS

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

OPTION A

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

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

OPTION C

Option C for the secondary mercury 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 metals, beyond the concentration attainable by gravity sedimentation. The filter suggested is of the gravity, mixed-media type, although other forms of filters, such as rapid sand filters or pressure filters would perform satisfactorily. The addition of filters also provides consistent removal during periods of time in which there are rapid increases in flows or loadings of pollutants to the treatment system.

SECONDARY MERCURY SUBCATEGORY

SECTION VIII

COSTS, ENERGY, AND NONWATER QUALITY ASPECTS

This section presents a summary of compliance costs for the secondary mercury 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 Section XI 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.

As there are no existing direct or indirect dischargers in this subcategory, plant-by-plant compliance cost estimation was not appropriate. Rather, based on analysis of the production sampling data from plants presently in the subcategory, compliance costs for new source model plants were estimated for each of the considered treatment options.

In addition, this section addresses nonwater quality environmental impacts of wastewater treatment and control alternatives, including air pollution, solid wastes, and energy requirements, which are specific to the secondary mercury subcategory.

TREATMENT OPTIONS FOR NEW SOURCES

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

OPTION A

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

OPTION C

Option C for the secondary mercury 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.

COST METHODOLOGY

A detailed discussion of the methodology used to develop the compliance costs is presented in Section VIII of the General Development Document. Projected compliance costs for new source model plants in the secondary mercury subcategory have been determined and are presented in the administrative record supporting this regulation. The costs developed for the proposed regulation are presented in Table VIII-1 for model new sources in the secondary mercury subcategory.

Each of the general assumptions used to develop compliance costs is presented in Section VIII of the General Development Document. Each subcategory contains a unique set of waste streams requiring certain subcategory-specific assumptions to develop compliance costs. Three major assumptions relevant to the cost estimation of new source model plants in the secondary mercury subcategory are discussed briefly below.

(1) Operating hours are assumed to be 2,000 hours per year (8 hrs/day, 250 days/yr).

(2) Treatment of the furnace wet air pollution control wastewater stream is not included in the cost estimate because it is considered a process step in the recovery of mercury from furnace scrubber liquor.

(3) Pollutant concentration data for the two wastewater streams included in the treatment scheme were transferred from the calciner venturi scrubber in the primary mercury 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 secondary mercury 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 new source model plants are estimated at 2,300 kWh/yr for Option A and 3,500 kWh/yr for Option C. Option C energy requirements increase over those for Option A because filtration is being added as an end-of-pipe treatment technology. Both options represent less than one percent of a typical existing plant's energy usage. It is therefore expected that the energy requirements of the treatment options considered will have no significant impact on total plant energy consumption for new sources.

SOLID WASTE

Sludge generated in the secondary mercury subcategory is due to the precipitation of metal hydroxides and carbonates using lime. Sludges associated with the secondary mercury subcategory will necessarily contain quantities of toxic metal pollutants. Wastes generated by secondary metal industries can be regulated as hazardous. However, the Agency examined the solid wastes that would be generated at secondary nonferrous metals manufacturing plants by the suggested treatment technologies and believes they are not hazardous wastes under the Agency's regulations implementing Section 3001 of the Resource Conservation and Recovery Act. None of the secondary mercury wastes are listed specifically as hazardous, nor are they likely to exhibit a characteristic of hazardous waste. This judgment is made based on the recommended technology of lime precipitation and filtration. By the addition of a small excess of lime during treatment, similar sludges, specifically toxic metal-bearing sludges, generated by other industries such as the iron and steel industry passed the Extraction Procedure (EP) toxicity test. See 40 CFR §261.24. Thus, the Agency believes that the wastewater sludges will similarly not be EP toxic if the recommended technology is applied.

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

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

Even if these wastes are not identified as hazardous, they still must be disposed of in compliance with the Subtitle D open dumping standards, implementing 4004 of RCRA. See 44 FR 53438 (September 13, 1979). It is estimated that a new source model plant in the secondary mercury subcategory would generate an estimated 12 kg/yr of sludge when implementing the proposed NSPS treatment technology, based on a production level of 50 metric tons of mercury per year. The Agency has calculated as part of the costs for wastewater treatment the cost of hauling and disposing of solid 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 NEW SOURCE MODEL PLANTS IN THE SECONDARY MERCURY SUBCATEGORY*

(March, 1982 Dollars)

Option	Total Required Capital Cost	Total Annual Cost
A	1,237	3,070
C	3,162	4,530

*Based on production of 50 metric tons of mercury per year.

SECONDARY MERCURY SUBCATEGORY

SECTION IX

BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE

The plants within the secondary mercury subcategory were studied as to their wastewater handling practices and it was determined that on the basis of the plants in the data base, BPT was found to be not applicable to this industrial subcategory. Existing performance of plants in the secondary mercury subcategory is such that no discharge of process wastewater is presently practiced. This is achieved by 100 percent recycle on-site or by contractor disposal of process wastewater, or is a result of a production process that generates no process wastewater. The inappropriateness of effluent limitations, then, leads to the conclusion that BPT and BAT mass limitations, with their corresponding treatment technologies, need not be prepared for this subcategory. Rather, the secondary mercury subcategory will be regulated under New Source Performance Standards in Section XI, and Pretreatment Standards for New Sources in Section XII.

SECONDARY MERCURY SUBCATEGORY

SECTION X

BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE

As described in Section IX, BAT is not applicable to the secondary mercury subcategory because no plants in the data base discharge process wastewater. Regulation of the secondary mercury subcategory is covered in Section XI under New Source Performance Standards, and Section XII under Pretreatment Standards for New Sources.

SECONDARY MERCURY 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 regulated pollutants for NSPS in the secondary mercury subcategory, based on the selected treatment technology.

TECHNICAL APPROACH TO NSPS

New source performance standards are based on the most effective and beneficial technologies currently available. The Agency reviewed and evaluated a wide range of technology options, and elected to examine two technology options, applied to combined wastewater streams, which could be applied to the secondary mercury subcategory as alternatives for the basis of NSPS.

Treatment technologies considered for the NSPS options are summarized below:

OPTION A (Figure XI-1) is based on:

- Chemical precipitation and sedimentation

OPTION C (Figure XI-2) is based on:

- Chemical precipitation and sedimentation
- Multimedia filtration

As explained in Section IV, the secondary mercury subcategory has been subdivided into three 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 three subdivisions.

For each of the subdivisions, a specific approach was followed for the development of NSPS. The first requirement to calculate these limitations is to account for production and flow variability from plant to plant. Therefore, a unit of production or production normalizing parameter (PNP) was determined for each waste stream which could then be related to the flow from the process to determine a production normalized flow. Selection of the PNP for each process element is discussed in Section IV. Each process 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 analyzed to determine which flow was to be used as part of the basis for NSPS. The selected flow (sometimes referred to as a NSPS regulatory flow or NSPS discharge flow) reflects the water use controls which are common practices within the industry. The NSPS normalized flow is based on the average of all applicable data. Nothing was found to indicate that the wastewater flows and characteristics of new plants would not be similar to those from existing plants, since the processes used by new sources are not expected to differ from those used at existing sources.

For the development of effluent limitations, mass loadings were calculated for each wastewater source or subdivision. This calculation was made on a stream-by-stream basis, primarily because plants in this category may perform one or more of the operations in various combinations. The mass loadings (milligrams of pollutant per metric ton of production unit - mg/kkg) were calculated by multiplying the NSPS normalized flow (l/kkg) by the treatability concentration using the NSPS treatment system (mg/l) for each pollutant parameter to be limited under NSPS. 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 NSPS for each plant will be the sum of the individual mass loadings for the various wastewater sources which are found at particular plants. Accordingly, all the wastewater generated within a plant may be combined for treatment in a single or common treatment system, but the effluent limitations for these combined wastewaters are based on the various wastewater sources which actually contribute to the combined flow. This method accounts for the variety of combinations of wastewater sources and production processes which may be found at secondary mercury 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

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

Since there are no existing discharging plants in the secondary mercury subcategory, the pollutant removal analysis was carried out for new source model plants.

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 used to characterize the major waste streams considered for regulation was production normalized for each unit operation (i.e., mass of pollutant generated per mass of product manufactured). This value, referred to as the raw waste, was used to estimate the mass of toxic pollutants generated within the secondary mercury 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 multiplying the raw waste values by the corresponding new source model plant production value for that stream and then summing these values for each pollutant for every stream generated by the plant.

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

The pollutant removal estimates for the new source model plant in the secondary mercury subcategory are presented in Table XI-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 BDT 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 each option are presented in Table XI-2 for new source model plants in the secondary mercury subcategory. These costs were used in assessing economic achievability.

NSPS OPTION SELECTION

EPA is proposing that the best available demonstrated technology for the secondary mercury subcategory be equivalent to Option C (chemical precipitation, sedimentation, and multimedia filtration). This selection is based on an economic analysis of the two NSPS options and their impact on the cost of building new production plants within the scope of this subcategory. We believe the proposed NSPS are economically achievable, and that they are not a barrier to entry of new plants into this subcategory. The estimated capital cost of proposed NSPS for new source model plants is $3,162, and the estimated annual cost is $4,530 (1982 dollars), based on production of 50 metric tons of mercury per year. The end-of-pipe treatment configuration for Option C is presented in Figure XI-2.

WASTEWATER DISCHARGE RATES

A NSPS discharge rate is calculated for each subdivision based on the average of the flows of the existing plants, as determined from analysis of dcp. The discharge rate is used with the achievable treatment concentrations to determine NSPS. Since the discharge rate may be different for each wastewater source, separate production normalized discharge rates for each of the three wastewater sources are discussed below and summarized in Table XI-3. The discharge rates are normalized on a production basis by relating the amount of wastewater generated to the mass of the product which is produced by the process associated with the waste stream in question. These production normalizing parameters, or PNP's, are also listed in Table XI-3.

Section V of this document further describes the discharge flow rates and presents production normalized water use and discharge rates for each plant by subdivision in Tables V-1 through V-3.

SPENT BATTERY ELECTROLYTE

The NSPS wastewater discharge rate for spent battery electrolyte is 106 liters per kkg of mercury produced from batteries. This rate is allocated only for those plants which drain electrolyte from mercuric oxide batteries prior to recovering mercury. Water use and wastewater discharge rates are presented in Table V-1. One plant drains spent battery electrolyte, and generates 106 l/kkg.

ACID WASH AND RINSE WATER

The NSPS wastewater discharge rate for acid wash and rinse water is 2.0 liters per kkg of mercury washed and rinsed. This rate is allocated only for those plants which further purify their mercury product by washing with acid and then rinsing with water. Water use and wastewater discharge rates are presented in Table V-2. One plant further purifies their mercury product in this manner, and generates 2.0 l/kkg.

FURNACE WET AIR POLLUTION CONTROL

No NSPS wastewater discharge rate for furnace wet air pollution control is provided based on 100 percent recycle of furnace scrubber water, as demonstrated at the one plant operating this process. This is shown in Table V-3.

REGULATED POLLUTANT PARAMETERS

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

122. lead
123. mercury
TSS
pH

The Agency has chosen not to regulate all four toxic pollutants selected in Section VI for further consideration.

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.

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. The mass limits established for lead and mercury will ensure that thallium and zinc, the other two toxic metals selected for further consideration, will be adequately removed by a lime and settle unit.

NEW SOURCE PERFORMANCE STANDARDS

The treatable concentrations achievable by application of the proposed NSPS 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 NSPS normalized discharge flows summarized in Table XI-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 NSPS effluent standards and are presented in Table XI-4 for each individual waste stream.

Table XI-1

POLLUTANT REMOVAL ESTIMATES FOR NEW SOURCE MODEL PLANTS*

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	0	0	0	0	0
Arsenic	0.0017	0.0017	0	0.0017	0
Cadmium	0.0002	0.0002	0	0.0002	0
Chromium (Total)	0	0	0	0	0
Copper	0	0	0	0	0
Lead	0.0119	0.0006	0.0112	0.0004	0.0114
Mercury	1.9440	0.0003	1.9437	0.0002	1.9438
Nickel	0	0	0	0	0
Selenium	0	0	0	0	0
Silver	0	0	0	0	0
Thallium	0.0033	0.0027	0.0006	0.0018	0.0015
Zinc	0.0039	0.0018	0.0022	0.0012	0.0027
TOTAL TOXICS	1.9651	0.0074	1.9577	0.0056	1.9594
TSS	0.4320	0.0646	0.3674	0.0140	0.4180
TOTAL CONVENTIONALS	0.4320	0.0646	0.3674	0.0140	0.4180
TOTAL POLLUTANTS	2.3971	0.0720	2.3250	0.0196	2.3774

*Based on production of 50 metric tons mercury per year.

Table XI-2

COST OF COMPLIANCE FOR NEW SOURCE MODEL PLANTS IN THE SECONDARY MERCURY SUBCATEGORY*

(March, 1982 Dollars)

Option	Total Required Capital Cost	Total Annual Cost
A	1,237	3,070
C	3,162	4,530

*Based on production of 50 metric tons of mercury per year.

Table XI-3

NSPS WASTEWATER DISCHARGE RATES FOR THE SECONDARY MERCURY SUBCATEGORY

Wastewater Stream	NSPS Normalized Discharge Rate l/kkg	NSPS Normalized Discharge Rate gal/ton	Production Normalized Parameter
Spent battery electrolyte	106	25.5	mercury produced from batteries
Acid wash and rinse water	2.0	0.5	mercury washed and rinsed
Furnace wet air pollution control	0	0	mercury control processed through furnace

TABLE XI-4

NSPS FOR THE SECONDARY MERCURY SUBCATEGORY

(a) Spent Battery Electrolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury produced from batteries		
Lead	0.030	0.014
Mercury	0.016	0.006
Total suspended solids	1.590	1.272
pH	Within the range of 7.5 to 10.0 at all times	

(b) Acid Wash and Rinse Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury washed and rinsed		
Lead	0.00056	0.00026
Mercury	0.00030	0.00012
Total suspended solids	0.030	0.024
pH	Within the range of 7.5 to 10.0 at all times	

(c) Furnace Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury processed through furnace		
Lead	0.000	0.000
Mercury	0.000	0.000
Total suspended solids	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

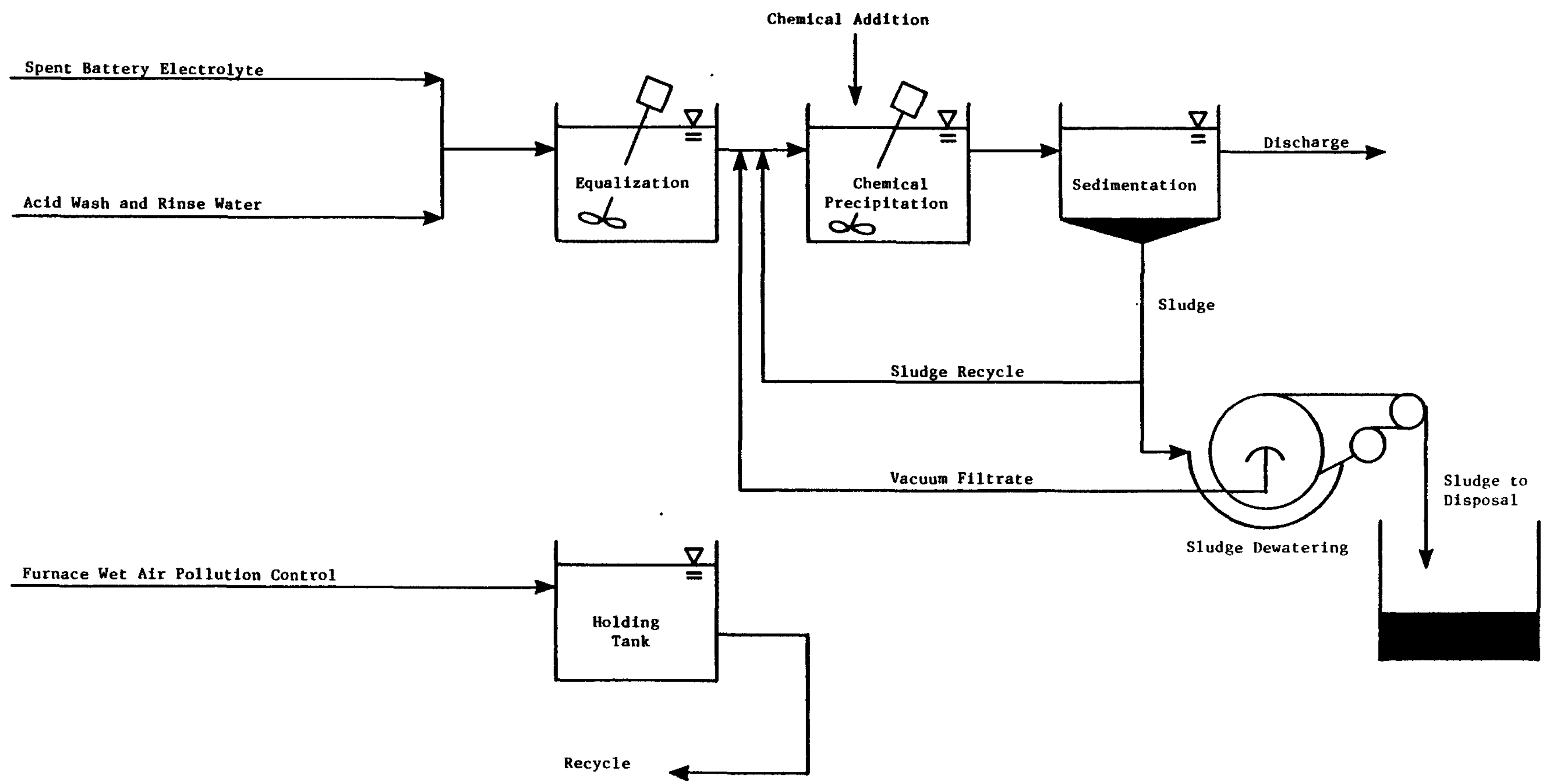

Figure XI-1

NSPS TREATMENT SCHEME FOR OPTION A

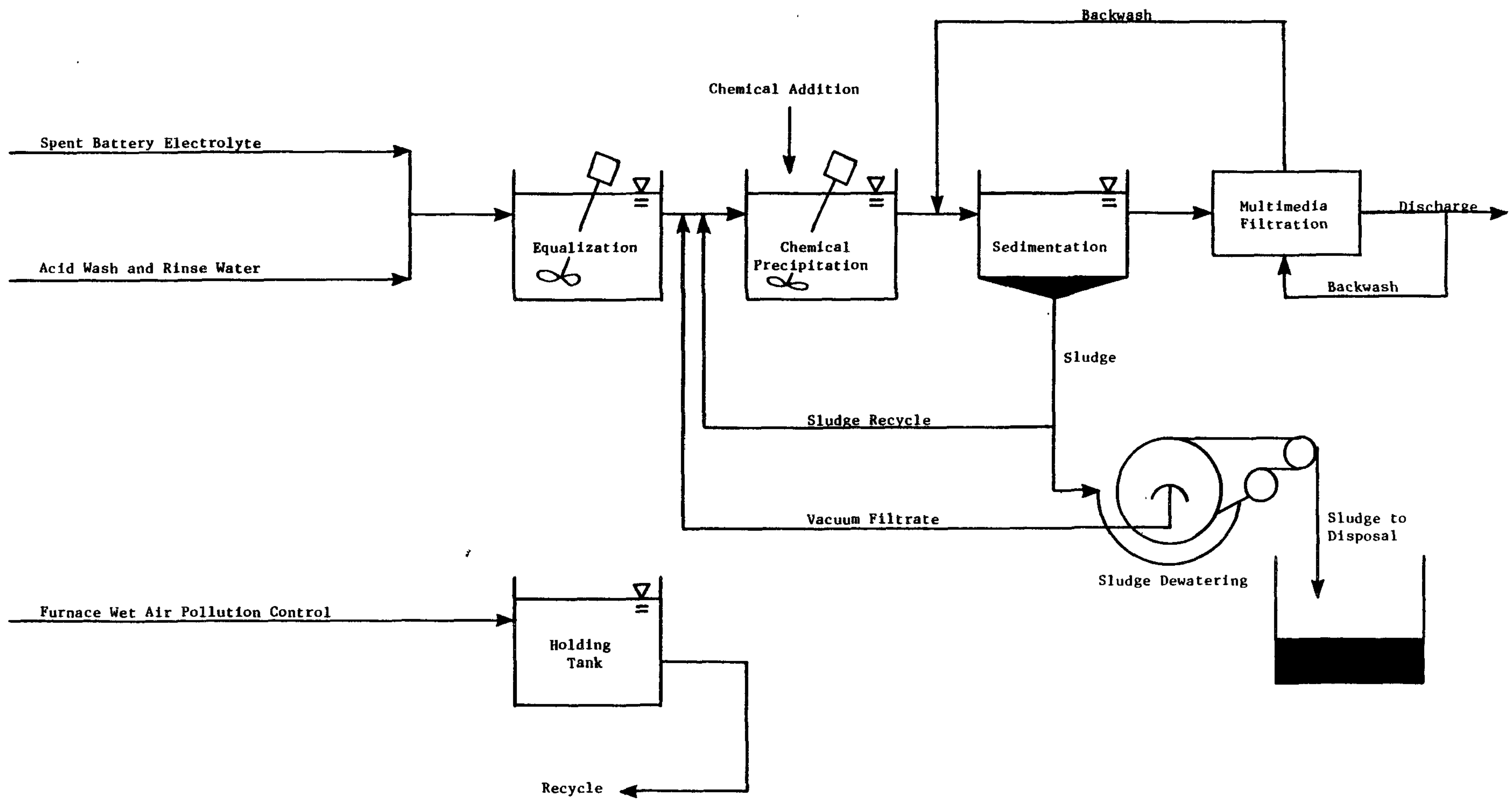

Figure XI-2

NSPS TREATMENT SCHEME FOR OPTION C

SECONDARY MERCURY 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 promulgated NSPS. New indirect discharge facilities, like new direct discharge facilities, have the opportunity to incorporate the best available demonstrated technologies, including process changes, in-plant controls, and end-of-pipe treatment technologies, and to use plant site selection to ensure adequate treatment system installation. Pretreatment standards are to be technology based, analogous to the best available technology for removal of toxic pollutants.

PSES will not be proposed for the secondary mercury subcategory because there are no existing indirect dischargers in this subcategory. However, PSNS for this subcategory will be proposed.

This section describes the control and treatment technologies for pretreatment of process wastewaters from new sources in the secondary mercury 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 Section XI. The options for PSNS, therefore, are the same as the NSPS options discussed in Section XI.

A description of each option is presented in Section XI, 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 treatment technology for pretreatment standards for new sources (PSNS) on the basis that it achieves effective removal of toxic pollutants at a reasonable cost. In addition, filtration is demonstrated in the nonferrous metals manufacturing category at 25 plants, and will not result in adverse economic impacts.

The wastewater discharge rates for PSNS are identical to the NSPS discharge rates for each waste stream. The PSNS discharge rates are shown in Table XII-1. No additional flow reduction measures for PSNS are feasible beyond the flow allowances given for NSPS.

REGULATED POLLUTANT PARAMETERS

The toxic pollutants selected for limitation, in accordance with the rationale of Sections VI and XI, are identical to those selected for limitation for NSPS. It is necessary to propose PSNS to prevent the pass-through of lead and mercury, which are the limited pollutants. The toxic pollutants are removed by a well operated POTW achieving secondary treatment at an average of 59 percent, while PSNS level technology removes approximately 99 percent.

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 XI for NSPS. 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 NSPS are identical to those for PSNS. These concentrations are listed in Table VII-19 of the General Development Document. PSNS are presented in Table XII-2.

Table XII-1

PSNS WASTEWATER DISCHARGE RATES FOR THE SECONDARY MERCURY SUBCATEGORY

Wastewater Stream	PSNS Normalized Discharge Rate l/kkg	PSNS Normalized Discharge Rate gal/ton	Production Normalized Parameter
Spent battery electrolyte	106	25.5	mercury produced from batteries
Acid wash and rinse water	2.0	0.5	mercury washed and rinsed
Furnace wet air pollution control	0	0	mercury control processed through furnace

TABLE XII-2

PSNS FOR THE SECONDARY MERCURY SUBCATEGORY

(a) Spent Battery Electrolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury produced from batteries		
Lead	0.030	0.014
Mercury	0.016	0.006

(b) Acid Wash and Rinse Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury washed and rinsed		
Lead	0.00056	0.00026
Mercury	0.00030	0.00012

(c) Furnace Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of mercury processed through furnace		
Lead	0.000	0.000
Mercury	0.000	0.000

SECONDARY MERCURY SUBCATEGORY

SECTION XIII

BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY

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