Exhibit 6

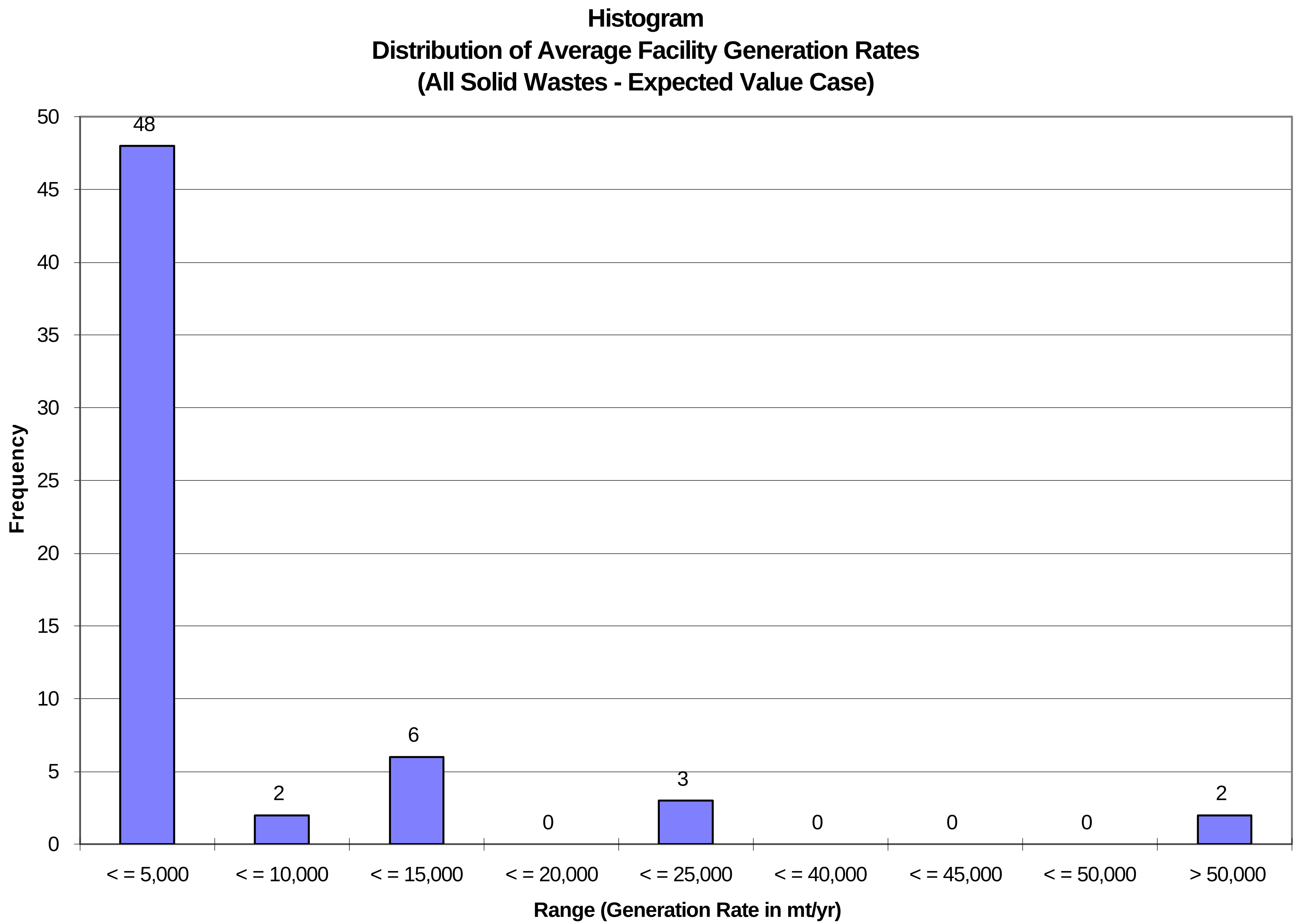

Histogram
Distribution of Average Facility Generation Rates
(All Solid Wastes - Expected Value Case)
Frequency
0
5
10
15
20
25
30
35
40
45
50
48
2
6
0
3
0
0
0
2
< = 5,000
< = 10,000
< = 15,000
< = 20,000
< = 25,000
< = 40,000
< = 45,000
< = 50,000
> 50,000
Range (Generation Rate in mt/yr)

Exhibit 7

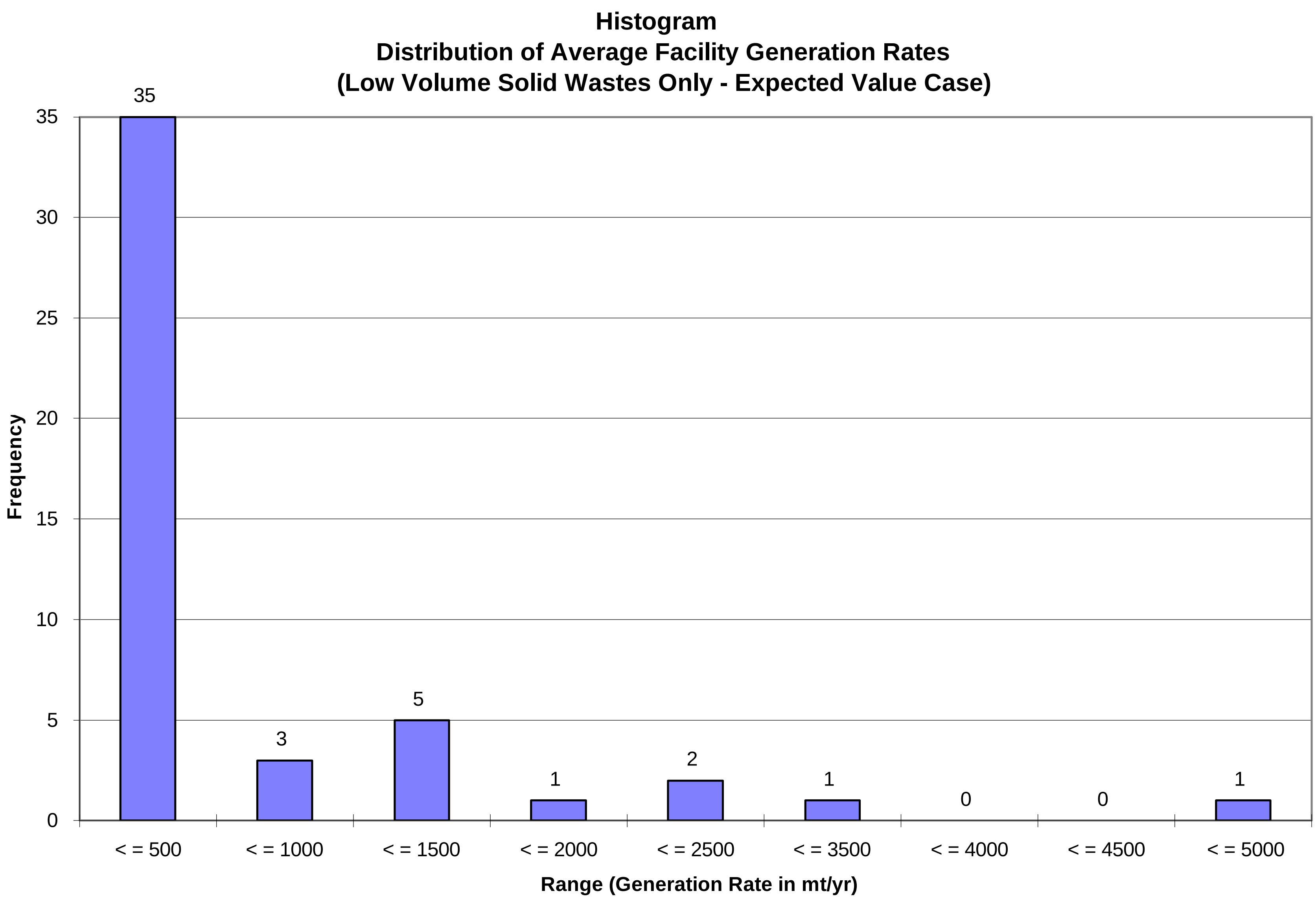

Histogram
Distribution of Average Facility Generation Rates
(Low Volume Solid Wastes Only - Expected Value Case)
Frequency
35
30
25
20
15
10
5
0
35
3
5
1
2
1
0
0
1
< = 500
< = 1000
< = 1500
< = 2000
< = 2500
< = 3500
< = 4000
< = 4500
< = 5000
Range (Generation Rate in mt/yr)

Exhibit 8

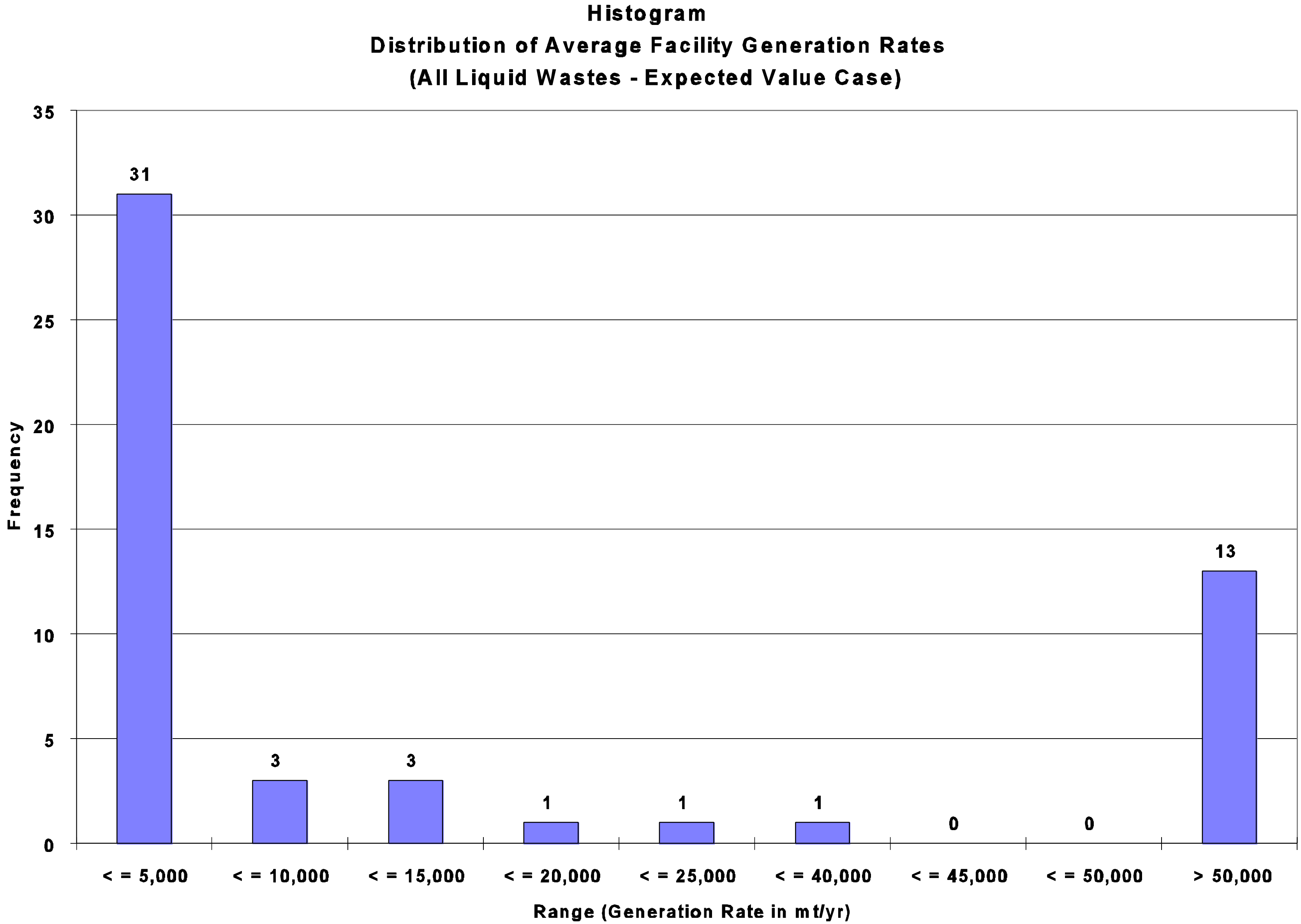
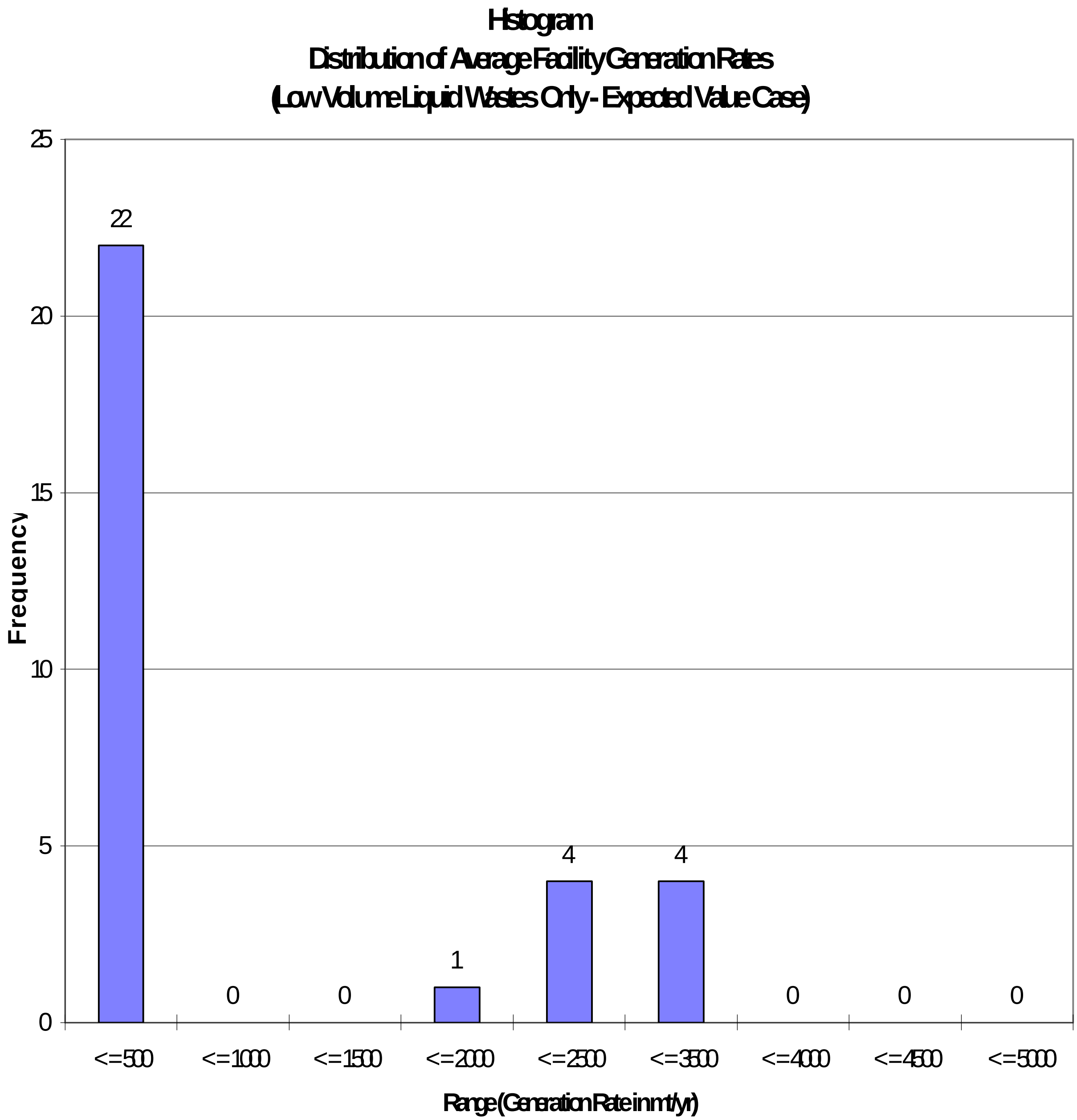

Histogram
Distribution of Average Facility Generation Rates
(All Liquid Wastes - Expected Value Case)
Frequency
0
5
10
15
20
25
30
35
31
3
3
1
1
1
0
0
13
< = 5,000
< = 10,000
< = 15,000
< = 20,000
< = 25,000
< = 40,000
< = 45,000
< = 50,000
> 50,000
Range (Generation Rate in mt/yr)

Exhibit 9

are generated annually by the entire sector. The waste generation rate per facility is greater than 45,000 metric tons/yr due to commingling of numerous waste streams. The Newly identified mineral



processing Waste Characterization Data Set contains data indicating that this waste stream may exhibit a hazardous characteristic. The lead waste stream may exhibit the characteristic of toxicity (cadmium and lead). The waste stream is fully recycled and is classified as a sludge.

In April 1991, SAIC conducted a study that contains data on samples of clarifier underflow and filter press solids collected from the wastewater treatment system (WWTP-1) at Doe Run's Herculaneum, Missouri facility. The clarifier underflow sample, which is derived from plant washdown and acid plant blowdown, exhibited the toxicity characteristic for cadmium (8.51 mg/L).

The filter press solids, which are derived from thickened clarifier underflow and sinter plant blowdown, exhibited the toxicity characteristic for lead (185 mg/L) and cadmium (98.8 mg/L). The Doe Run samples were not analyzed for any organic compounds. (SAIC, 1991b, pp. 13, 15)

Zinc - Process Wastewater

Process wastewater is generated at all four of the operating zinc processing plants. Approximately 6.6 million metric tons of process wastewater are generated annually at the four U.S. primary zinc facilities. (EPA, August 1992) (The excessive generation rate for this wastewater [i.e., greater than one million metric tons/yr] is due to commingling of numerous wastestreams.) Zinc process wastewater may be recycled and may exhibit the characteristic of toxicity for arsenic, cadmium, chromium, lead, selenium, and silver. It may also exhibit the corrosivity characteristic. The waste is classified as a spent material. At ZCA's electrolytic refinery in Bartlesville, Oklahoma process wastewaters consist of small streams from the roasting, purification, electrowinning, and zinc secondaries processes. Process wastewater and plant runoff collect in two large, clay-lined surface impoundments and are pumped to the wastewater treatment plant for neutralization. At ZCA's Monaca, Pennsylvania smelter, wastewaters include plant runoff as well as process wastewater from the blue powder impoundments and the zinc sulfate circuit. These wastewaters collect in a lined equalization basin and are treated in a two-stage neutralization process.

Comparison with Similar Listed Wastes

This section compares the volumes, toxicities, and management of mineral processing secondary materials with several similar industrial wastes currently regulated under RCRA. The purpose of this comparison is to demonstrate the similarity between mineral processing secondary materials and RCRA Subtitle C hazardous waste.

Generation Rates

Many mineral processing waste streams are generated in quantities similar to other industrial wastes that are managed in tanks, containers, and buildings. To compare generation rates, EPA identified 8 listed waste streams that are similar to mineral processing wastes, or are generated by industries similar to the primary mineral processing industry. Generation rates for each of these waste streams were obtained from the Biennial Reporting System (BRS). An average generation rate for each of the listed wastes was then calculated by dividing total waste generated by the number of facilities that reported the waste stream in BRS. These average rates are presented in Exhibit 10.[3] Exhibit 11 compares the generation rates of the solid listed wastes in Exhibit 10 (F006, F019, K060, K061, K069, K088, and K141) with all of the solid newly identified mineral processing wastes. Exhibit 12 provides

---

[3] BRS data include information on wastes managed at commercial treatment, storage, and disposal facilities (TSDFs), as well as generators. Prior to calculating average facility generation rates, ICF deleted from the BRS data any entries for known commercial TSDFs (e.g., Chemical Waste Management, USCPI, Clean Harbors, etc.)

more detail on the lower volume (i.e., less than 5,000 mt/yr) mineral processing wastes. Exhibit 13 compares the generation rates of the liquid listed wastes in Exhibit 10 (K062) with all of the liquid newly identified mineral processing wastes.

It is evident from Exhibits 11 through 13 that the 14 listed waste streams often are generated at higher rates than wastes generated in the mineral processing industry. For example, K069 (Emission control dust/sludge from secondary lead smelting) has the smallest average generation rate (710 mt/yr) of the solid listed wastes outlined in Exhibit 10. However, this generation rate is still larger than average generation rates for 35 of the 61 newly identified solid waste streams in the analysis. Twenty-one of the newly identified solid wastes are generated in quantities similar to the average generation rates of the solid listed wastes in Exhibit 10, while only five waste streams are generated in larger quantities. Only two of those five waste streams (lead WWTP sludges/solids and titanium WWTP sludges/solids) are generated in sufficient quantities to be above the high-volume threshold for Bevill status (45,000 mt/yr for solid wastes). K062 (spent pickle liquor generated by steel finishing operations), has the smallest average generation rate (31,335 mt/yr) of the liquid listed wastes in Exhibit 10. This generation rate is greater than 39 of the 53 newly identified liquid waste streams in the analysis. One of the 53 liquid wastes is generated in quantities similar to the average generation rates of the liquid wastes in Exhibit 10, and thirteen liquid wastes are generated in larger quantities than the liquid listed wastes. Only one newly identified liquid waste stream, zinc process wastewater, is generated in sufficient quantity to be above the high volume threshold of the analysis (1,000,000 mt/yr for liquid wastes).

Toxicities

Many of the newly identified mineral processing waste streams pose threats similar to those posed by RCRA listed wastes. Of the current 118 newly identified waste streams in the analysis, 23 are known to be hazardous, and the rest are suspected to be hazardous. Exhibit 14 summarizes the TC metal and corrosivity characteristic data for these 23 waste streams. This exhibit lists each known hazardous waste stream, the metals for which it fails TC levels, and the pH level if the waste is corrosive.

Using the RCRA Subtitle C "Identification and Listing of Hazardous Waste" Background Document (hereafter referred to as the listing background document) as a source, EPA identified leachate or total constituent concentration data for seven listed wastes. The listing background document, however, provided concentration data for only three of the eight TC metals: chromium, cadmium, and lead. In addition, some of the leachate results presented in the listing background document were obtained using water extraction tests rather than the EP test. Although water extraction tests and the EP test will not likely produce the same leachate concentration due to the difference in leaching agents (distilled water vs. acetic acid), water extraction data can be compared to EP data because:

> "wastes may leach harmful concentrations of lead, cadmium, and hexavalent chromium even under relatively mild environmental conditions. If these wastes are exposed to more acidic disposal environments, for example disposal environments subject to acid rainfall, these metals would most likely be

solubilized to a considerable extent, since lead, and cadmium (including their oxides), as well as most chromium compounds, are more soluble in acid than in distilled water."[4]

Exhibit 15 presents a summary of the toxicity characteristic data for the seven listed wastes identified from the listing background document.

In order to easily compare the listed waste leachate concentrations with the leachate concentrations of the newly identified mineral processing wastes, a combined mean and maximum range of chromium, cadmium, and lead concentrations for the seven listed wastes were calculated using the data in Exhibit 15. The mean leachate concentrations for chromium, cadmium, and lead range from 6.03 mg/l to 273.23 mg/l, <0.01 mg/l to 117.5 mg/l, and 1.47 mg/l to 259.83 mg/l, respectively. Likewise, the maximum leachate concentrations for chromium, cadmium, and lead range from 12 mg/l to 4250 mg/l, <0.01 mg/l to 268 mg/l, and 2.10 mg/l to 1550 mg/l, respectively. Exhibit 16 presents a comparison of the ranges in constituent concentrations exhibited by the listed wastes and the newly identified mineral processing wastes. As can be seen in Exhibit 16, 15 of the 23 mineral processing wastes exhibit leachate concentrations of chromium, cadmium, and lead at levels that are equal to or greater than those levels exhibited by the seven listed wastes summarized in Exhibit 15. These fifteen mineral processing wastes, arranged in alphabetical order, are as follows:

- Aluminum Cast House Dust;
- Copper Acid Plant Blowdown;
- Elemental Phosphorous AFM Rinsate;
- Elemental Phosphorous Furnace Scrubber Blowdown;
- Lead Baghouse Incinerator Ash;
- Lead Slurried APC Dust;
- Lead Spent Furnace Brick;
- Lead Stockpile Miscellaneous Plant Waste;
- Rare Earths Process Wastewater;
- Selenium Plant Process Wastewater;
- Titanium and Titanium Dioxide Waste Acids (Sulfate Process);
- Zinc Acid Plant Blowdown;
- Zinc Process Wastewater;
- Zinc Spent Goethite and Leach Cake Residues; and
- Zinc Spent Synthetic Gypsum.

A comparison of the remaining eight newly identified mineral processing waste streams could not be made because the listing background document did not provide data

---

[4] U.S. Environmental Protection Agency, Office of Solid Waste. *Background Document, Resource Conservation and Recovery Act, Subtitle C - Identification and Listing of Hazardous Waste*, Washington D.C., 1980.

for arsenic, barium, mercury, selenium, silver, or pH. However, it is important to note that at least one sample from each of these waste streams exhibits the RCRA characteristics of a hazardous waste (i.e., exceeds the TC or the characteristic for corrosivity).

Conclusions

Based on the comments received and further evaluation of new data, the Agency has found the volumes of hazardous secondary materials from mineral processing to be much lower than earlier believed. Additional Agency analyses also suggest that mineral processing wastes contain concentrations of contaminants similar to those found in RCRA listed wastes. Because the newly identified mineral processing wastes exhibit characteristics that are similar to other RCRA listed metal-bearing waste streams, the Agency believes that the newly identified mineral processing wastes should be subject to the same storage requirements (and prohibitions) faced by all other RCRA hazardous wastes (listed and characteristic). These requirements are described briefly below.

As stipulated in 40 CFR §262.34(a), generators of RCRA hazardous wastes (listed and characteristic) may accumulate hazardous waste on-site for 90 days or less without a permit or without having interim status, provided that the waste is placed:

(I) In containers and the generator complies with subpart I of 40 CFR part 265; and/or

(ii) In tanks and the generator complies with subpart J of 40 CFR part 265, except §265.197© and §265.200; and/or

(iii) On drip pads and the generator complies with subpart W of part 265 and maintains the following records at the facility...

(iv) The waste is placed in containment buildings and the generator complies with subpart DD of 40 CFR part 265...

RCRA hazardous wastes (listed and characteristic) that are stored in excess of 90 days (unless an extension is granted) must be stored in Part B permitted storage units that meet minimum technical construction requirements. Furthermore, as stipulated in 40 CFR §268.50, the land-based storage of wastes that exhibit concentrations of hazardous constituents in excess of the treatment standards set under the Land Disposal Restrictions program, is prohibited

Exhibit 10. Average Facility Generation of Listed Wastes

Waste Number	Waste Description	Average Generation (Metric Tons/Year)
F006	Wastewater treatment sludges from electroplating operations	3,528
F019	Wastewater treatment sludges from the aluminum coating	3,207
K060	Ammonia still lime sludge from coking operations	17,978
K061	Emission control dust/sludg e from the primary production of steel in electric furnaces	13,975
K062	Spent pickle liquor generated by steel finishing operations	31,335
K069	Emission control dust/sludge from secondary lead smelting	710
K088	Spent potliners from primary aluminum reduction	4,613
K141	Process residues from the recovery of coal tar, including, but not limited to, collecting sump residues from the production of coke from coal or th e recovery of coke by-products produced form coal. This listing does no t include K087 (decanter tank	4,221

Exhibit 11

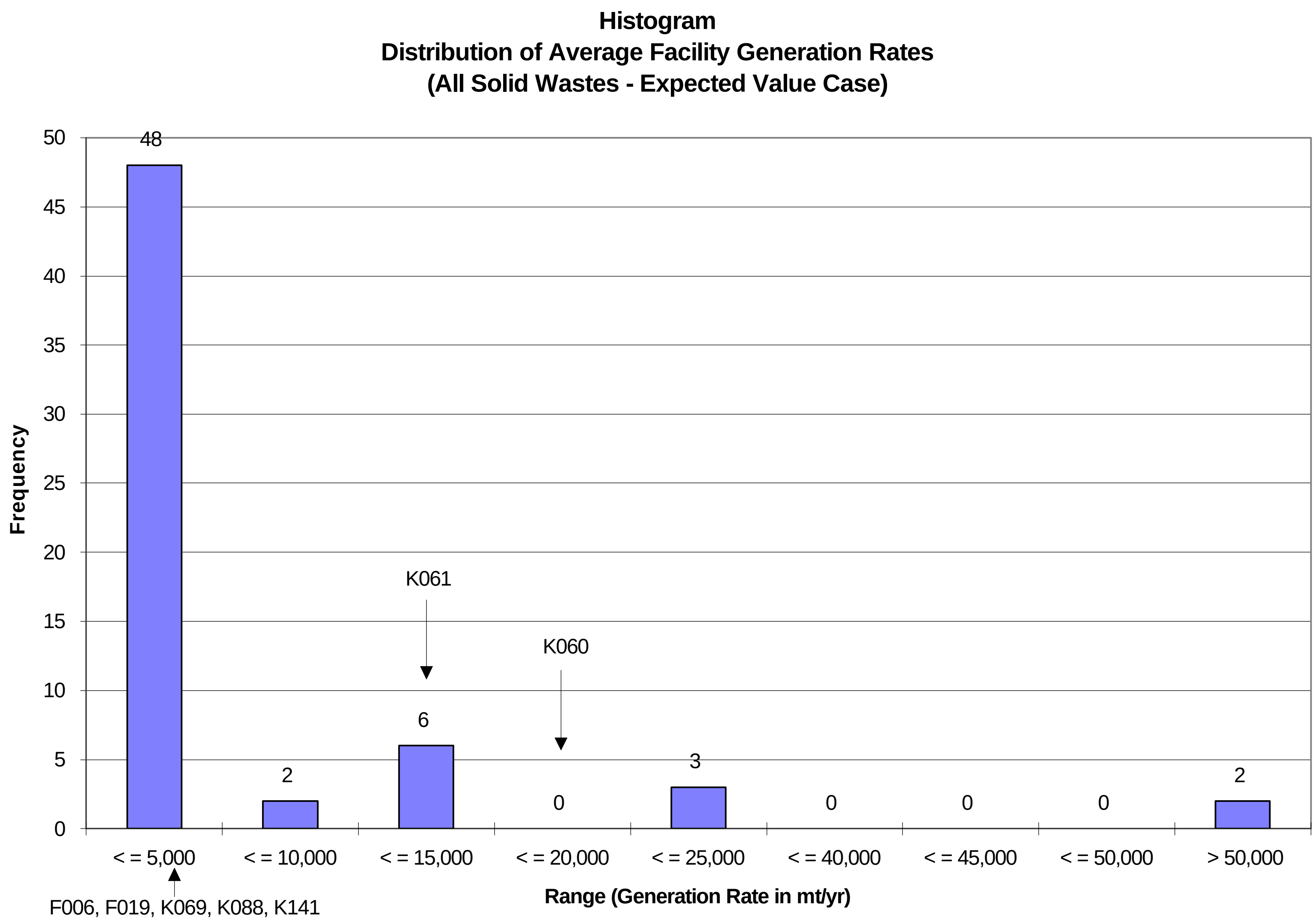

Histogram
Distribution of Average Facility Generation Rates
(All Solid Wastes - Expected Value Case)
Frequency
50
45
40
35
30
25
20
15
10
5
0
48
2
6
0
3
0
0
0
2
K061
K060
< = 5,000
< = 10,000
< = 15,000
< = 20,000
< = 25,000
< = 40,000
< = 45,000
< = 50,000
> 50,000
F006, F019, K069, K088, K141
Range (Generation Rate in mt/yr)

Exhibit 12

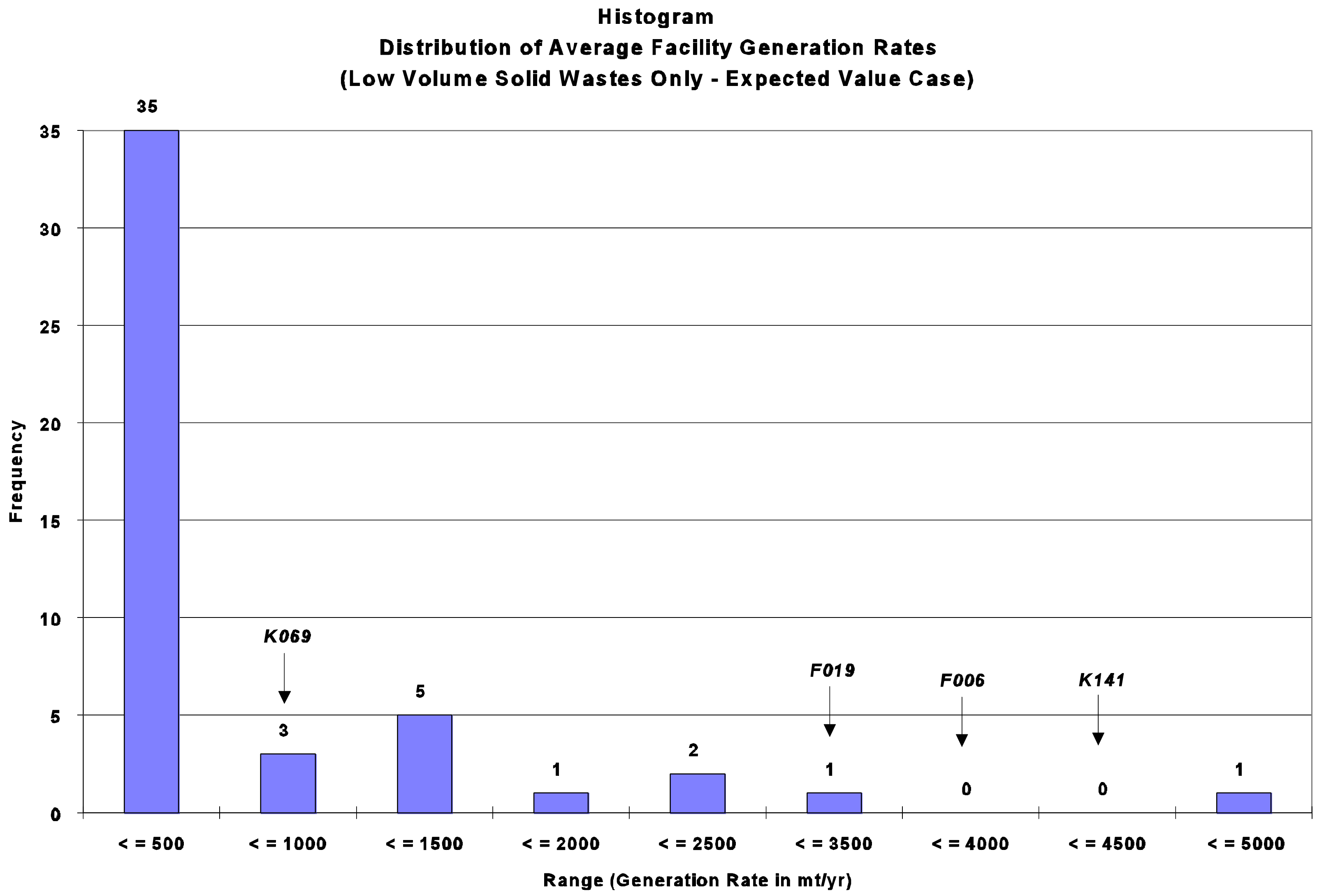

Histogram
Distribution of Average Facility Generation Rates
(Low Volume Solid Wastes Only - Expected Value Case)
Frequency
0
5
10
15
20
25
30
35
35
K069
3
5
1
2
F019
1
F006
0
K141
0
1
< = 500
< = 1000
< = 1500
< = 2000
< = 2500
< = 3500
< = 4000
< = 4500
< = 5000
Range (Generation Rate in mt/yr)

Exhibit 13

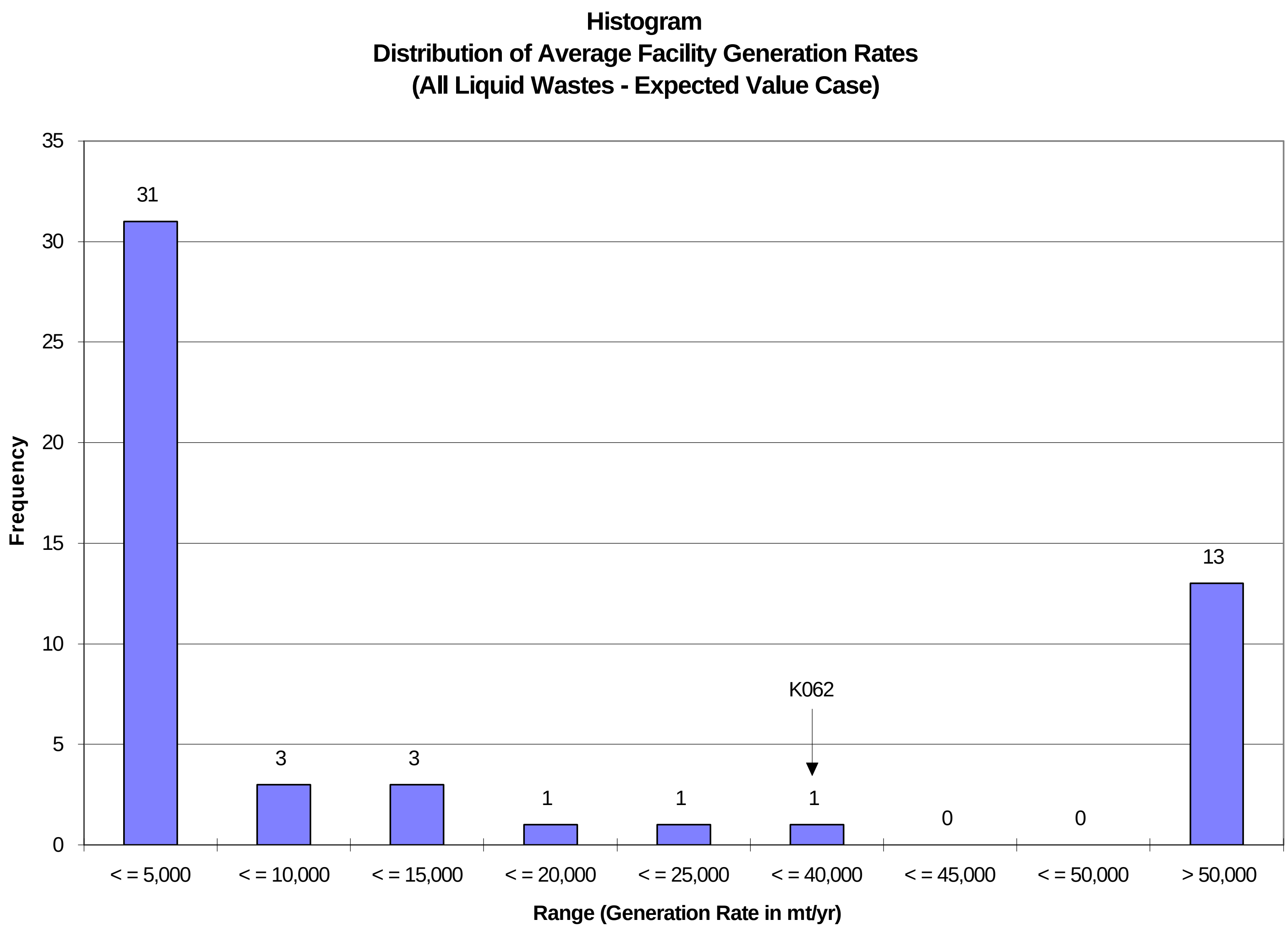

Histogram
Distribution of Average Facility Generation Rates
(All Liquid Wastes - Expected Value Case)
Frequency
35
30
25
20
15
10
5
0
31
3
3
1
1
1
0
0
13
K062
< = 5,000
< = 10,000
< = 15,000
< = 20,000
< = 25,000
< = 40,000
< = 45,000
< = 50,000
> 50,000
Range (Generation Rate in mt/yr)

EXHIBIT 14. SUMMARY OF EP ANALYSIS RESULTS FOR MINERAL PROCESSING WASTE

Sector/Waste Stream	Constituent	TC Limits (mg/l)	Min	Mean	Max	Number of Samples	Number of detects	Number above TC
Aluminum Cast House Dust	Cadmium	1	3.5	3.5	3.5	1	1	1
	Mercury	0.2	0.84	0.84	0.84	1	1	1
Coal Gas MEE Concentrate	Arsenic	5	3	16	29		2	1
	Selenium	1	15	30	44		2	2
Copper Acid Plant Blowdown	Arsenic	5	0.04	884.35	12800	15	12	10
	Cadmium	1	0.05	4.28	24.5	15	14	9
	Chromium	5	0	0.41	5	15	11	1
	Lead	5	0.04	2.83	6.74	15	13	3
	Mercury	0.2	0.0001	0.042	0.31	15	8	2
	Selenium	1	0.01	1.21	7.63	15	11	3
	Silver	5	0.01	0.41	5	15	6	1
	pH	2<pH>12	0.99	2.21	5	17	17	10
Elemental Phosphorous AFM Rinsate	Cadmium	1	4.12	4.12	4.12	1	1	1
	Selenium	1	1.03	1.03	1.03	1	1	1
Elemental Phosphorous Furnace Scrubber Blowdown	Cadmium	1	0.005	0.4	2.07	7	4	2
Lead Baghouse Incinerator Ash	Cadmium	1	5.76	5.76	5.76		1	1
	Lead	5	19.2	19.2	19.2		1	1
Lead Slurried APC Dust	Cadmium	1	22	22	22		1	1

EXHIBIT 14. SUMMARY OF EP ANALYSIS RESULTS FOR MINERAL PROCESSING WASTE

Sector/Waste Stream	Constituent	TC Limits (mg/l)	Min	Mean	Max	Number of Samples	Number of detects	Number above TC
	Lead	5	959	959	959		1	1
Lead Spent Furnace Brick	Lead	5	63.3	647	1230		2	2
Lead Stockpile Miscellaneous Plant Waste	Cadmium	1	29.4	29.4	29.4		1	1
	Lead	5	1380	1380	1380		1	1
Lead WWTP Liquid Effluent	pH	2<pH>12	7	9.08	13	4	4	1
Lead WWTP Sludges/Solids	pH	2<pH>12	7.5	9.06	13	5	5	1
Magnesium & Magnesia Smut	Barium	100	14.9	81.95	149	2	2	1
Rare Earths Spent Ammonium Nitrate Processing Solution	pH	2<pH>12	0.1	7.07	9.59	9	9	1
Rare Earths Process Wastewater	Lead	5	0.63	5.31	10	2	2	1
Selenium Plant Process Wastewater	Lead	5	12	12	12	1	1	1
	pH	2<pH>12	0.8	1.35	1.9	2	2	2
Tantalum Process Wastewater	pH	2<pH>12	3	8.4	12	5	5	2
Titanium and Titanium Dioxide Waste Acids (Sulfate Process)	Arsenic	5	0.01	1.33	5	5	1	1
	Chromium	5	0.08	31.12	83	5	4	3
	Selenium	1	0.1	1.21	5	5	0	1

EXHIBIT 14. SUMMARY OF EP ANALYSIS RESULTS FOR MINERAL PROCESSING WASTE

Sector/Waste Stream	Constituent	TC Limits (mg/l)	Min	Mean	Max	Number of Samples	Number of detects	Number above TC
	Silver	5	0.005	1.12	5	5	0	1
	pH	2<pH>12	0	0.33	1	3	3	3
Titanium and Titanium Dioxide Leach Liquor & Sponge Wash Water	pH	2<pH>12	0	0.5	1	2	2	2
Zinc Acid Plant Blowdown	Arsenic	5	1.1	2.12	5	4	3	1
	Cadmium	1	0.83	8.58	19	4	4	2
	Chromium	5	0.03	1.81	5	4	2	1
	Selenium	1	0.055	1.69	5	4	2	2
	Silver	5	1.53	0.015	5	4	1	1
	pH	2<pH>12	0.5	1.67	3.4	8	8	8
Zinc Process Wastewater	Arsenic	5	0.02	1.59	10	10	2	1
	Cadmium	1	0.023	123	589	10	10	6
	Chromium	5	0.005	1.13	10	10	1	1
	Lead	5	0.025	1.27	5	10	6	1
	Selenium	1	0.0025	1.13	10	10	0	1
	Silver	5	0.0015	1.13	10	10	0	1
	pH	2<pH>12	1	5.64	10.5	24	24	4
Zinc Spent Goethite & Leach Cake Residues	Arsenic	5	0.014	2.51	5	2	1	1
	Cadmium	1	6.68	7.82	8.96	2	2	2
	Chromium	5	0.001	2.5	5	2	0	1
	Selenium	1	0.001	2.5	5	2	0	1
	Silver	5	0.015	2.51	5	2	0	1
Zinc Spent Surface Impoundment Liquids	pH	2<pH>12	2	6.02	10	23	23	3

EXHIBIT 14. SUMMARY OF EP ANALYSIS RESULTS FOR MINERAL PROCESSIN

Sector/Waste Stream	Constituent	TC Limits (mg/l)	Min	Mean	Max	I
Zinc Spent Synthetic Gypsum	Cadmium	1	0.52	5.81	11.1	2

Note: Gray shading indicates detection limit may have been equal to or higher than TC limit.

Exhibit 15
Listed Waste Leachate Concentration Data
(Source: EPA Listing Background Document)

Listed Waste	Constituent	TC Limits (mg/l)	Min	Mean	Max
F006[1]	Chromium	5	<0.01	45.42	400
	Cadmium	1	<0.01	67.07	268
	Lead	5	-	-	-
K061[1]	Chromium	5	<0.1	273.23	1248
	Cadmium	1	0.05	4.74	13.4
	Lead	5	<0.2	6.32	36.7
K062[2]	Chromium	5	2	1314	4250
	Cadmium	1	-	-	-
	Lead	5	-	259.83	1550
K064[3]	Chromium	5	-	-	-
	Cadmium	1	8.4	8.4	8.4
	Lead	5	7.8	7.8	7.8
K065[2]	Chromium	5	-	-	-
	Cadmium	1	11	11	11
	Lead	5	4.5	4.5	4.5
K066	Chromium	5	-	-	-
	Cadmium	1	<0.01	<0.01	<0.01
	Lead	5	1.0	1.47	2.10
K069	Chromium	5	0.05	6.03	12
	Cadmium	1	5	117.5	230
	Lead	5	2.5	13.25	24

[1] Incorporates both EP and water test data.
[2] This listed waste is a liquid; therefore, total concentration data is presented.
[3] Based on one data point.

PROCESSING WASTE

Average Facility Waste Generation Rates (mt/yr)

Liquid Wastes

Average Facility Waste Generation Rates (mt/yr)

Solid Wastes

Commodity	Waste Stream	Expected	Maximum
Titanium			
Bismuth			

Sector/Waste Stream	Constituent	TC Limits	Min	Mean	Max	Number of Samples	Number of detects	Number above TC