TABLE 8-4
RAW WASTEWATER POLLUTANT LOADINGS

FRACTION : PESTICIDES/HERBICIDES

| PARAMETER | UNITS | A | B | C | D | FLOW WEIGHTED MEAN CONC. | INDUSTRY LOADING (POUNDS/DAY) |
|---|---|---|---|---|---|---|---|
| PLANT NO. | | A | B | C | D | | |
| EPISODE NO. | | 1128 | 1130 | 1133 | 1179 | | |
| SAMPLE POINT | | RAW WASTEWTR | RAW WASTEWTR | RAW WASTEWTR | RAW WASTEWTR | | |
| FLOW | | 14700 | 2700 | 300 | 15000 | | |
| DICAMBA | UG/L | 5 | 5 | 5 | 5 | 5 | 0 |
| DICHLORAN | UG/L | 100 | 50 | 50 | 175 | 130 | 1 |
| DICHLOROFENTHION | UG/L | 1000 | 100 | 100 | 400 | 642 | 4 |
| DICHLORPROP | UG/L | 5 | 5 | 5 | 5 | 5 | 0 |
| DICHLOVOS | UG/L | 500 | 50 | 50 | 200 | 321 | 2 |
| DICOFOL | UG/L | 1000 | 50 | 50 | 175 | 534 | 3 |
| DICROTOPHOS | UG/L | 0 | 100 | 100 | 400 | 193 | 1 |
| DIELDREN | UG/L | 10 | 0.5 | 0.5 | 2 | 5 | 0 |
| DIMETHOATE | UG/L | 2000 | 200 | 200 | 567 | 1177 | 7 |
| DINOSEB | UG/L | 5 | 5 | 5 | 5 | 5 | 0 |
| DIOXATHION | UG/L | 2000 | 200 | 200 | 800 | 1284 | 8 |
| DISULFOTON | UG/L | 500 | 50 | 50 | 200 | 321 | 2 |
| ENDOSULFAN I | UG/L | 8 | 0.4 | 0.4 | 149 | 72 | 0 |
| ENDOSULFAN II | UG/L | 100 | 0.5 | 0.5 | 2 | 46 | 0 |
| ENDOSULFAN SULFATE | UG/L | 100 | 0.5 | 0.5 | 264 | 166 | 1 |
| ENDRIN | UG/L | 100 | 0.5 | 0.5 | 2 | 46 | 0 |
| ENDRIN ALDEHYDE | UG/L | 100 | 0.5 | 0.5 | 2 | 46 | 0 |
| ENDRIN KETONE | UG/L | 16 | 0.8 | 0.8 | 3 | 9 | 0 |
| EPN | UG/L | 500 | 50 | 50 | 200 | 321 | 2 |
| ETHION | UG/L | 500 | 50 | 50 | 200 | 321 | 2 |
| ETHOPROP | UG/L | 500 | 50 | 50 | 200 | 321 | 2 |
| ETRIDAZONE | UG/L | 1000 | 50 | 50 | 251 | 569 | 4 |
| FAMPHUR | UG/L | 1000 | 100 | 100 | 400 | 642 | 4 |
| FENSULFOTHION | UG/L | 2000 | 200 | 200 | 6295 | 3805 | 24 |
| FENTHION | UG/L | 500 | 50 | 50 | 200 | 321 | 2 |
| HEPTACHLOR | UG/L | 4 | 0.2 | 0.2 | 142 | 67 | 0 |
| HEPTACHLOR EPOXIDE | UG/L | 4 | 0.2 | 0.2 | 1 | 2 | 0 |
| HEXACHLOROBENZENE | UG/L | 200 | 10 | 10 | 35 | 107 | 1 |
| HMPA | UG/L | 1500 | 150 | 150 | 600 | 963 | 6 |
| ISODRIN | UG/L | 1000 | 50 | 50 | 175 | 534 | 3 |
| KEPONE | UG/L | 5000 | 250 | 250 | 875 | 2672 | 17 |
| LEPTOPHOS | UG/L | 1000 | 100 | 100 | 2518 | 1614 | 10 |
| MALATHION | UG/L | 1000 | 100 | 100 | 400 | 642 | 4 |
| MCPA | UG/L | 5 | 5 | 5 | 5 | 5 | 0 |
| MCPP | UG/L | 5 | 5 | 5 | 5 | 5 | 0 |
| MERPHOS | UG/L | 500 | 50 | 50 | 200 | 321 | 2 |
| METHOXYCHLOR | UG/L | 20 | 1 | 1 | 3 | 11 | 0 |

NOTE: MG/L = MILLIGRAMS PER LITER
UG/L = MICROGRAMS PER LITER
PPT = PARTS PER TRILLION
MEAN = FLOW WEIGHTED MEAN
INDUSTRY LOADING = MEAN (MG/L) * 0.75 MGD * 8.345 or
(MEAN (UG/L) * 0.75 MGD * 8.345)/1000

TABLE 8-4 (CONTINUED)
RAW WASTEWATER POLLUTANT LOADINGS

FRACTION : PESTICIDES/HERBICIDES

| PARAMETER | UNITS | A | B | C | D | FLOW WEIGHTED MEAN CONC. | INDUSTRY LOADING (POUNDS/DAY) |
|---|---|---|---|---|---|---|---|
| PLANT NO. | | A | B | C | D | | |
| EPISODE NO. | | 1128 | 1130 | 1133 | 1179 | | |
| SAMPLE POINT | | RAW WASTEWTR | RAW WASTEWTR | RAW WASTEWTR | RAW WASTEWTR | | |
| FLOW | | 14700 | 2700 | 300 | 15000 | | |
| 2,3,5-TP | UG/L | 5 | 5 | 5 | 5 | 5 | 0 |
| 2,4,5-T | UG/L | 5 | 5 | 5 | 5 | 5 | 0 |
| 2,4-D | UG/L | 5 | 5 | 5 | 5 | 5 | 0 |
| 2,4-DB | UG/L | 5 | 5 | 5 | 5 | 5 | 0 |
| ALDRIN | UG/L | 4 | 0.2 | 0.2 | 1 | 2 | 0 |
| AROCHLOR 1016 | UG/L | 100 | 5 | 5 | 17 | 53 | 0 |
| AROCHLOR 1221 | UG/L | 100 | 5 | 5 | 17 | 53 | 0 |
| AROCHLOR 1242 | UG/L | 100 | 5 | 5 | 17 | 53 | 0 |
| AROCHLOR 1254 | UG/L | 100 | 5 | 5 | 17 | 53 | 0 |
| AROCHLOR 1260 | UG/L | 4 | 5 | 5 | 17 | 10 | 0 |
| AZINPHOS ETHYL | UG/L | 1000 | 100 | 100 | 1787 | 1278 | 8 |
| AZINPHOS METHYL | UG/L | 1500 | 150 | 150 | 5043 | 3001 | 19 |
| BHC, ALPHA | UG/L | 4 | 0.2 | 0.2 | 1 | 2 | 0 |
| BHC, BETA | UG/L | 4 | 0.2 | 0.2 | 1 | 2 | 0 |
| BHC, DELTA | UG/L | 4 | 0.2 | 0.2 | 1 | 2 | 0 |
| BHC, GAMMA | UG/L | 4 | 0.2 | 0.2 | 1 | 2 | 0 |
| BOLSTAR | UG/L | 500 | 50 | 50 | 200 | 321 | 2 |
| CAPTAN | UG/L | 1000 | 50 | 50 | 175 | 534 | 3 |
| CAPTOFOL | UG/L | 5000 | 250 | 250 | 875 | 2672 | 17 |
| CARBOPHENTHION | UG/L | 750 | 50 | 50 | 190 | 429 | 3 |
| CHIORDANE | UG/L | 25 | 1.25 | 1.25 | 4 | 13 | 0 |
| CHLORFENVINPHOS | UG/L | 1000 | 100 | 100 | 400 | 642 | 4 |
| CHLOROBENZYLATE | UG/L | 2500 | 125 | 125 | 438 | 1336 | 8 |
| CHLORONEB | UG/L | 5000 | 250 | 250 | 875 | 2672 | 17 |
| CHLOROPROPYLATE | UG/L | 1000 | 50 | 50 | 175 | 534 | 3 |
| CHLORPYROPHOS | UG/L | 1500 | 150 | 150 | 600 | 963 | 6 |
| CHLORPYROPHOS, METHYL | UG/L | 500 | 50 | 50 | 200 | 321 | 2 |
| COUMOPHOS | UG/L | 2000 | 200 | 200 | 800 | 1284 | 8 |
| CROTOXYPHOS | UG/L | 1000 | 100 | 100 | 400 | 642 | 4 |
| DALAPON | UG/L | 5 | 5 | 5 | 5 | 5 | 0 |
| DBCP | UG/L | 1000 | 50 | 50 | 175 | 534 | 3 |
| DDD | UG/L | 10 | 0.5 | 0.5 | 2 | 5 | 0 |
| DDE | UG/L | 8 | 0.4 | 0.4 | 1 | 4 | 0 |
| DDT | UG/L | 10 | 0.5 | 0.5 | 2 | 5 | 0 |
| DEMETON (MIXED) | UG/L | 500 | 50 | 50 | 200 | 321 | 2 |
| DIALLATE(CIS,TRANS) | UG/L | 100 | 50 | 50 | 175 | 130 | 1 |
| DIAZINON | UG/L | 500 | 50 | 50 | 844 | 617 | 4 |

NOTE: MG/L = MILLIGRAMS PER LITER
UG/L = MICROGRAMS PER LITER
PPT = PARTS PER TRILLION
MEAN = FLOW WEIGHTED MEAN
INDUSTRY LOADING = MEAN (MG/L) * 0.75 MGD * 8.345 or
(MEAN (UG/L) * 0.75 MGD * 8.345)/1000

TABLE 8-4 (CONTINUED)
RAW WASTEWATER POLLUTANT LOADINGS

FRACTION : PESTICIDES/HERBICIDES

| PARAMETER | UNITS | A | B | C | D | FLOW WEIGHTED MEAN CONC. | INDUSTRY LOADING POUNDS/DAY) |
|---|---|---|---|---|---|---|---|
| PLANT NO. | | A | B | C | D | | |
| EPISODE NO. | | 1128 | 1130 | 1133 | 1179 | | |
| SAMPLE POINT | | RAW WASTEWTR | RAW WASTEWTR | RAW WASTEWTR | RAW WASTEWTR | | |
| FLOW | | 14700 | 2700 | 300 | 15000 | | |
| METHYL TRITHION | UG/L | 500 | 50 | 50 | 200 | 321 | 2 |
| MEVINPHOS | UG/L | 1000 | 100 | 100 | 400 | 642 | 4 |
| MIREX | UG/L | 1000 | 50 | 50 | 175 | 534 | 3 |
| MONOCROTOPHOS | UG/L | 1500 | 150 | 150 | 600 | 963 | 6 |
| NALED | UG/L | 500 | 50 | 50 | 200 | 321 | 2 |
| NITROFEN | UG/L | 1000 | 50 | 50 | 175 | 534 | 3 |
| PARATHION, ETHYL | UG/L | 500 | 50 | 50 | 200 | 321 | 2 |
| PARATHION, METHYL | UG/L | 500 | 50 | 50 | 200 | 321 | 2 |
| PCNB | UG/L | 1000 | 50 | 50 | 175 | 534 | 3 |
| PERTHANE (ETHYLAN) | UG/L | 7500 | 375 | 375 | 1312 | 4008 | 25 |
| PHORATE | UG/L | 500 | 50 | 50 | 200 | 321 | 2 |
| PHOSMET | UG/L | 1000 | 100 | 100 | 400 | 642 | 4 |
| PHOSPHAMIDON | UG/L | 2000 | 200 | 200 | 800 | 1284 | 8 |
| PROPACHLOR | UG/L | 1000 | 50 | 50 | 175 | 534 | 3 |
| RONNEL | UG/L | 1500 | 150 | 150 | 600 | 963 | 6 |
| STROBANE | UG/L | 2000 | 100 | 100 | 350 | 1069 | 7 |
| SULFOTEPP | UG/L | 500 | 50 | 50 | 200 | 321 | 2 |
| TEPP | UG/L | 0 | 500 | 500 | 2000 | 963 | 6 |
| TERBUPHOS | UG/L | 500 | 50 | 50 | 200 | 321 | 2 |
| TETRACHLOROVINPHOS | UG/L | 500 | 50 | 50 | 200 | 321 | 2 |
| TOPKUTHION | UG/L | 1000 | 100 | 100 | 400 | 642 | 4 |
| TOXAPHENE | UG/L | 10 | 5 | 5 | 17 | 13 | 0 |
| TRICHLOROFON | UG/L | 2000 | 200 | 200 | 800 | 1284 | 8 |
| TRIFLURALIN | UG/L | 1000 | 50 | 50 | 175 | 534 | 3 |
| TRIMETHYL PHOSPHATE | UG/L | 500 | 50 | 50 | 200 | 321 | 2 |

NOTE: MG/L = MILLIGRAMS PER LITER
UG/L = MICROGRAMS PER LITER
PPT = PARTS PER TRILLION
MEAN = FLOW WEIGHTED MEAN
INDUSTRY LOADING = MEAN (MG/L) * 0.75 MGD * 8.345 or
(MEAN (UG/L) * 0.75 MGD * 8.345)/1000

Motor oil residue contained within drums is 0.737 percent, or 0.41 gallons. Surfactant residue contained in drums is 0.485 percent, or 0.27 gallons. Therefore, the estimate of 0.3 gallons of residue is reasonable with respect to other data sources. From this estimate one may conclude that the industry disposes of 124 million pounds of residue per year (50 millions drums x 2.4 pounds per drum).

The significance of drum reconditioning industry raw waste loads becomes apparent when compared to loads for the metal finishing industry. Raw wastewater loadings reported in the metal finishing development document are presented below. These are shown paired with drum industry loadings for selected compounds.

| | Raw Wastewater Loading (pounds/day) | |
|---|---|---|
| Pollutant | Drum Reconditioning | Metal Finishing |
| Lead | 137 | 3221 |
| Total Organics | 3961 | 45216 |

The total organics load present in drum reconditioning wastewater is about 19 percent of metal finishing raw wastewater load. The lead load is about 5 percent of the metal finishing raw wastewater load.

## 8.2 RESIDUALS GENERATION AND DISPOSAL

Nonaqueous liquid wastes and solids are generated in several plant areas. Liquid residues are sometimes dumped into process wastewater floor drains but are usually contract hauled. Petroleum residues are sometimes sold for use in fuel blends. Oil and grease removed from oil/water separators is also sold for the same purpose. Solids generated include wastewater treatment sludges and furnace ash.

Limited data do not allow a precise estimate of the total volume of sludge and ash disposed by the industry. Data from 3 plants that use air flotation show that approximately 0.7 kilograms, or 0.17 gallons of air flotation sludge are generated per drum recondtioned. Two of the three plants

comingle ash quench with washing wastestreams, therefore, the 0.7Kg estimate reflects both tight head and open head wastestreams. Caustic wash sediments are also comingled with the wastestreams. The Agency believes that this estimate is the best available for estimating the total mass of solids disposed by the industry (SAIC, 1987c).

NABADA (Touhill, 1981a) reports that 51.2 percent of the industry used air flotation or flocculation/sedimentation. Therefore, the annual industry solids generation rate is 18 million Kilograms (51.2 percent x 0.7Kg/drum x 50,000,000 drums), or 153,000 pounds daily, if 260 working days per year are assumed. Facilities that do not use air flotation or sedimentation are assumed to dispose solids through their wastewater discharge. The high levels of solids observed in raw wastewaters support this assumption.

Data collected by EPA ITD and EPA ORD are presented below for caustic clarifier sludges, furnace ash and air flotation sludges. EPA ITD collected air flotation sludge samples at Plants B and D. A sedimentation sludge sample was collected at Plant C. EPA ORD collected caustic clarifier sludge samples at Plants E and F and a furnace ash sample was obtained from Plant G.

### 8.2.1 EPA ITD Data

The data collected by EPA ITD is the best available for estimating the characteristics of sludge disposed by the industry. Sludges at 3 Plants were sampled. Plant B used air flotation to treat tight head process wastewater generated by paint drum reconditioning. Plant C used sedimentation to remove solids from the washing and stripping of petroleum drums. Two samples were obtained from Plant D where air flotation is used to treat wastewaters generated by tight and open head processing. A wide range of drum types are processed at Plant D and the furnace quench constitutes 27 percent of the treatment system influent. Sludge analyses were conducted for conventional and nonconventional pollutants, metals, extractable and volatile organics and dioxins/furans. Analytical results are summarized below.

- Conventional and Nonconventional - The data in Table 8-5 show that sludges are composed mainly of oil and grease (15 percent) and suspended solids (7 percent) which are mostly volatile solids.

TABLE 8-5
EPA-ITD SAMPLING PROGRAM
SEDIMENTATION AND AIR FLOTATION SLUDGES

FRACTION : CONVENTIONALS AND NONCONVENTIONALS

| PARAMETER | UNITS | B | C | D | D | MEAN CONC. | INDUSTRY LOADING POUNDS/DAY) |
|---|---|---|---|---|---|---|---|
| PLANT NO. | | B | C | D | D | | |
| EPISODE NO. | | 1130 | 1133 | 1179 | 1179 | | |
| SAMPLE POINT | | SLUDGE | SLUDGE | SLUDGE | SLUDGE | | |
| SAMPLE NO. | | 15347 | 15359 | 15721 | 15724 | | |
| SAMPLE DATE | | Aug 7, 1986 | Sep 18, 1986 | Feb 4, 1987 | Feb 5, 1987 | | |
| AMMONIA | MG/KG | 68 | NA | 9.52 | 33.1 | 45.00 | 1772 |
| BOD-5, TOTAL | MG/KG | 2280 | 6000 | 160000 | 100000 | 46093.33 | 1828615 |
| BOD5, DISSOLVED | MG/KG | 1800 | 1440 | 26600 | 18400 | 8580.00 | 340386 |
| CHLORIDE | MG/KG | 2800 | 1000 | 66700 | 26500 | 16800.00 | 666490 |
| COD, DISSOLVED | MG/KG | 2300 | 1430 | 112000 | 77900 | 32893.33 | 1304944 |
| COD, TOTAL | MG/KG | 84000 | 339000 | 1190000 | 1090000 | 521000.00 | 20669112 |
| DISSOLVED SOLIDS | MG/KG | 784 | 18000 | 20000 | 15400 | 12161.33 | 482464 |
| FLUORIDE | MG/KG | 500 | 570 | .95 | 2.79 | 357.29 | 14174 |
| OIL & GREASE | MG/KG | 167 | 21000 | 51000 | 827000 | 153389.00 | 6085248 |
| PHENOL | MG/KG | .37 | 4.96 | 914 | 870 | 299.11 | 11866 |
| SULFIDE | MG/KG | 1 | 7.4 | NA | NA | | |
| SUSPENDED SOLIDS | MG/KG | 58000 | 53050 | 84600 | 118000 | 70783.33 | 2808116 |
| SUSPENDED VOL SOLIDS | MG/KG | 23000 | 37875 | 16600 | 103100 | 40241.67 | 1596467 |
| TKN | MG/KG | 330 | NA | 950 | 897 | 627.00 | 24864 |
| TOTAL CYANIDE | MG/KG | 284 | 120 | 6.09 | 1.91 | 136.00 | 5395 |
| TOTAL ORGANIC CARBON | MG/KG | 330 | 4000 | 5.5 | 227000 | 39277.58 | 1558220 |
| TOTAL VOL SOLIDS | MG/KG | 33000 | 21000 | 77460 | 124330 | 51631.67 | 2048331 |

NOTE: MG/L = MILLIGRAMS PER LITER
UG/L = MICROGRAMS PER LITER
PPT = PARTS PER TRILLION
MEAN = MEAN OF PLANT MEANS
INDUSTRY LOADING = MEAN (MG/L) * 18 KG KG/MG * 2.204 LBS/KG or
(MEAN (UG/L) * 18 KG KG/MG * 2.204 LBS/KG)/1000
NA = DATA NOT AVAILABLE

- Extractable and Volatile Organics - The data in Table 8-6 shows analytical detection limits as well as detected values. Detected valves are marked with asterisks and all other values are detection limits. Only a few conclusions can be drawn about the presence of organics in the four sludge samples, since detection limits in many cases are greater than 1 mg/l. 2-Butanone (MEK), biphenyl, bis(2-ethylhexyl)phthalate, ethylbenzene, napthalene, and toluene were found in samples at two of the three plants. No single compound is found at all three sites and no site-specific patterns are evident.

- Metals - Industry mean concentrations are shown in Table 8-7. Iron, sodium and aluminum compose 3.1, 2.8, and 2.5 percent, respectively, of the typical industry sludge. Zinc and lead, the primary wastewater constitutes, are observed at levels up to 0.3 and 0.8 percent, respectively.

- Dioxins/Furans - Twelve compound were detected in the 4 samples shown in Table 8-8. Most of these are associated with Plant D. This facilty is the only one of the sampled plants that generated furnace quench. No dioxin/furans were found in raw wastewaters from the other plants. Seventeen compounds were found in the furnace quench sample. These compounds are the likely result of the low temperature drum burning operation. Because of this probability and the fact that Plant D would so heavily weights the data, no industry loadings are calculated. None of detected compounds exceed BDAT standards for dioxin wastes.

Sludge samples were also analyzed using the Toxicity Characteristic Leaching Procedure (TCLP). The TCLP is designed to determine the mobility of both organic and inorganic contaminents present in liquid, solid and multi-phasic wastes. The solid phase of sludges are subject to extraction with an acid. The extract is then mixed with the aqueous phase and the mixed liquid is then analyzed. The analytical results are used to determine compliance with treatment standards for solvent waste disposed on land. Results are shown in Tables 8-9 and 8-10 Sludge from Plants B and D fail to meet the BDAT standards for the land disposal of spent solvents, (U.S. EPA, 1987b).

### 8.2.2 EPA ORD Data

#### Caustic Clarifier Sludges

Samples of the sludge resulting from the clarification of caustic are shown in Table 8-11 for Plants E and F. The sample from Plant E contained floating oil and emulsions. The level of organics measured in Plant E's sludge is considerably higher than the level measured in the clarified effluent. The organics have probably been absorbed by oil and emulsions that

TABLE 8-6
EPA-ITD SAMPLING PROGRAM
SEDIMENTATION AND AIR FLOTATION SLUDGES

FRACTION : EXTRACTABLE AND VOLATILE ORGANICS

| PARAMETER | UNITS | | | | |
|---|---|---|---|---|---|
| PLANT NO. | | B | C | D | D |
| EPISODE NO. | | 1130 | 1133 | 1179 | 1179 |
| SAMPLE POINT | | SLUDGE | SLUDGE | SLUDGE | SLUDGE |
| SAMPLE NO. | | 15347 | 15359 | 15721 | 15724 |
| SAMPLE DATE | | Aug 7, 1986 | Sep 18, 1986 | Feb 4, 1987 | Feb 5, 1987 |
| O-CRESOL | UG/L | | 10 | 333 | |
| 1,1,1,2-TETRACHLOROETHANE | UG/L | | 10 | 10 | 10 |
| 1,1,1-TRICHLOROETHANE | UG/L | 10 | | *15710 | *4140 |
| 1,1,2,2-TETRACHLOROETHANE | UG/L | 10 | | 10 | 10 |
| 1,1,2-TRICHLOROETHANE | UG/L | 10 | | 10 | 10 |
| 1,1-DICHLOROETHANE | UG/L | 10 | | 10 | 10 |
| 1,1-DICHLOROETHENE | UG/L | 10 | | 10 | 10 |
| 1,2,3-TRICHLOROBENZENE | UG/L | 33333 | 333 | 333 | 3333 |
| 1,2,3-TRICHLOROPROPANE | UG/L | | 10 | 10 | 10 |
| 1,2,3-TRIMETHOXYBENZENE | UG/L | | 10 | 333 | 3333 |
| 1,2,4,5-TETRACHLOROBENZENE | UG/L | | 10 | 333 | 3333 |
| 1,2,4-TRICHLOROBENZENE | UG/L | 33333 | 333 | 333 | 3333 |
| 1,2-DIBROMO-3-CHLOROPROPANE | UG/L | | 20 | 667 | 6667 |
| 1,2-DIBROMOETHANE (EDB) | UG/L | | 10 | 10 | 10 |
| 1,2-DICHLOROBENZENE | UG/L | 33333 | 333 | 333 | 3333 |
| 1,2-DICHLOROETHANE | UG/L | 10 | | 10 | 10 |
| 1,2-DICHLOROPROPANE | UG/L | 10 | | 10 | 10 |
| 1,2-DIPHENYLHYDRAZINE | UG/L | 66667 | 667 | 667 | 6667 |
| 1,2:3,4-DIEPOXYBUTANE | UG/L | | 20 | 667 | 6667 |
| 1,3,5-TRITHIANE | UG/L | | 50 | 1667 | 16667 |
| 1,3-BENZENEDIOL (RESORCINOL) | UG/L | | 50 | 1667 | 16667 |
| 1,3-DICHLORO-2-PROPANOL | UG/L | | 10 | 333 | 3333 |
| 1,3-DICHLOROBENZENE | UG/L | 33333 | 333 | 333 | 3333 |
| 1,3-DICHLOROPROPANE | UG/L | | 10 | 10 | 10 |
| 1,3-DINITROBENZENE | UG/L | | 20 | 667 | 6667 |
| 1,4-DICHLOROBENZENE | UG/L | 33333 | 333 | 333 | 3333 |
| 1,4-NAPHTHOQUINONE | UG/L | | 99 | 3300 | 33000 |
| 1,5-NAPHTHALENEDIAMINE | UG/L | | 99 | 3300 | 33000 |
| 1-METHYLFLUORENE | UG/L | | 10 | 333 | 3333 |
| 1-METHYLPHENANTHRENE | UG/L | | 10 | 333 | 3333 |
| 1-PHENYLNAPHTHALENE | UG/L | | 10 | 333 | 3333 |
| 2,3,4,6-TETRACHLOROPHENOL | UG/L | | 20 | 66667 | 200 |
| 2,3,6-TRICHLOROPHENOL | UG/L | 333 | 33333 | 33333 | 100 |
| 2,3-BENZOFLUORENE | UG/L | | 10 | 333 | 3333 |
| 2,3-DICHLOROANILINE | UG/L | | 10 | 333 | 3333 |
| 2,3-DICHLORONITROBENZENE | UG/L | | 50 | 1667 | 16667 |
| 2,4,5-TRICHLOROPHENOL | UG/L | 333 | 33333 | 33333 | 100 |

NOTE: MG/L = MILLIGRAMS PER LITER
UG/L = MICROGRAMS PER LITER
PPT = PARTS PER TRILLION

ASTERISK (*) INDICATES DETECTED VALUE, ALL OTHER VALUES ARE DETECTION LIMITS

TABLE 8-6 (CONTINUED)
EPA-ITD SAMPLING PROGRAM
SEDIMENTATION AND AIR FLOTATION SLUDGES

FRACTION : EXTRACTABLE AND VOLATILE ORGANICS

| PARAMETER | UNITS | B | C | D | D |
|---|---|---|---|---|---|
| PLANT NO. | | B | C | D | D |
| EPISODE NO. | | 1130 | 1133 | 1179 | 1179 |
| SAMPLE POINT | | SLUDGE | SLUDGE | SLUDGE | SLUDGE |
| SAMPLE NO. | | 15347 | 15359 | 15721 | 15724 |
| SAMPLE DATE | | Aug 7, 1986 | Sep 18, 1986 | Feb 4, 1987 | Feb 5, 1987 |
| 2,4,5-TRIMETHYLANILINE | UG/L | | 20 | 667 | 6667 |
| 2,4,6-TRICHLOROPHENOL | UG/L | 333 | 33333 | 33333 | 100 |
| 2,4-DIAMINOTOLUENE | UG/L | | 99 | 3300 | 33000 |
| 2,4-DICHLOROPHENOL | UG/L | 333 | 33333 | 33333 | 100 |
| 2,4-DIMETHYLPHENOL | UG/L | 33333 | 333 | 333 | 3333 |
| 2,4-DINITROPHENOL | UG/L | 1667 | 166667 | 166667 | 500 |
| 2,4-DINITROTOLUENE | UG/L | 33333 | 333 | 333 | 3333 |
| 2,6-DI-TERT-BUTYL-P-BENZOQINO | UG/L | | 99 | 3300 | 33000 |
| 2,6-DICHLORO-4-NITROANILINE | UG/L | | 99 | 3300 | 33000 |
| 2,6-DICHLOROPHENOL | UG/L | | 10 | 33333 | 100 |
| 2,6-DINITROTOLUENE | UG/L | 33333 | 333 | 333 | 3333 |
| 2-(METHYLTHIO)BENZOTHIAZOLE | UG/L | | 10 | 333 | 3333 |
| 2-BROMOCHLOROBENZENE | UG/L | | 10 | 333 | 3333 |
| 2-BUTANONE (MEK) | UG/L | *164278 | | *1938 | 50 |
| 2-CHLORO-1,3-BUTADIENE | UG/L | | 10 | 10 | 10 |
| 2-CHLOROETHYLVINYL ETHER | UG/L | 10 | | 10 | 10 |
| 2-CHLORONAPHTHALENE | UG/L | 33333 | 333 | 333 | 3333 |
| 2-CHLOROPHENOL | UG/L | 333 | 33333 | 33333 | 100 |
| 2-HEXANONE | UG/L | | 50 | 50 | 50 |
| 2-ISOPROPYLNAPHTHALENE | UG/L | | 10 | 333 | 3333 |
| 2-METHYL-4,6-DINITROPHENOL | UG/L | 667 | 66667 | 66667 | 200 |
| 2-METHYLBENZOTHIOAZOLE | UG/L | | 10 | 333 | 3333 |
| 2-METHYLNAPHTHALENE | UG/L | | 10 | 333 | 3333 |
| 2-NITROANILINE | UG/L | | 10 | 333 | 3333 |
| 2-NITROPHENOL | UG/L | 667 | 66667 | 66667 | 200 |
| 2-PHENYLNAPHTHALENE | UG/L | | 10 | 333 | 3333 |
| 3,3'-DICHLOROBENZIDINE | UG/L | 166667 | 1667 | 1667 | 16667 |
| 3,3'-DIMETHOXYBENZIDINE | UG/L | | 50 | 1667 | 16667 |
| 3,5-DIBROMO-4-HYDROXYBENZONITR | UG/L | | 50 | 166667 | 500 |
| 3,6-DIMETHYLPHENANTHRENE | UG/L | | 10 | 333 | 3333 |
| 3-BROMOCHLOROBENZENE | UG/L | | 10 | 333 | 3333 |
| 3-CHLORONITROBENZENE | UG/L | | 50 | 1667 | 16667 |
| 3-CHLOROPROPENE | UG/L | | 10 | 10 | 10 |
| 3-METHYLCHOLANTHRENE | UG/L | | 10 | 333 | 3333. |
| 3-NITROANILINE | UG/L | | 20 | 667 | 6667 |
| 4,4'-METHYLENEBIS(2-CHLOROANI) | UG/L | | 20 | 667 | 6667 |
| 4,5-METHYLENEPHENANTHRENE | UG/L | | 10 | 333 | 3333 |

NOTE: MG/L = MILLIGRAMS PER LITER
UG/L = MICROGRAMS PER LITER
PPT = PARTS PER TRILLION
ATERISK (*) INDICATES DETECTED VALUE.
ALL OTHER VALUE ARE DETECTION LIMITS

TABLE 8-6 (CONTINUED)
EPA-ITD SAMPLING PROGRAM
SEDIMENTATION AND AIR FLOTATION SLUDGES

FRACTION : EXTRACTABLE AND VOLATILE ORGANICS

| PARAMETER | UNITS | B | C | D | D |
|---|---|---|---|---|---|
| PLANT NO. | | B | C | D | D |
| EPISODE NO. | | 1130 | 1133 | 1179 | 1179 |
| SAMPLE POINT | | SLUDGE | SLUDGE | SLUDGE | SLUDGE |
| SAMPLE NO. | | 15347 | 15359 | 15721 | 15724 |
| SAMPLE DATE | | Aug 7, 1986 | Sep 18, 1986 | Feb 4, 1987 | Feb 5, 1987 |
| 4-AMINOBIPHENYL | UG/L | | 10 | 333 | 3333 |
| 4-BROMOPHENYL PHENYL ETHER | UG/L | 33333 | 333 | 333 | 3333 |
| 4-CHLORO-2-NITROANILINE | UG/L | | 20 | 667 | 6667 |
| 4-CHLORO-3-METHYLPHENOL | UG/L | 333 | 33333 | 33333 | 100 |
| 4-CHLOROANILINE | UG/L | | 10 | 333 | 100 |
| 4-CHLOROPHENYL PHENYL ETHER | UG/L | 33333 | 333 | 333 | 3333 |
| 4-METHYL-2-PENTANONE | UG/L | | 50 | 50 | 50 |
| 4-NITROANILINE | UG/L | | 50 | 1667 | 16667 |
| 4-NITROBIPHENYL | UG/L | | 10 | 333 | 3333 |
| 4-NITROPHENOL | UG/L | 1667 | 166667 | 166667 | 500 |
| 5-CHLORO-O-TOLUIDINE | UG/L | | 10 | 333 | 3333 |
| 5-NITRO-O-TOLUIDINE | UG/L | | 10 | 333 | 3333 |
| 7,12-DIMETHYLBENZ(A)ANTHRACENE | UG/L | | 10 | 333 | 3333 |
| ACENAPHTHENE | UG/L | 33333 | 333 | 333 | 3333 |
| ACENAPHTHYLENE | UG/L | 33333 | 333 | 333 | 3333 |
| ACETONE | UG/L | 50 | | *20785 | *9507 |
| ACETOPHENONE | UG/L | | 10 | 333 | 3333 |
| ACROLEIN | UG/L | 50 | | 50 | *160 |
| ACRYLONITRILE | UG/L | 50 | | 50 | 50 |
| ALLYL ALCOHOL | UG/L | | 10 | 10 | 10 |
| ALPHA-NAPHTHYLAMINE | UG/L | | 10 | 333 | 3333 |
| ALPHA-PICOLINE | UG/L | 166667 | 1667 | 1667 | 1667 |
| ALPHA-TERPINEOL | UG/L | 33333 | 333 | 333 | 3333 |
| ANILINE | UG/L | | 10 | 333 | 3333 |
| ANTHRACENE | UG/L | 33333 | 333 | 333 | 3333 |
| ARAMITE | UG/L | | 50 | 1667 | 16667 |
| B-NAPHTHYLAMINE | UG/L | 166667 | 1667 | 1667 | 16667 |
| BENZANTHRONE | UG/L | | 50 | 1667 | 16667 |
| BENZENE | UG/L | 10 | | 10 | 10 |
| BENZENETHIOL | UG/L | | 10 | 333 | 3333 |
| BENZIDINE | UG/L | 166667 | 1667 | 1667 | 16667 |
| BENZO(A)ANTHRACENE | UG/L | 33333 | 333 | 333 | 3333 |
| BENZO(A)PYRENE | UG/L | 33333 | 333 | 333 | 3333 |
| BENZO(B)FLUORANTHENE | UG/L | 33333 | 333 | 333 | 3333 |
| BENZO(GHI)PERYLENE | UG/L | 66667 | 667 | 667 | 6667 |
| BENZO(K)FLUORANTHENE | UG/L | 33333 | 333 | 333 | 3333 |
| BENZOIC ACID | UG/L | 10 | 50 | 166667 | 500 |

NOTE: MG/L = MILLIGRAMS PER LITER
UG/L = MICROGRAMS PER LITER
PPT = PARTS PER TRILLION
ASTERISK INDICATES DETECTED VALUE.
ALL OTHER ARE DETECTION LIMITS

TABLE 8-6 (CONTINUED)
EPA-ITD SAMPLING PROGRAM
SEDIMENTATION AND AIR FLOTATION SLUDGES

FRACTION : EXTRACTABLE AND VOLATILE ORGANICS

| PARAMETER | UNITS | | | | |
|---|---|---|---|---|---|
| PLANT NO. | | B | C | D | D |
| EPISODE NO. | | 1130 | 1133 | 1179 | 1179 |
| SAMPLE POINT | | SLUDGE | SLUDGE | SLUDGE | SLUDGE |
| SAMPLE NO. | | 15347 | 15359 | 15721 | 15724 |
| SAMPLE DATE | | Aug 7, 1986 | Sep 18, 1986 | Feb 4, 1987 | Feb 5, 1987 |
| BENZYL ALCOHOL | UG/L | | 10 | 333 | 3333 |
| BIPHENYL | UG/L | 33333 | *3829 | *414 | 3333 |
| BIS (2-CHLOROETHOXY) METHANE | UG/L | 33333 | 333 | 333 | 3333 |
| BIS (2-CHLOROETHYL) ETHER | UG/L | 33333 | 333 | 333 | 3333 |
| BIS (2-CHLOROISOPROPYL) ETHER | UG/L | 33333 | 333 | 333 | 3333 |
| BIS (2-ETHYLHEXYL) PHTHALATE | UG/L | 33333 | *3115 | *2502 | 3333 |
| BIS (CHLOROMETHYL) ETHER (NR) | UG/L | 10 | | 10 | 10 |
| BROMODICHLOROMETHANE | UG/L | 10 | | 10 | 10 |
| BROMOFORM | UG/L | 10 | | 10 | 10 |
| BROMOMETHANE | UG/L | 50 | | 50 | 50 |
| BUTYL BENZYL PHTHALATE | UG/L | 33333 | 333 | 333 | 3333 |
| CARBAZOLE | UG/L | 66667 | 667 | 667 | 6667 |
| CARBON DISULFIDE | UG/L | | 10 | 10 | 10 |
| CARBON TETRACHLORIDE | UG/L | 10 | | 10 | 10 |
| CHLOROACETONITRILE | UG/L | | 10 | 10 | 10 |
| CHLOROBENZENE | UG/L | 10 | | 10 | 10 |
| CHLOROETHANE | UG/L | 50 | | 50 | 50 |
| CHLOROFORM | UG/L | 10 | | 10 | 10 |
| CHLOROMETHANE | UG/L | 50 | | 50 | 50 |
| CHRYSENE | UG/L | 33333 | 333 | 333 | 3333 |
| CIS-1,3-DICHLOROPROPENE | UG/L | | 10 | 10 | 10 |
| CROTONALDEHYDE | UG/L | | 50 | 50 | 50 |
| CROTOXYPHOS | UG/L | | 99 | 3300 | 33000 |
| DI-N-BUTYL PHTHALATE | UG/L | 33333 | 333 | *2416 | *4257 |
| DI-N-OCTYL PHTHALATE | UG/L | 33333 | 333 | 333 | 3333 |
| DIBENZO(A,H)ANTHRACENE | UG/L | 66667 | 667 | 667 | 6667 |
| DIBENZOFURAN | UG/L | 33333 | 333 | 333 | 3333 |
| DIBENZOTHIOPHENE | UG/L | 33333 | 333 | 333 | 3333 |
| DIBROMOCHLOROMETHANE | UG/L | 10 | | 10 | 10 |
| DIBROMOMETHANE | UG/L | | 10 | 10 | 10 |
| DICHLORODIFLUOROMETHANE (NR) | UG/L | 10 | | 10 | 10 |
| DIETHYL ETHER | UG/L | 50 | | 50 | 50 |
| DIETHYL PHTHALATE | UG/L | 33333 | 333 | 333 | 3333 |
| DIMETHYL PHTHALATE | UG/L | 33333 | 333 | 333 | 3333 |
| DIMETHYL SULFONE | UG/L | | 10 | 333 | 3333 |
| DIPHENYL ETHER | UG/L | 33333 | 333 | 333 | 3333 |
| DIPHENYLAMINE | UG/L | 33333 | 333 | 333 | 3333 |

NOTE: MG/L = MILLIGRAMS PER LITER
UG/L = MICROGRAMS PER LITER
PPT = PARTS PER TRILLION
ASTERISK (*) DETECTED VALUES.
ALL OTHER VALUES ARE DETECTION LIMITS

TABLE 8-6 (CONTINUED)
EPA-ITD SAMPLING PROGRAM
SEDIMENTATION AND AIR FLOTATION SLUDGES

FRACTION : EXTRACTABLE AND VOLATILE ORGANICS

| PARAMETER | UNITS | | | | |
|---|---|---|---|---|---|
| PLANT NO. | | B | C | D | D |
| EPISODE NO. | | 1130 | 1133 | 1179 | 1179 |
| SAMPLE POINT | | SLUDGE | SLUDGE | SLUDGE | SLUDGE |
| SAMPLE NO. | | 15347 | 15359 | 15721 | 15724 |
| SAMPLE DATE | | Aug 7, 1986 | Sep 18, 1986 | Feb 4, 1987 | Feb 5, 1987 |
| DIPHENYLDISULFIDE | UG/L | | 20 | 667 | 6667 |
| ETHYL CYANIDE | UG/L | | 10 | 10 | 10 |
| ETHYL METHACRYLATE | UG/L | | 10 | 10 | *33 |
| ETHYL METHANESULFONATE | UG/L | | 20 | 667 | 6667 |
| ETHYLBENZENE | UG/L | *1981 | | *17900 | *133057 |
| ETHYLENETHIOUREA | UG/L | | 20 | 667 | 6667 |
| ETHYNYLESTRADIOL 3-METHYL ETHE | UG/L | | 20 | 667 | 6667 |
| FLUORANTHENE | UG/L | 33333 | 333 | 333 | 6667 |
| FLUORENE | UG/L | 33333 | *2109 | 333 | 3333 |
| HEXACHLORO-1,3-BUTADIENE | UG/L | 33333 | 333 | 333 | 3333 |
| HEXACHLOROBENZENE | UG/L | 33333 | 333 | 333 | 3333 |
| HEXACHLOROCYCLOPENTADIENE | UG/L | 33333 | 333 | 333 | 3333 |
| HEXACHLOROETHANE | UG/L | 33333 | 333 | 333 | 3333 |
| HEXACHLOROPROPENE | UG/L | | 20 | 667 | 6667 |
| HEXANOIC ACID | UG/L | 10 | 10 | 33333 | 100 |
| INDENO(1,2,3-CD)PYRENE | UG/L | 66667 | 667 | 667 | 6667 |
| IODOMETHANE | UG/L | | 10 | 10 | 10 |
| ISOBUTYL ALCOHOL | UG/L | | 10 | 10 | 64 |
| ISOPHORONE | UG/L | 33333 | 333 | *889 | 3333 |
| ISOSAFROLE | UG/L | | 10 | 333 | 3333 |
| LONGIFOLENE | UG/L | | 50 | 1667 | 16667 |
| MALACHITE GREEN | UG/L | | 10 | 333 | 3333 |
| METHACRYLONITRILE | UG/L | | 10 | 10 | 10 |
| METHAPYRILENE | UG/L | | 10 | 333 | 3333 |
| METHYL METHACRYLATE | UG/L | | 10 | 10 | 10 |
| METHYL METHANESULFONATE | UG/L | | 20 | 667 | 6667 |
| METHYLENE CHLORIDE | UG/L | 10 | | 10 | 10 |
| N,N-DIMETHYLFORMAMIDE | UG/L | | 10 | 333 | 3333 |
| N-DECANE (N-C10) | UG/L | 33333 | 333 | 333 | 3333 |
| N-DOCOSANE (N-C22) | UG/L | 33333 | 333 | *6741 | 3333 |
| N-DODECANE (N-C12) | UG/L | 33333 | 333 | 333 | 3333 |
| N-EICOSANE (N-C20) | UG/L | 33333 | 333 | 333 | 3333 |
| N-HEXACOSANE (N-C26) | UG/L | 33333 | 333 | 333 | 3333 |
| N-HEXADECANE (N-C16) | UG/L | 33333 | *127003 | 333 | 3333 |
| N-NITROSODI-N-BUTYLAMINE | UG/L | | 10 | 333 | 3333 |
| N-NITROSODI-N-PROPYLAMINE | UG/L | 66667 | 667 | 667 | 6667 |
| N-NITROSODIETHYLAMINE | UG/L | | 10 | 333 | 3333 |

NOTE: MG/L = MILLIGRAMS PER LITER
UG/L = MICROGRAMS PER LITER
PPT = PARTS PER TRILLION
ASTERISK (*) INDICATES DETECTED VALUE
ALL OTHER VALUES ARE DETECTION LIMITS.

TABLE 8-6 (CONTINUED)
EPA-ITD SAMPLING PROGRAM
SEDIMENTATION AND AIR FLOTATION SLUDGES

FRACTION : EXTRACTABLE AND VOLATILE ORGANICS

| PARAMETER | UNITS | | | | |
|---|---|---|---|---|---|
| PLANT NO. | | B | C | D | D |
| EPISODE NO. | | 1130 | 1133 | 1179 | 1179 |
| SAMPLE POINT | | SLUDGE | SLUDGE | SLUDGE | SLUDGE |
| SAMPLE NO. | | 15347 | 15359 | 15721 | 15724 |
| SAMPLE DATE | | Aug 7, 1986 | Sep 18, 1986 | Feb 4, 1987 | Feb 5, 1987 |
| N-NITROSODIMETHYLAMINE | UG/L | 166667 | 1667 | 1667 | 16667 |
| N-NITROSODIPHENYLAMINE | UG/L | 66667 | 667 | 667 | 6667 |
| N-NITROSOMETHYLETHYLAMINE | UG/L | | 10 | 333 | 3333 |
| N-NITROSOMETHYLPHENYLAMINE | UG/L | | 99 | 3300 | 33000 |
| N-NITROSOMORPHOLINE | UG/L | | 10 | 333 | 3333 |
| N-NITROSOPIPERIDINE | UG/L | | 10 | 333 | 3333 |
| N-OCTACOSANE (N-C28) | UG/L | 33333 | 333 | 333 | 3333 |
| N-OCTADECANE (N-C18) | UG/L | 33333 | 333 | *2494 | 3333 |
| N-TETRACOSANE (N-C24) | UG/L | 33333 | 333 | 333 | 3333 |
| N-TETRADECANE (N-C14) | UG/L | 33333 | 333 | *2271 | 3333 |
| N-TRIACONTANE (N-C30) | UG/L | 33333 | 333 | 333 | 3333 |
| NAPHTHALENE | UG/L | 33333 | *5425 | *1692 | 3333 |
| NITROBENZENE | UG/L | 33333 | 333 | 333 | 3333 |
| O-ANISIDINE | UG/L | | 10 | 333 | 3333 |
| O-CRESOL | UG/L | | | | 3333 |
| O-TOLUIDINE | UG/L | | 10 | 333 | 3333 |
| P-CRESOL | UG/L | | 10 | 33333 | 100 |
| P-CYMENE | UG/L | 33333 | *5380 | 333 | 3333 |
| P-DIMETHYLAMINOAZOBENZENE | UG/L | | 20 | 667 | 6667 |
| P-DIOXANE | UG/L | 10 | | 10 | 10 |
| PENTACHLOROBENZENE | UG/L | | 20 | 667 | 6667 |
| PENTACHLOROETHANE | UG/L | | 20 | 667 | 6667 |
| PENTACHLOROPHENOL | UG/L | 1667 | 166667 | 166667 | 500 |
| PENTAMETHYLBENZENE | UG/L | | 10 | 333 | 3333 |
| PERYLENE | UG/L | | 10 | 333 | 3333 |
| PHENACETIN | UG/L | | 10 | 333 | 3333 |
| PHENANTHRENE | UG/L | 33333 | *1754 | 333 | 3333 |
| PHENOL | UG/L | 33333 | 333 | 333 | 3333 |
| PHENOTHIAZINE | UG/L | | 50 | 1667 | 16667 |
| PRONAMIDE | UG/L | | 10 | 333 | 3333 |
| PYRENE | UG/L | 33333 | *478 | 333 | 3333 |
| PYRIDINE | UG/L | | 10 | 333 | 3333 |
| SAFROLE | UG/L | | 10 | 333 | 3333 |
| SQUALENE | UG/L | | 99 | 3300 | 33000 |
| STYRENE | UG/L | 33333 | 333 | *5120 | 3333 |
| T-1,3-DICHLOROPROPENE | UG/L | 10 | | 10 | 10 |

UG/L = MICROGRAMS PER LITER
PPT = PARTS PER TRILLION
ASTERISK (*) INDICATES DETECTED VALUE.
ALL OTHER VALUES ARE DETECTION LIMITS

TABLE 8-6 (CONTINUED)
EPA-ITD SAMPLING PROGRAM
SEDIMENTATION AND AIR FLOTATION SLUDGES

FRACTION : EXTRACTABLE AND VOLATILE ORGANICS

| SAMPLE POINT | SLUDGE | SLUDGE | SLUDGE | SLUDGE |
|---|---|---|---|---|
| SAMPLE NO. | 15347 | 15359 | 15721 | 15724 |
| SAMPLE DATE | Aug 7, 1986 | Sep 18, 1986 | Feb 4, 1987 | Feb 5, 1987 |
| PARAMETER | UNITS | | | |
| TETRACHLOROETHENE | UG/L 10 | | *174 | 10 |
| THIANAPHTHENE | UG/L | 10 | 333 | 3333 |
| THIOACETAMIDE | UG/L | 20 | 667 | 6667 |
| THIOXANTHONE | UG/L | 20 | 667 | 6667 |
| TOLUENE | UG/L* 1257 | | *12954 | 10 |
| TRANS-1,2-DICHLOROETHENE | UG/L 10 | | 10 | 10 |
| TRANS-1,4-DICHLORO-2-BUTENE | UG/L | 50 | 50 | 50 |
| TRICHLOROETHENE | UG/L 10 | | *1571 | *695 |
| TRICHLOROFLUOROMETHANE | UG/L | 10 | 10 | 10 |
| TRICHLOROFLUOROMETHANE (NR) | UG/L 10 | | 10 | 10 |
| TRIPHENYLENE | UG/L | 10 | 333 | 3333 |
| TRIPROPYLENEGLYCOL METHYL ETHE | UG/L | 99 | 3300 | 33000 |
| VINYL ACETATE | UG/L | 50 | 50 | 50 |
| VINYL CHLORIDE | UG/L 10 | | 10 | 10 |

NOTE: MG/L = MILLIGRAMS PER LITER
UG/L = MICROGRAMS PER LITER
PPT = PARTS PER TRILLION
ASTERISK (*) INDICATES DETECTED VALUE.
ALL OTHER VALUES ARE DETECTION LIMITS.

TABLE 8-7
EPA-ITD SAMPLING PROGRAM
SEDIMENTATION AND AIR FLOTATION SLUDGES

FRACTION : METALS

| PARAMETER | UNITS | B | C | D | D | MEAN CONC. | INDUSTRY LOADING POUNDS/DAY) |
|---|---|---|---|---|---|---|---|
| PLANT NO. | | B | C | D | D | | |
| EPISODE NO. | | 1130 | 1133 | 1179 | 1179 | | |
| SAMPLE POINT | | SLUDGE | SLUDGE | SLUDGE | SLUDGE | | |
| SAMPLE NO. | | 15347 | 15359 | 15721 | 15724 | | |
| SAMPLE DATE | | Aug 7, 1986 | Sep 18, 1986 | Feb 4, 1987 | Feb 5, 1987 | | |
| ALUMINUM | MG/KG | 57800 | 17400 | 862 | 833 | 25349.17 | 1006 |
| ANTIMONY | MG/KG | 33 | 30 | 26 | 35 | 31.17 | 1 |
| ARSENIC | MG/KG | 48 | 221 | | | 89.67 | 3557 |
| BARIUM | MG/KG | 678 | 535 | 80 | 103 | 434.83 | 17 |
| BERYLLIUM | MG/KG | 8 | 4 | 1 | 1 | 4.33 | 0 |
| BORON | MG/KG | 154 | 74 | 31 | 33 | 86.67 | 3 |
| CADMIUM | MG/KG | 16 | 393 | 7 | 19 | 140.67 | 6 |
| CALCIUM | MG/KG | 2260 | 20600 | 132 | 116 | 7661.33 | 304 |
| CHROMIUM | MG/KG | 428 | 1680 | 17 | 35 | 711.33 | 28 |
| COBALT | MG/KG | 77 | 74 | | 4 | 51.00 | 2023 |
| COPPER | MG/KG | 204 | 383 | 19 | 19 | 202.00 | 8 |
| IRON | MG/KG | 26300 | 60100 | 4630 | 10100 | 31255.00 | 1240 |
| LEAD | MG/KG | 1010 | 8380 | 277 | 667 | 3287.33 | 130 |
| MAGNESIUM | MG/KG | 2110 | 2590 | 91 | 154 | 1607.50 | 64 |
| MANGANESE | MG/KG | 713 | 74 | 12 | 33 | 269.83 | 11 |
| MERCURY | MG/KG | 2 | .74 | .2 | | .95 | 38 |
| MOLYBDENUM | MG/KG | 155 | 157 | | 10 | 105.67 | 4192 |
| NICKEL | MG/KG | 163 | 30 | | | 64.33 | 2552 |
| SELENIUM | MG/KG | 33 | 15 | | | 16.00 | 635 |
| SILVER | MG/KG | 2 | .8 | | | .93 | 37 |
| SODIUM | MG/KG | 29000 | 53400 | 620 | 3010 | 28071.67 | 1114 |
| THALLIUM | MG/KG | 33 | 15 | | | 16.00 | 635 |
| TIN | MG/KG | 155 | 143 | 50 | 170 | 136.00 | 5 |
| TITANIUM | MG/KG | 337 | 112 | | 10 | 151.00 | 5990 |
| VANADIUM | MG/KG | 95 | 37 | 3 | 3 | 45.00 | 2 |
| YTTRIUM | MG/KG | 80 | 37 | | | 39.00 | 1547 |
| ZINC | MG/KG | 2150 | 3260 | 197 | 251 | 1878.00 | 75 |

NOTE: MG/L = MILLIGRAMS PER LITER
UG/L = MICROGRAMS PER LITER
PPT = PARTS PER TRILLION
MEAN = MEAN OF PLANT MEANS
INDUSTRY LOADING = MEAN (MG/L) * 18 KG KG/MG * 2.204 LBS/KG or
(MEAN (UG/L) * 18 KG KG/MG * 2.204 LBS/KG)/1000

TABLE 8-8
EPA-ITD SAMPLING PROGRAM
SEDIMENTATION AND AIR FLOTATION SLUDGES

FRACTION : DIOXINS/FURANS

| PARAMETER | UNITS | | | | |
|---|---|---|---|---|---|
| PLANT NO. | | B | C | D | D |
| EPISODE NO. | | 1130 | 1133 | 1179 | 1179 |
| SAMPLE POINT | | SLUDGE | SLUDGE | SLUDGE | SLUDGE |
| SAMPLE NO. | | 15347 | 15359 | 15721 | 15724 |
| SAMPLE DATE | | Aug 7, 1986 | Sep 18, 1986 | Feb 4, 1987 | Feb 5, 1987 |
| 1234678-HpCDD | PPT | | 2226.11 | 260.89 | 496.799 |
| 1234678-HpCDF | PPT | | | 114.55 | |
| 123478-HxCDF | PPT | | | 40.10 | |
| 234678-HxCDF | PPT | | | 44.31 | |
| OCDD | PPT | | 41954.20 | 2774.67 | 5619.11 |
| OCDF | PPT | 143.73 | | | 330.89 |
| TOTAL HpCDD | PPT | | 4044.62 | 537.35 | 1002.79 |
| TOTAL HpCDF | PPT | | 112.99 | 187.33 | 171.61 |
| TOTAL HxCDD | PPT | | | 168.52 | 138.87 |
| TOTAL HxCDF | PPT | | | 139.62 | |
| TOTAL PCDF | PPT | | | 92.46 | |
| TOTAL TCDF | PPT | | | 37.06 | 32.67 |

NOTE: MG/L = MILLIGRAMS PER LITER
UG/L = MICROGRAMS PER LITER
PPT = PARTS PER TRILLION
MEAN = MEAN OF PLANT MEANS
INDUSTRY LOADING = MEAN (MG/L) * 18 KG KG/MG * 2.204 LBS/KG or
(MEAN (UG/L) * 18 KG KG/MG * 2.204 LBS/KG)/1000

TABLE 8-9
EPA-ITD SAMPLING PROGRAM
TOXICITY CHARACTERISTIC LEACHING PROCEDURE

FRACTION : EXTRACTABLE AND VOLATILE ORGANICS

| PLANT NUMBER | B | C | D | D |
|---|---|---|---|---|
| EPISODE NUMBER: | 1130 | 1133 | 1179 | 1179 |
| SAMPLE POINT | SLUDGE | SLUDGE | SLUDGE | SLUDGE |
| SAMPLE NO. | 15347 | 15359 | 15721 | 15724 |
| SAMPLE DATE | Aug 7, 1986 | Sep 18, 1986 | Feb 4, 1987 | Feb 5, 1987 |

| PARAMETER | UNITS | | | | |
|---|---|---|---|---|---|
| 1,1,1-TRICHLOROETHANE | UG/L | | | 7527 | 669 |
| 1,1-DICHLOROETHENE | UG/L | | | 144 | |
| 2-BUTANONE (MEK) | UG/L | 109078 | | 611 | 670 |
| 2-CHLORONAPHTHALENE | UG/L | 47 | | | |
| ACETONE | UG/L | | | 16067 | 1038 |
| ACETOPHENONE | UG/L | | | 18 | |
| ACROLEIN | UG/L | | | 197 | 87 |
| ALPHA-TERPINEOL | UG/L | 28 | 54 | | |
| BIS (2-ETHYLHEXYL) PHTHALATE | UG/L | | | 128 | |
| DI-N-BUTYL PHTHALATE | UG/L | | | 115 | |
| ETHYLBENZENE | UG/L | 642 | | 1965 | 1419 |
| HEXANOIC ACID | UG/L | 162 | | | |
| ISOBUTYL ALCOHOL | UG/L | | | | 80 |
| ISOPHORONE | UG/L | | | 38 | |
| METHYLENE CHLORIDE | UG/L | 117 | | | 82 |
| N-DODECANE (N-C12) | UG/L | | | 377 | |
| N-EICOSANE (N-C20) | UG/L | | | 162 | 342 |
| N-HEXACOSANE (N-C26) | UG/L | | | 593 | |
| N-OCTADECANE (N-C18) | UG/L | | | 38 | |
| NAPHTHALENE | UG/L | 63 | 21 | 76 | |
| P-CYMENE | UG/L | | | 15 | |
| STYRENE | UG/L | | | | 172 |
| TETRACHLOROETHENE | UG/L | | | 1712 | |
| THIOXANTHONE | UG/L | 379 | | | |
| TOLUENE | UG/L | 1518 | | 2396 | |
| TRICHLOROETHENE | UG/L | | | 167 | 82 |

NOTE: BLANK = NO VALUE REPORTED
MG/L = MILLIGRAMS PER LITER
UG/L = MICROGRAMS PER LITER
PPT = PARTS PER TRILLION

TABLE 8-10
EPA-ITD SAMPLING PROGRAM
TOXICITY CHARACTERISTIC LEACHING PROCEDURE

FRACTION : METALS

| PARAMETER | UNITS | | | | |
|---|---|---|---|---|---|
| PLANT NUMBER | | B | C | D | D |
| EPISODE NUMBER: | | 1130 | 1133 | 1179 | 1179 |
| SAMPLE POINT | | SLUDGE | SLUDGE | SLUDGE | SLUDGE |
| SAMPLE NO. | | 15347 | 15359 | 15721 | 15724 |
| SAMPLE DATE | | Aug 7, 1986 | Sep 18, 1986 | Feb 4, 1987 | Feb 5, 1987 |
| ALUMINUM | UG/L | 147000 | 7000 | | |
| ANTIMONY | UG/L | 20 | 20 | | |
| ARSENIC | UG/L | 220 | 20 | | |
| BARIUM | UG/L | 534 | 183 | | |
| BERYLLIUM | UG/L | 5 | 5 | | |
| BORON | UG/L | 260 | 731 | | |
| CADMIUM | UG/L | 44 | 17 | | |
| CALCIUM | UG/L | 4550 | 118000 | | |
| CHROMIUM | UG/L | 390 | 355 | | |
| COBALT | UG/L | 50 | 286 | | |
| COPPER | UG/L | 120 | 25 | | |
| IRON | UG/L | 1230 | 120000 | | |
| LEAD | UG/L | 2120 | 200 | | |
| MAGNESIUM | UG/L | 732 | 5920 | | |
| MANGANESE | UG/L | 425 | 1060 | | |
| MERCURY | UG/L | .2 | .6 | | |
| MOLYBDENUM | UG/L | 100 | 100 | | |
| NICKEL | UG/L | 78 | 91 | | |
| SELENIUM | UG/L | 200 | 100 | | |
| SILVER | UG/L | 20 | 20 | | |
| SODIUM | UG/L | 1640000 | 2360000 | | |
| THALLIUM | UG/L | 20 | 20 | | |
| TIN | UG/L | 100 | 125 | | |
| TITANIUM | UG/L | | 50 | | |
| VANADIUM | UG/L | 50 | 50 | | |
| YTTRIUM | UG/L | 50 | 50 | | |
| ZINC | UG/L | 10500 | 1930 | | |

NOTE: BLANK = NO VALUE REPORTED
MG/L = MILLIGRAMS PER LITER
UG/L = MICROGRAMS PER LITER
PPT = PARTS PER TRILLION

TABLE 8-11 ANALYTICAL DATA FOR CAUSTIC CLARIFIER SLUDGES PLANTS E AND F

| Parameter | Concentration (mg/l) | | |
|---|---|---|---|
| | Plant E | Plant F | Other Data* |
| Acenaphthalene | -- | 165 | -- |
| Acenaphthalenes, C1 | -- | 135 | -- |
| Acenaphthalenes, C2 | -- | 25 | -- |
| Acenaphthene | 7.6 | -- | -- |
| Aliphatics, C7-C18 | -- | 12,500 | -- |
| Anthracene/phenanthrene | 50 | -- | -- |
| Benzenex, C3-C4 | -- | 1,625 | -- |
| Bis-(2-ethylhexyl)-Phthalate | -- | 13 | -- |
| 2-chlorophenol | 14 | -- | -- |
| Chrysene/benzo(a)anthracene | 5.4 | -- | -- |
| Dicyclohexylamine | 59 | -- | -- |
| Diethyl phthalate | -- | 13 | -- |
| Fluoranthrene | 5.5 | -- | -- |
| Fluorene | 12 | -- | -- |
| Isopropyl diphenyl amine | 17 | -- | -- |
| Naphthalene | 47 | 360 | -- |
| Naphthalenes, C1 | -- | 330 | -- |
| Naphthalenes, C2 | -- | 335 | -- |
| n-nitrosodiphenylamine | 1,200 | -- | -- |
| Pyrene | 5 | -- | -- |
| Silicones | -- | 4,350 | -- |
| Aluminum | 11.0 | -- | -- |
| Antimony | 3.77 | -- | -- |
| Arsenic | 0.076 | -- | 1.6 |
| Barium | 0.520 | -- | 651 |
| Beryllium | 0.060 | -- | -- |
| Boron | 23.1 | -- | -- |
| Cadmium | 1.16 | -- | 9.6 |
| Calcium | 50.8 | -- | 1,687 |
| Chromium | 0.880 | -- | 199 |
| Cobalt | 0.960 | -- | -- |
| Copper | 0.990 | -- | 2,393 |
| Cyanides | -- | -- | 10 |
| Iron | 8.98 | -- | 24,922 |
| Lead | 4.28 | -- | 4,554 |
| Magnesium | 21.7 | -- | -- |
| Manganese | 1.21 | -- | 290 |
| Mercury | 0.178 | -- | 0.48 |
| Molybdenum | 3.41 | -- | -- |
| Nickel | 0.48 | -- | 29.2 |
| Phosphorus | 36.7 | -- | 7,500 |
| Selenium | 0.023 | -- | 30.5 |
| Silicon | 22.9 | -- | 5,325 |
| Silver | <0.005 | -- | 2.3 |
| Sodium | 23,400 | -- | 8,455 |
| Strontium | 0.250 | -- | -- |

TABLE 8-11 ANALYTICAL DATA FOR CAUSTIC CLARIFIER SLUDGES PLANTS E AND F (CONTINUED)

| Parameter | Concentration (mg/l) | | |
|---|---|---|---|
| | Plant A | Plant B | Other Data* |
| Thallium | <0.1 | -- | -- |
| Tin | <0.015 | -- | -- |
| Titanium | 0.230 | -- | -- |
| Vanadium | 1.41 | -- | -- |
| Zinc | 1.44 | -- | 6,791 |

*Other data refers to data submitted by several drum reconditioners in response to a NABADA survey.

compose the sludge. The sludge from plant F was scraped from the sides of the clarifier. This sample was probably high in oils and greases which adhered to the clarifier walls. The high hydrocarbons levels measured reflect the fact that 95 percent of the drums serviced at Plant F contained petroleum.

The metals levels measured in Plant E sludge are generally lower than those measured in clarified effluent. This suggests either poor removals or the use of analytical protocol which did not appropriately account for the solids. Metals data is also listed in Table 8-11 for plants that supplied data in response to the NABADA survey. The data is the average of sludges from several plants and shows significantly higher levels than the data from Plant E.

Table 8-12 shows metals data for dried caustic sludge samples from Plant G that contain about 30 percent water. If a solids level of 1 percent were assumed for the undried sludge then the data would be representative of a sludge that had been concentrated about 70 times. An extrapolation of the data with the use of a divisor of 70 would yield metals levels that are lower than those reported by NABADA respondents.

Furnace Ash

Ash removed from the surfaces of burned open head drums is likely to contain high amounts of metal as well as incompletely combusted organics. In Table 8-13, hydrocarbons and extractable organics are shown to be present in an ash collected from Plant B.

## 8.3 POTENTIAL FOR INDUSTRY GROWTH

Drum reconditioning industry growth is largely a function of local economic conditions. Drum usage, and subsequent reconditioning, reflects demand for petroleum, paint, chemical and other products. The Agency visited three drum reconditioners in Detroit Michigan, in 1986, at a time when automotive production levels were high. Each reconditioner reported that business was good as a result of demand in the automotive industry. Conversely, the Agency contacted several reconditioners in Oklahoma and Texas who stated that business was off due to a recession in the oil industry (SAIC, 1981d).

TABLE 8-12 ANALYTICAL DATA FOR DRIED CAUSTIC SLUDGE PLANT G

| | Sample 1 | Sample 2 | Sample 3 |
|---|---|---|---|
| Moisture Content, wt.% | 27.66 | 14.63 | 45.20 |
| | | Concentration, mg/kg | |
| Aluminum | 8,500 | 12,700 | 7,800 |
| Antimony | 889 | 975 | 828 |
| Arsenic | 6.6 | 11.7* | 6.8 |
| Barium | 3,100 | 4,900 | 3,000 |
| Beryllium | 1.94 | 1.90 | <1 |
| Boron | 378 | 539 | 405 |
| Cadmium | 65.2 | 95.2 | 73.6 |
| Calcium | 23,000 | 33,400 | 22,800 |
| Chromium | 1,500 | 2,300 | 1,400 |
| Cobalt | 209 | 548 | 293 |
| Copper | 990 | 1,900 | 919 |
| Iron | 81,500 | 134,000 | 80,000 |
| Lead | 5,900 | 10,300 | 5,800 |
| Magnesium | 3,600 | 6,200 | 3,800 |
| Manganese | 779 | 1,200 | 771 |
| Mercury | 3.1 | 1.7 | 3.5 |
| Molybdenum | 269 | 202 | 60.1 |
| Nickel | 1,900 | 2,100 | 1,600 |
| Phosphorus | 4,200 | 5,600 | 4,000 |
| Selenium | 1.0 | 1.3 | 1.4 |
| Silicon | 1,600 | 1,600 | 1,400 |
| Silver | 231 | 230 | 198 |
| Sodium | 55,600 | 87,600 | 58,800 |
| Strontium | 127 | 194 | 126 |
| Thallium | <10 | <10 | <10* |
| Tin | 265 | 320 | 227 |
| Titanium | 1,300 | 6,800 | 1,800 |
| Vanadium | 290 | 341 | 289 |
| Zinc | 1,900 | 3,300 | 2,000 |

*Average values for two analyses.

TABLE 8-13 ANALYTICAL DATA FOR FURNACE ASH PLANT F

| Parameter | Concentration mg/kg ash |
|---|---|
| Aluminum | 9,700 |
| Antimony | 105 |
| Arsenic | 9.2 |
| Barium | 9,460 |
| Beryllium | <2 |
| Boron | 78.7 |
| Cadmium | 11 |
| Calcium | 7,840 |
| Chromium | 1,250 |
| Cobalt | 24.5 |
| Copper | 1,880 |
| Iron | 5,330 |
| Lead | 8,740 |
| Magnesium | 1,110 |
| Manganese | 35.9 |
| Mercury | 2.8 |
| Molybdenum | 320 |
| Nickel | 79.6 |
| Phosphorus | 606 |
| Selenium | 1.0 |
| Silicon | 156 |
| Silver | <30 |
| Sodium | 1,450 |
| Strontium | 953 |
| Thallium | <98.0 |
| Tin | 199 |
| Titanium | 426 |
| Vanadium | 98.3 |
| Zinc | 700 |
| C7-C25 Aliphatics | 4,200 |
| Anthracene | 40 |
| C1 Anthracene | 30 |
| C2 Anthracene | 50 |
| C3-C4 Benzene | 900 |
| Bis (ethylhexyl) phthalate | 170 |
| Butyl benzl phthalate | 5 |
| Diisobutyrate | 100 |
| Fluoranthene | 10 |
| Naphthalene | 90 |
| $C^5$ phenol | 60 |
| Pyrene | 30 |
| Silicones | 10 |

In 1985, 50 million drums were reconditioned (Rich, 1986). This represents a twenty percent increase over the 1979 level of 41 million (Touhill, 1981a). This increase is equivalent to a compounded growth rate of about three percent per year. Steel drum reconditioners, in 1979, believed that the emergence of plastic drums posed no serious threat to their industry. In recent years, plastic drums have become a more attractive alternative since they provide a means for ultimate disposal. Plastic drums and residual contents are being incinerated in large furnaces, rather being than reconditioned. This form of incineration offers a means for ultimate hazardous waste disposal and the plastic has a high BTU content (SAIC, 1987e).

In summary, industry growth or decline will not be significant and will not affect the quantitities of waste generated by the drum reconditioning industry. The raw wastewater loadings have been shown to be significant with respect to metal finishing industry loadings for lead and toxic organics. Wastewater treatment sludges are generated at a less significant annual rate but contain dioxin/furan compounds and fail to meet BDAT standards for land disposal.

## 8.4 SUMMARY

- Approximately 124 million pounds of residue are contained in drum received by reconditioners, annually.
- Drum reconditioning industry raw wastewater loads are significant when compared to loads for the metal finishing industry. These loads are compared below for selected parameters.

| Parameter | Loading (pounds/day) Drum Reconditioning | Metal Finishing |
|---|---|---|
| Lead | 173 | 3,221 |
| Total Organics | 3,961 | 45,216 |

- Wastewater treatment sludges generated by the industry are composed mainly of oil and grease (15 percent) and suspended solids (7 percent). High concentrations of twenty-three organics are observed.
- Twelve dioxin/furan, compounds are found in industry sludges.
- The industry is not expected to grow or decline significantly, hence, the waste quantities estimated here are reasonable projections of future waste quantities.

# 9. REFERENCES


Engineering News Record. March 21, 1985. Vol. 214, No. 12, p. 98.

Means, R.S., Company Inc. 1986. Building Construction Cost Data. 44th Annual Edition.

PEI Associates Inc. 1986. Releases During Cleaning of Equipment. Prepared for USEPA Office of Pesticides and Toxic Substances. Washington, D.C. June 30, 1986.

Rich, L.A. 1986. Drum Residue: A $ Billion Inch. Chemical Week. March 5, 1986. pp. 13-16.

Science Applications International Corporation. 1987a. Memo to project files. June 17, 1987.

Science Applications International Corporation. 1987b. Memo to project files. May 28, 1987.

Science Applications International Corporation. 1987c. Memo to project files. June 18, 1987.

Science Applications International Corporation. 1987d. Drum Reconditioning Industry Plant Files.

Science Applications International Corporation. 1987e. Personal Communications Between Richard Hergenroeder and an Industry Representative.

Touhill, Shuckrow and Associates, Inc. 1981a. Barrel and Drum Reconditioning Industry Status Profile. EPA-600/2-81-232.

Touhill, Shuckrow and Associates, Inc. 1981b. Drum Reconditioning Process Optimization. EPA-600/2-81-233.

U.S. Environmental Protection Agency. 1983. Development Document for Effluent Limitations Guidelines and Standards for the Metal Finishing Point Source Category. EPA 440/1-83/091.

U.S. Environmental Protection Agency. 1986a. Report to Congress on the Discharge of Hazardous Wastes to Publicly Owned Treatment Works. EPA 530/-SW-86-004.

U.S. Environmental Protection Agency. 1986b. Hazardous Waste Management System; Land Disposal Restrictions; Final Rule. Federal Register Vol. 51, No. 216, p. 40572.