FINAL REPORT

STATE OF CALIFORNIA

DEPARTMENT OF HEALTH SERVICES
Toxic Substances Control Division
Alternative Technology Section

Technical Support Document for:

Treatment Levels for Auto Shredder Waste

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We've Changed...

On July 17, 1991, the California Environmental Protection Agency officially came into existence and the Toxic Substances Control Program became the Department of Toxic Substances Control under that Agency. The Toxics Program is no longer affiliated with the Department of Health Services or the Health and Welfare Agency. The wording within this particular document has not been changed to indicate this new affiliation. The new mailing address follows:

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Acknowledgment

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I. Summary

Pursuant to Senate Bill (SB) 1500 (Roberti, 1986), chaptered as the Hazardous Waste Management Act of 1986, Article 7.7 of the Health and Safety Code (HSC), Division 20, the Department of Health Services (Department) must adopt treatment standards establishing the level of treatment required prior to land disposal. This report presents staff's findings of treatment technologies available to treat auto shredder waste.

Staff characterized the volumes and the chemical composition of auto shredder waste from information contained in the Hazardous Waste Information System, data submitted to the Department by the auto shredder facilities for nonhazardous classifications, and monitoring data for BKK landfill from the Los Angeles Regional Water Quality Control Board. Information on the availability and effectiveness of the applicable treatment technologies was collected from the literature, a survey of technology vendors and affected industry.

Significant amounts of auto shredder waste were and continue to be land disposed, and stored on-site. The California Waste Management Board estimated that 166,500 tons were generated in 1985 and that that amount will increase to 203,100 tons by 1995. Staff found that chemical stabilization treatment technologies for this waste are available and being used in California to reduce the level of leachable

metal constituents. Five of the eight auto shredder facilities in California are using chemical stabilization to render their waste nonhazardous. The proposed standard will impact only three auto shredder facilities and any new ones by requiring treatment of their auto shredder waste prior to land disposal.

The volume of auto shredder waste generated in California is significant. Although a majority of this waste is being treated to nonhazardous levels, there are auto shredder wastes that still must be disposed of in hazardous waste landfills and meet all applicable regulations. There are eight metals and metal compounds, and PCB's, in auto shredder waste that can cause it to be hazardous. These eight metals will be addressed by these proposed treatment standards. PCBs will not be addressed. Disposal of hazardous wastes containing PCB's is addressed by treatment standards developed by the Department specifically for PCB wastes.

This proposed treatment standard will establish allowable leachable metals from auto shredder waste. The eight metals and metal compounds in auto shredder waste that will be addressed are as follows: cadmium, hexavalent chromium, total chromium, copper, lead, mercury, nickel and zinc.

Conclusions and Findings

1. Significant volumes of auto shredder waste are generated and land disposed in California (approximately 166,500 tons in 1985).
2. Chemical stabilization technologies are available and being used in California to reduce extractable metal concentrations in auto shredder waste.
3. Adequate treatment capacity for California's volume of auto shredder waste can be made available in less than one year.

Recommendations

1. Staff recommends that regulations be adopted to establish treatment standards for auto shredder waste.
2. The proposed levels of treatment are the extractable amounts determined by the Waste Extraction Test (WET) described in Section 66700 of Title 22, the California Code of Regulations (CCR) for the following metals:

Metal	Proposed Treatment Standard (mg/l)
Cadmium	1.0
Hexavalent Chromium	5.0
Chromium	560.0
Copper	25.0
Lead	50.0
Mercury	0.2
Nickel	20.0
Zinc	250.0

3. Staff recommends a one year extension from the date of filing with the Secretary of State as the effective date for these regulations.

II. Introduction

The Hazardous Waste Management Act of 1986, (Roberti, 1986), SB 1500, chaptered as Article 7.7 of the Health and Safety Code, requires the Department of Health Services to adopt treatment standards for all hazardous waste by May 8, 1990. As a treatment standard is adopted, the affected hazardous waste will be prohibited from land disposal unless the waste has been treated in accordance with that standard (Section 25179.6(a), HSC) or receives either a variance or an exemption from this prohibition.

If the Department does not establish a treatment standard by May 8, 1990, the land disposal of any hazardous auto shredder waste can be permitted only if the waste does not contain any substances above the Soluble Threshold Limit Concentration (STLC) listed in Article 11, Title 22, CCR or if the waste has been classified as a special waste by the Department. Treated auto shredder wastes, even those that receive a nonhazardous classification, have lead concentrations above the STLC values. This will prohibit the land disposal of these wastes if a treatment standard is not established and will be burdensome for generators that cannot satisfy either condition.

III. Auto Shredder Process

Auto shredder waste is the material that remains after metallic articles such as auto bodies, appliances and sheet metal are shredded and the metals removed. The auto shredding process involves crushing; shredding; separation of ferrous and nonferrous metals from nonmetallic parts; and recovery of various metals such as copper, steel, and iron.

The shredding process begins when an automobile is fed into a hammer mill, where it is crushed to fist-sized pieces. The heavy material is conveyed to rotating magnets, which separate most of the metallic fraction from the non-metallic fraction. The metallic fraction is transported to a storage bin before being shipped to a mill or foundry; the non-ferrous fraction is further processed for metals recovery. The non-ferrous metal fraction is then fed either to a water elutriator or to an air classifier for further separation.

A water elutriator is a separator that uses an upward waterflow to separate nonferrous metals from the non-metallic fraction. Figure III-1 illustrates a shredding operation with a water elutriator. A water elutriator works on the principle that a particle falling through a fluid will accelerate under gravity until a drag force just balances the gravitational force. The water elutriator uses an upward waterflow to separate metals from non-metals. As the water is forced upward, particles with a lower density, of a larger size, or large shape flow with the water. Heavier or smaller particles are not carried by the water and move downward. Thus the water elutriator produces three products, which are:

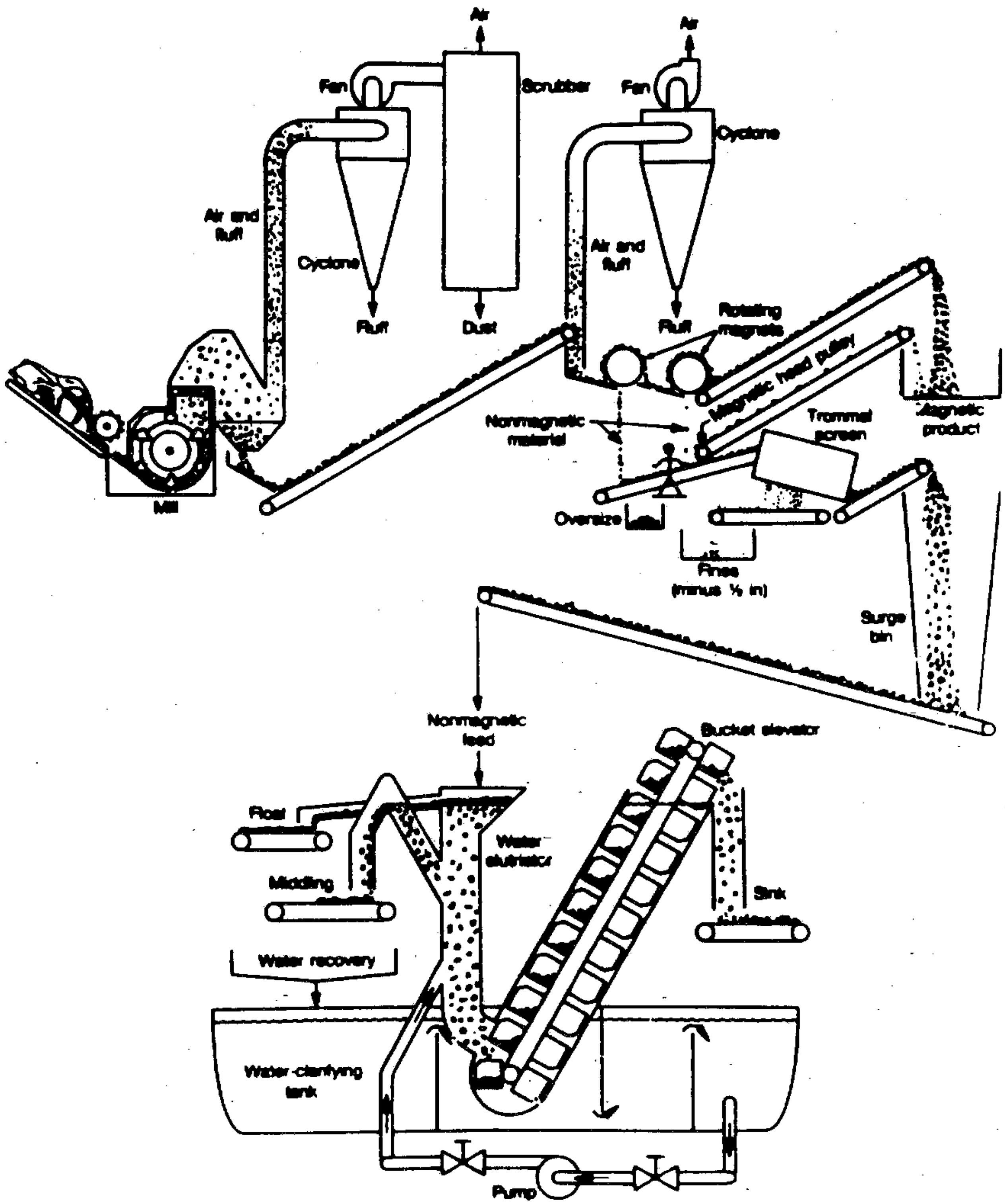
1. Float material: mostly common combustibles, fine wire, light plastics and foam.
2. Middling material: heavy plastics, light metals, rubber, glass, and rock.
3. Sink material: aluminum, copper, lead, magnesium, stainless steel, and zinc.[1]

The float and middling materials collected from the water elutriator are either treated and/or transported to a landfill for proper disposal. The sink material is sent to a smelter for metal recovery.

Another shredding method uses an air classifier to separate the nonferrous metals from the non-metallic fraction. This shredding process produces three scrap fractions: a magnetic fraction, a non-magnetic fraction, and an air fraction. In an air classifier system the magnetic fraction contains approximately 95 percent of the ferrous metal present in the original car. The non-magnetic fraction contains about 80 percent non-ferrous metals, 45 percent of non-foam plastic, 45 percent of rubber and 1 percent of iron and steel. The air fraction contains all the polyurethane foam, 25 percent of the non-foam plastic, 16 percent of the rubber, and 6 percent of the non-ferrous metals present in the original car.[2]

Figure III-1

Shredding Operation and Water Elutriator



Source : Bureau of Mines Research on Recycling Scrapped Automobiles

Background of Auto Shredder Waste Management

Prior to 1984, auto shredder waste (ASW) was not managed as hazardous waste. Auto shredder waste was found to have high levels of lead when the Waste Extraction Test used by the Department was applied. On March 1, 1984, the Department informed all generators of ASW that their waste was classified as hazardous and must be managed in accordance with hazardous waste regulations. This requirement for disposal of ASW as a hazardous waste greatly increased cost for the shredder operator and created a concern for the hazardous waste landfill operator, who wanted to reserve the volume for other, smaller volume waste with a higher profit yield than ASW. In addition, the Department was concerned about filling hazardous waste landfills with a high volume - low environmental risk hazardous waste. The Department investigated ASW further and determined that it did not pose a threat to human health or water quality if disposed at a properly maintained Class III landfill. The Department granted variances allowing disposal of ASW at Class III landfills if the shredder operator implemented a separation program to remove specific automobile parts that contained heavy metals before shredding, including lead-laden parts such as batteries, exhaust pipes, and mufflers.

Alternatives to Land Disposal of Auto Shredder Waste

Landfilling is unsatisfactory because of the large volume of ASW requiring disposal, rising disposal costs, the limited number of disposal sites, and issues of biodegradability. The alternatives to land disposal of the non-metallic shredder waste (i.e., ASW) material focus on two areas: separation, recovery and reuse; and energy recovery.

Separation, recovery and reuse of ASW requires extensive resources to obtain a stream of clean and homogeneous plastic fractions. Energy recovery might make these plastic fractions attractive as a fuel source. The high heating value of the plastic material may be used as an energy source for municipal waste incinerators. Burning material containing PVC (chlorinated plastic), including the potential release of toxic gases from incomplete combustion of acrylic plastics may make direct combustion undesirable.

On the other hand, pyrolizing the plastic and rubber residues to produce potentially valuable chemicals and fuels may be more attractive. Preliminary experiments indicate that it should be possible to pyrolize this residue to obtain a yield of 42% by weight liquid hydrocarbon, 42% char residue, and 8% gas with a heating value of about 300 - 500 BTU/std ft.[3] Ford Motor Co. and the University of Tennessee have undertaken a joint program (Department of Energy sponsored) to review pyrolysis of shredder waste.

Under the Department's Waste Reduction Grant Program, Sur-Lite Corporation has received $49,000 to investigate converting ASW to a useful gas through autothermal pyrolysis in a fluid bed unit. Initial estimate states that ASW has a heating value of approximately 5000 BTU/lb at an ash content of 50 percent by weight.[3]

IV. Other Laws Governing Auto Shredder Waste

Besides SB 1500, two other state laws affect the disposal and taxation of auto shredder waste. The following briefly discusses SB 976 (1985) and AB 1542 (1987). These laws provide for adequate and low cost disposal and exemptions from disposal and generator fees for the high volumes of ASW generated in California.

A. Senate Bill 976

SB 976 (Bergeson), which became effective October 1, 1985, required five Regional Water Quality Control Boards (RWQCBs) to prepare a list of Class III nonhazardous waste landfills (including at least one in each of the five specified water quality control regions) authorized to accept and dispose of ASW. Class III landfills are generally authorized to accept nonhazardous waste. The RWQCB's identified thirteen Class III landfills that could accept auto shredder waste.[4] Below is the list of the identified landfills:

Landfills	Location (County)
West Contra Costa*	Contra Costa
Kirby Canyon	Santa Clara
Durham Road	Alameda
Arvin	Kern
China Grade	Kern
San Timeteo	San Bernardino
Lamb Canyon	Riverside
Badlands	Riverside
Chiquita Canyon	Los Angeles
Olinda	Orange
Prima Deschecha	Orange
Miramar	San Diego
Otay	San Diego

*The only Class II facility; all other are Class III facilities.

SB 976 does not specifically require that the listed landfills accept ASW, or provides exemptions from other hazardous waste regulations including those governing storing, transporting, manifesting, and the paying of hazardous waste disposal fees. Designating ASW as nonhazardous for purposes of disposal only and retaining the hazardous designation for purposes of storage, transportation, manifesting and fees has resulted in only a few Class III landfills accepting the ASW and the disposal costs remaining high for the shredder generators.

Besides the additional cost of the fees, many Class III landfills operators are not willing to upgrade their facilities to standards required by the RWQCBs in order to accept ASW.

B. Assembly Bill 1542

AB 1542 (Bradley, Peace), which became effective January 1, 1988, exempted untreated ASW disposed in an appropriate Class III landfill from specified hazardous waste disposal fees and taxes. The AB 1542 exemption provision was effective only if the generator carried out specified monitoring, recordkeeping, and testing requirements; if the Department determined that the waste would not pose a threat to human health or water quality; and that the waste was disposed within a certain length of time. The provisions of AB 1542 were rescinded January 1, 1989.

On November 30, 1987, the Department rescinded all disposal variances issued to ASW generators during 1984 and 1985. This recission allowed auto shredder facilities sufficient time to apply to the Department for a new variance prior to enactment of AB 1542. Pursuant to AB 1542, ASW must be analyzed for both total and soluble concentrations of chromium, cadmium, copper, lead, mercury, nickel, and zinc, and total concentrations of polychlorinated biphenyls.

Of the eight auto shredder facilities in California, only two utilized the AB 1542 nonhazardous disposal provision: Levins Metal Corporation and Schnitzer Steel. Of the other six facilities, four have nonhazardous waste classifications from the Department (Ferromet, Hugo Neu-Proler, Clean Steel, and Orange County Steel Salvage) and two are no longer disposing ASW (Pacific Steel and Golden State Metal).

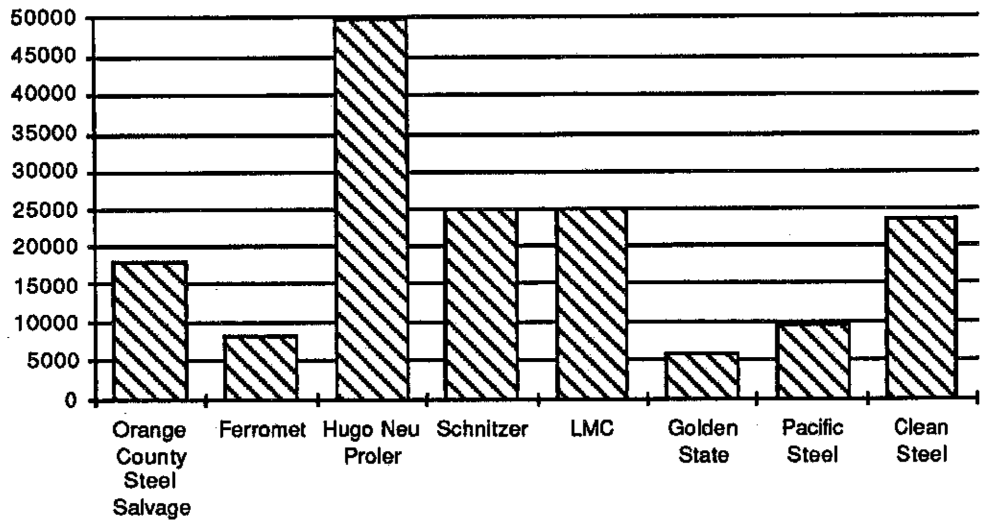
V. Waste Generated and Disposed

Auto shredder waste originates from the shredding of automobiles, major household and industrial appliances, and other scrap for their recyclable metal content. Over 9 million cars are now deregistered each year in the United States, and approximately 90 percent are recycled for their metal content. These junked cars are the most recycled of post consumer products, its steel scrap alone representing 30-40 percent of that category.

Auto shredder waste is the material that remains after metallic articles such as auto bodies, appliances and sheet metal are shredded and the metals removed. A significant volume of ASW is generated in California; in 1985, the auto shredder industry generated approximately 166,500 tons of waste. California's eight auto shredder facilities' production of ASW ranged from Golden State Metals, generating only 6000 tons per year, to Hugo Neu-Proler, generating 50,000 tons per year. Figure V-1 illustrates the volume generated for each facility in 1985. Manifested ASW for 1985 totaled only 61,650 tons. Staff analyzed the data from the Hazardous Waste Information System (HWIS), the California Waste Management Board, and the Department files on waste classification requests. The following discussion provides information on the volumes and management of ASWs.

Figure V-1

AUTO SHREDDER WASTE GENERATED IN 1985 (TONS)



Source: The Need for Long Term Additional Disposal Capacity for Shredder Waste, California Waste Management Board, March 1987

The Hazardous Waste Information System, which is a compilation of data provided by generators on manifests, was used to determine the volume of hazardous ASW deposited in hazardous waste landfills. In 1986, 103,046 tons of ASW were manifested in California, with a major portion (79,000 tons) from Clean Steel, managed under a disposal variance. In February, 1986 Hugo Neu-Proler received a nonhazardous waste classification from the Department and thus, its wastes were not reported.

In 1987, the Department added California Waste Code 613 for ASW for use in manifesting and reporting. In 1987, only 9437 tons of ASW were manifested. This decrease was attributed in part by Clean Steel receiving a nonhazardous waste classification in September of 1987, and Ferromet receiving a nonhazardous waste classification in December of 1987. In first half of 1988, 22,838 tons of ASW were manifested, with a major portion (19,499 tons) generated by Schnitzer Steel. With the provisions of AB 1542, Schnitzer Steel disposed of its waste in a RWQCB designated landfill during 1988. Figure V-2 summarizes the volumes manifested from 1985 to the first half of 1988.

The manifest data did not provide a good estimate of the volumes of ASW generated in California and is inconsistent because some treated waste was not hazardous and needed no reporting, other waste stored onsite, and no reporting of hazardous waste managed with a disposal variance. Because of these reasons, this report will use the 1985

Figure V-2
Auto Shredder Waste Manifested

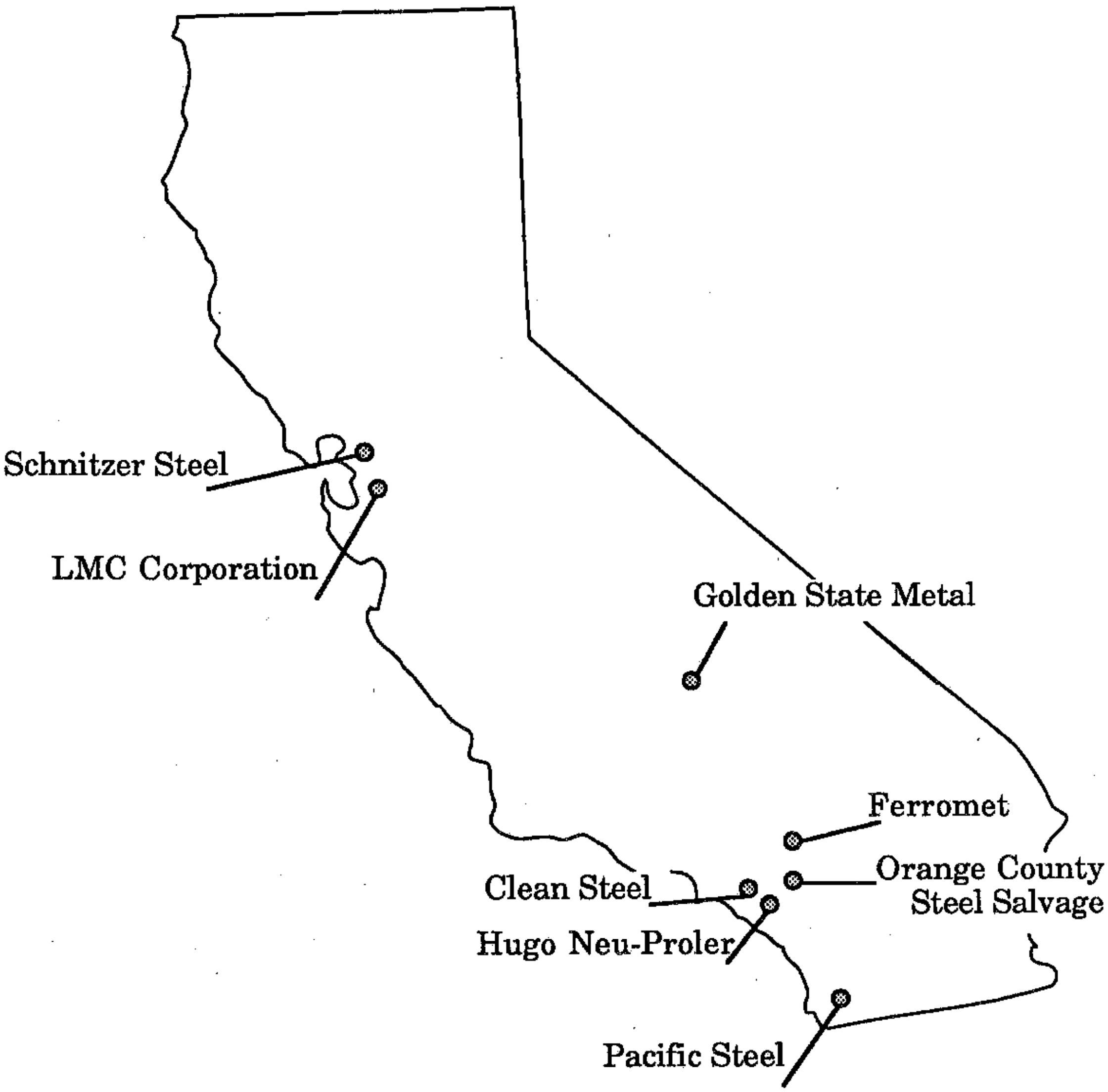
	Tons	HWIS File Source
ASW Manifested in 1985		
Hugo Neu-Proler	3,496	History
Clean Steel	5,050	History
	31,874	Suspense
Hugo Neu-Proler	19,233	Suspense
Pacific Steel	1,997	Suspense
Total for 1985 (tons)	**61,650**	
ASW Manifested in 1986		
Pacific Steel	4,810	History
Clean Steel	53	History
Hugo Neu-Proler	2,904	History
Hugo Neu-Proler	4,137	Suspense
Pacific Steel	12,123	Suspense
Clean Steel	79,021	Suspense
Total for 1986 (tons)	**103,048**	
ASW Manifested in 1987		
Golden State Refinery	15	History
Pacific Steel	884	Suspense
Schnitzer Steel	2,844	Suspense
Unknown	22	Suspense
Total for 1987 (tons)	**3,765**	
ASW Manifested in first six month of 1988		
Pacific Steel	3,066	Suspense
Schnitzer Steel	19,500	Suspense
Unocal Service Station #2121	101	Suspense
Unknown	163	Suspense
Total for first half of 1988 (tons)	**22,830**	

Source: Hazardous Waste Information System, DHS

Note: HWIS categories data from manifests that have missing item(s) of information in a separate file called "SUSPENSE"; data from manifests with completed items if information are noted as "HISTORY" values from the California Solid Waste Management Board as a basis for ASW generated in California.

The locations of the eight auto shredder facilities in California are shown in Figure V-3. Six of the facilities are located in the southern part of the state. These six facilities generated 70 percent of the ASW generated in 1985.

Figure V-3
Auto Shredder Facilities in California



Facilities with Inline Treatment

Five auto shredder facilities have inline treatment which renders their auto shredder waste nonhazardous: Hugo Neu-Proler, Ferromet, Clean Steel, Schnitzer Steel and Orange County Steel Salvage. Schnitzer Steel has a nonhazardous waste classification; however, from July 1988 to January 1989 this facility did not treat their ASW, but rather disposed of their ASW under the provisions of AB 1542. Using the volumes generated in 1985, the facilities with treatment accounts for 107,500 of the 166,500 tons(65%). Nonhazardous waste generated by treatment facilities is not regulated by the Department. But in the event that the treated waste changes to the extent that the Department's determination can no longer be supported by previously submitted information, these facilities must manage their treated waste as a hazardous waste.

Regional Water Quality Control Boards Designated Landfills

Currently four landfills (West Contra Costa landfill in Richmond, Altamount landfill in Livermore, BKK landfill in West Covina and Prima Deschecha in Orange County) have requested and received approval from the Regional Water Quality Control Boards for the disposal of ASW. BKK landfill accepts ASW from Hugo Neu-Proler, Clean Steel, Inc. and Ferromet, Inc. These companies are allowed by the Los Angeles Regional Water Quality Control Board to dispose of the following volumes:

Company	Daily	Annual
Hugo Neu-Proler	300 tons	72,000 tons
Clean Steel, Inc.	150 tons	36,000 tons
Ferromet, Inc	90 tons	21,000 tons.[5]

Converting these daily values to an annual total volume, 129,000 tons per year are allowed to be disposed in BKK landfill.

West Contra Costa Landfill accepts ASW from Levins Metal Corporation. The annual volume disposed is 25,000 tons from Levins Metal Corporation. Orange County's landfill, Prima Deschecha accepts newly generated ASW from Orange County Steel Salvage at a rate of 75 tons per day or 18,000 tons per year. Altamount landfill has begun accepting Schnitzer Steel ASW at a rate of 25,000 tons per year.

Summary of ASW Management at Auto Shredder Facilities

To summarize current ASW management, below is a brief discussion of each facility's current status. The volume of treated ASW is 125,500 tons; the volume of disposed untreated ASW is 25,000. There are also approximately 87,000 tons of untreated ASW stored on-site. Below is the approximate volumes stored by the following facilities:

Ferromet, Inc	9,000 tons stored on-site
Clean Steel, Inc.	3,000 tons stored on-site
Golden State Metal	15,000 tons on-site
Orange County Steel	60,000 stored on-site.[6]

Hugo Neu-Proler

Hugo Neu-Proler was granted a nonhazardous waste classification on February 21, 1986. It is using a treatment process using a reagent known as K-20, and disposing of 50,000 tons per year at the BKK landfill in West Covina. No auto shredder wastes are stored on site.

Ferromet, Inc.

Ferromet was granted a nonhazardous waste classification on December 7, 1987. The facility utilizes the K-20 process and disposes of 9,000 tons per year of the treated ASW at BKK landfill. An additional 9,000 tons of untreated ASW is stored on-site and under a variance is being treated to nonhazardous levels and disposed.

Clean Steel

Clean Steel was granted a nonhazardous waste classification on September 24, 1987. The K-20 process is used to treat its ASW, and 24,000 tons are disposed at BKK landfill per year. An additional 3,000 tons are stored on-site. Clean Steel received a variance in April 1988; to treat the on-site untreated ASW.

Schnitzer Steel

Schnitzer Steel received its AB 1542 disposal variance on February 25, 1988. Schnitzer presently disposes of its ASW at Altamount Landfill at a rate of 25,000 tons per year. On June 13, 1988, the Department granted a nonhazardous waste classification to Schnitzer for K-20 treated ASW. Schnitzer had continued to use the AB 1542 variance to dispose of its waste instead of treating during 1988.

LMC Corporation

LMC received its AB 1542 disposal variance on February 25, 1988. LMC disposed 25,000 tons of ASW at the West Contra Costa landfill is presently incorporating the use of the K-20 process.

Golden State Metals

Golden State has 15,000 tons of untreated ASW stored on-site. On January 13, 1988, the Department revoked a storage variance that allowed the facility to store on-site indefinitely.

Pacific Steel, Inc.

Pacific Steel had 15,000 tons of untreated ASW stored on-site. It asked for an AB 1542 disposal variance from the Department, which was denied. Under a court order, it has land disposed some of the stored ASW in Utah. The rest of the on-site material was removed and shipped to Mexico. It has applied for clarification from the Depatment regarding a recycling exemption for the newly generated fluff used in brick manufacturing in Mexico.

Orange County Steel Salvage(OCSS)

OCSS is treating newly generated ASW by the ToxCo process and disposing of it at Prima Deschecha landfill, which is operated by Orange County. OCSS received its nonhazardous waste classification on December 19, 1988. It disposes 18,000 tons per year. OCSS also has a 60,000 ton pile of ASW containing hazardous levels of PCBs onsite.

VI. Waste Characterization

To determine what hazardous constituents cause ASW to be hazardous, staff reviewed available data on the composition of untreated ASW. The following discusses the extractable levels and total concentrations of metals in untreated ASW. Staff reviewed the analytical data on untreated ASW from three facilities, and found that the metals of concern are cadmium, hexavalent chromium, total chromium, copper, lead, mercury, nickel and zinc.

Figures VI-1 to VI-7 represent the 95 percent confidence interval for extractable concentrations in mg/1 of the metals listed above in untreated waste. Figures VI-8 to VI-14 show the total concentrations of these metals in ASW at the 95 percent confidence interval.

The one-sided 95 percent confidence interval was used to illustrate the range of the metal concentrations found in untreated auto shredder waste. The basic assumption in deriving the confidence interval is that the data follows a normal distribution or the number of samples is sufficiently large and are independent of each other.[7] Given the mean and standard deviation of samples of a certain size from an approximately normal population, a confidence interval can be calculated for the true mean. Appendix A shows the critical values for the t distribution.

The governing equation for upper one-sided confidence interval is;

$$\mu < X + T(alpha/2)*(S/\sqrt{N})$$

where;

X = Estimated Mean

S = Standard Deviation

N = Number of samples

μ = True Mean

T(alpha/2) = The t value with n-1 degrees of freedom.

Figure VI-1 shows that extractable cadmium in ASW is above the hazardous level (STLC = 1.0 mg/l). Figure VI-2 shows that extractable chromium in ASW is below the hazardous level (STLC = 5.0 mg/l for hexavalent chromium and 560 mg/l for chromium (III) and chromium compounds).

Figure VI-3 shows that extractable copper in ASW is above the hazardous level in some instances (STLC = 25.0 mg/1). Only the Pacific Steel data showed a hazardous level for copper. Figure VI-4 shows that extractable lead in ASW is above the hazardous level (STLC = 5.0 mg/l). All three facilities have soluble lead concentrations well above the hazardous level.

Figure VI-5 shows that extractable mercury in ASW is below the hazardous level, (STLC = 0.2 mg/l). Figure VI-6 shows that extractable nickel in ASW is below the hazardous level (STLC = 20.0 mg/1). Figure VI-7 shows that extractable zinc in ASW is above the hazardous level (STLC = 250 mg/l).

Figure VI-1
Extractable Levels of Cadmium in Untreated ASW

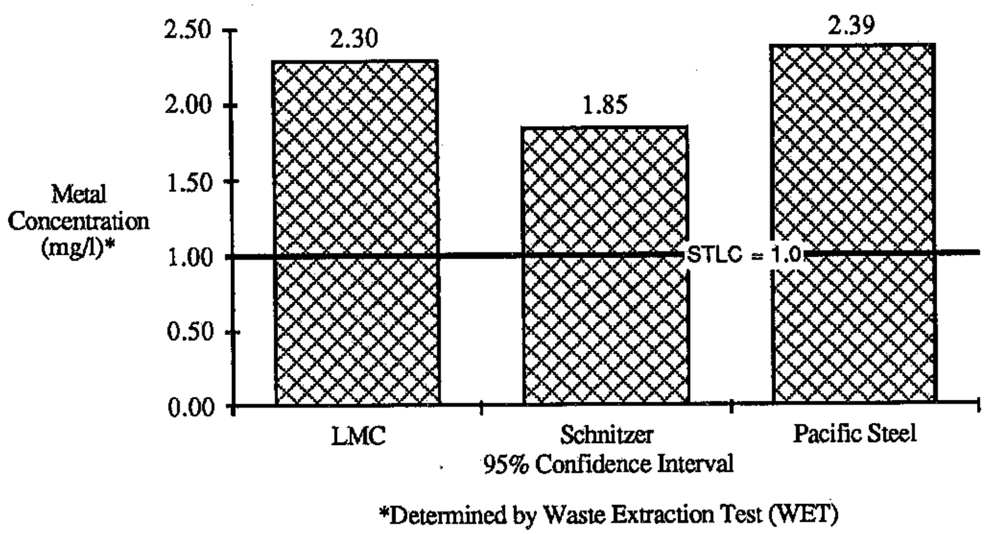


Figure VI-2
Extractable Levels of Chromium in Untreated ASW

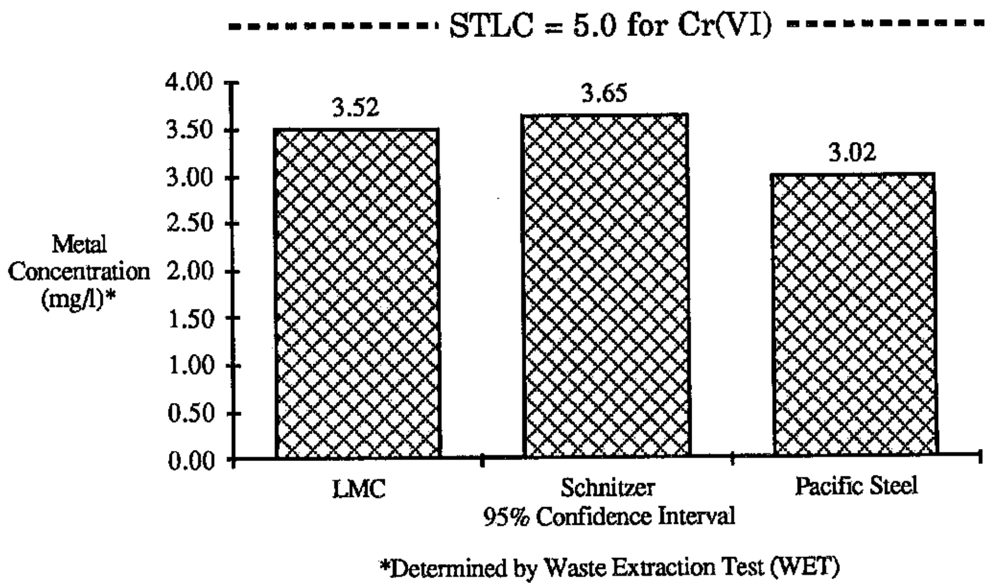
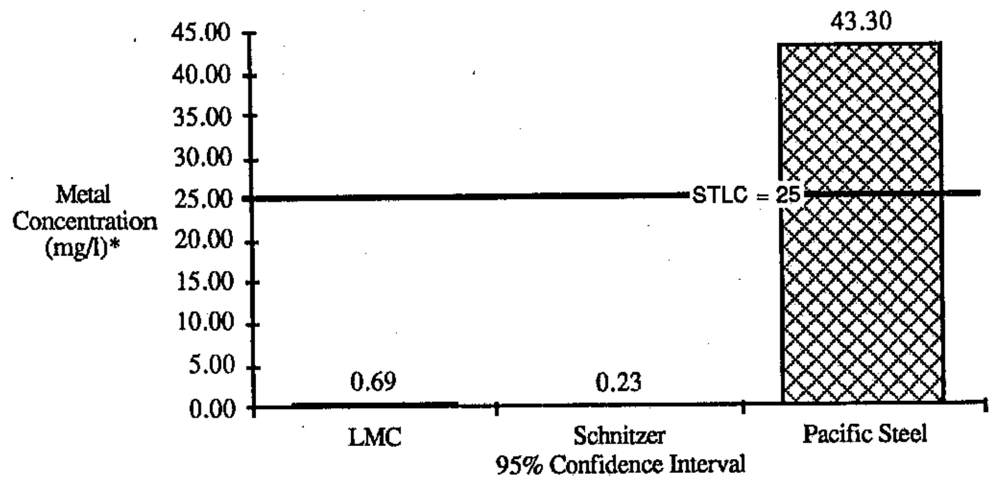
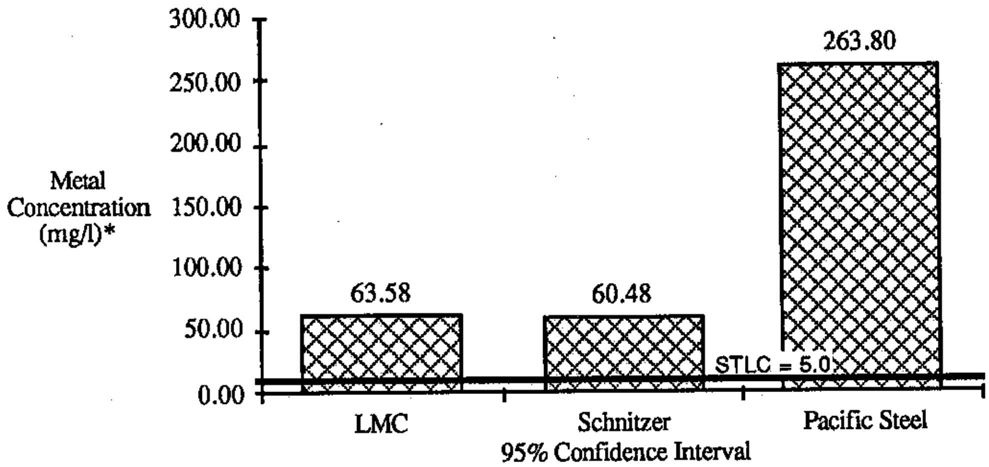


Figure VI-3
Extractable Levels of Copper in Untreated ASW



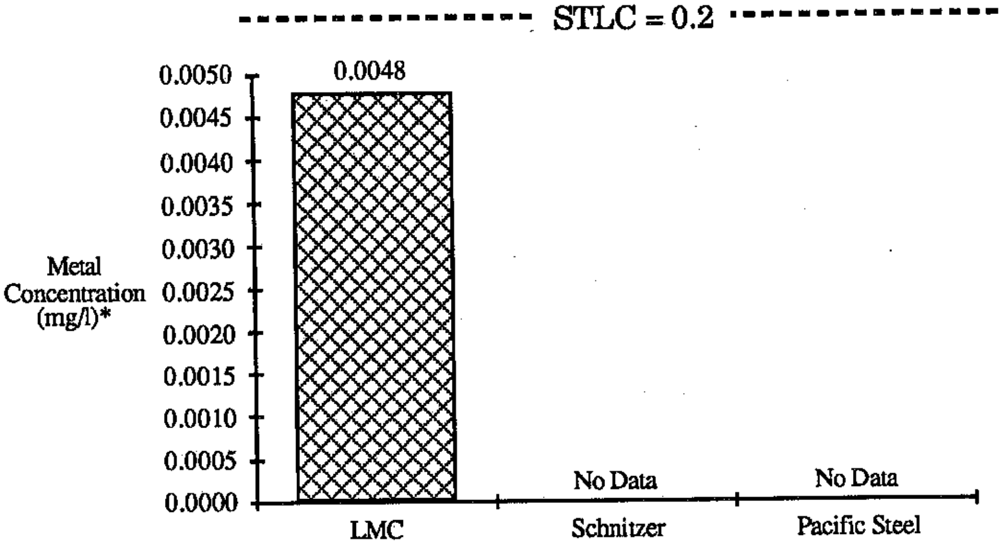
*Determined by Waste Extraction Test (WET)

Figure VI-4
Extractable Levels of Lead in Untreated ASW



*Determined by Waste Extraction Test (WET)

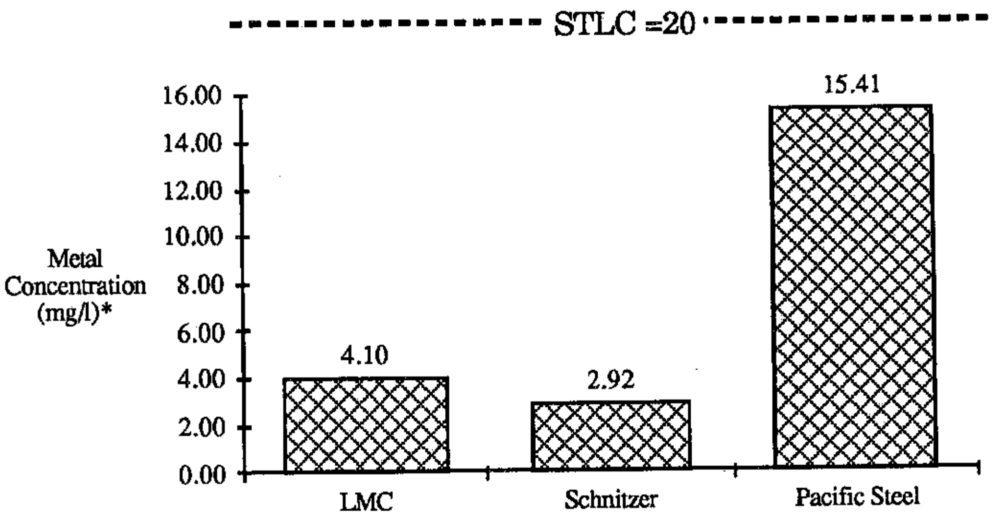
Figure VI-5
Extractable Levels of Mercury in Untreated ASW



95 % Confidence Interval

*Determined by Waste Extraction Test (WET)

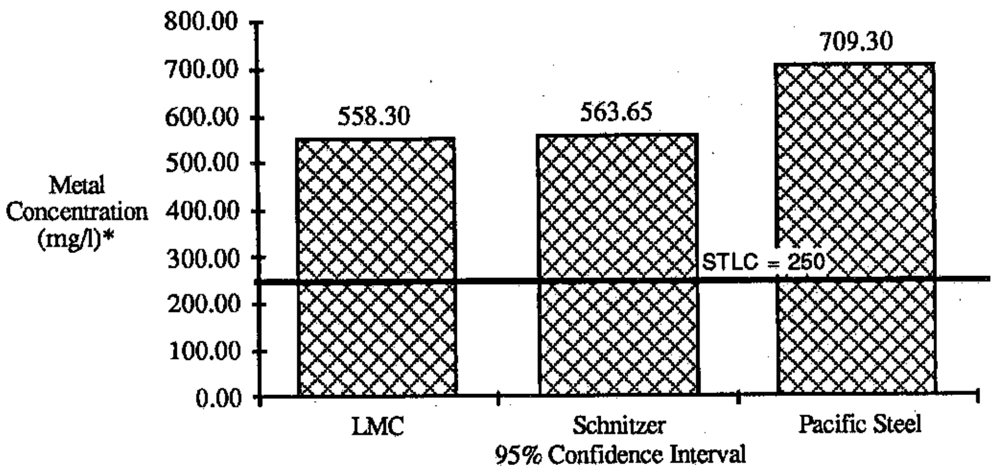
Figure VI-6
Extractable Levels of Nickel in Untreated ASW



95% Confidence Interval

*Determined by Waste Extraction Test (WET)

Figure VI-7
Extractable Levels of Zinc in Untreated ASW



*Determined by Waste Extraction Test (WET)

Figure VI-8 shows that the 95 percent confidence interval of total concentration for cadmium in untreated ASW is below the hazardous level (TTLC = 100 mg/kg). Figure VI-9 shows that the 95 percent confidence interval of total concentration for chromium in untreated ASW is below the hazardous level (TTLC = 500 mg/kg).

Figure VI-10 shows that the 95 percent confidence interval of total concentration for copper in untreated ASW is above the hazardous level (TTLC = 2500 mg/kg). Figure VI-11 shows that the 95 percent confidence interval of total concentration for lead in untreated ASW is above the hazardous level (TTLC = 1000 mg/kg).

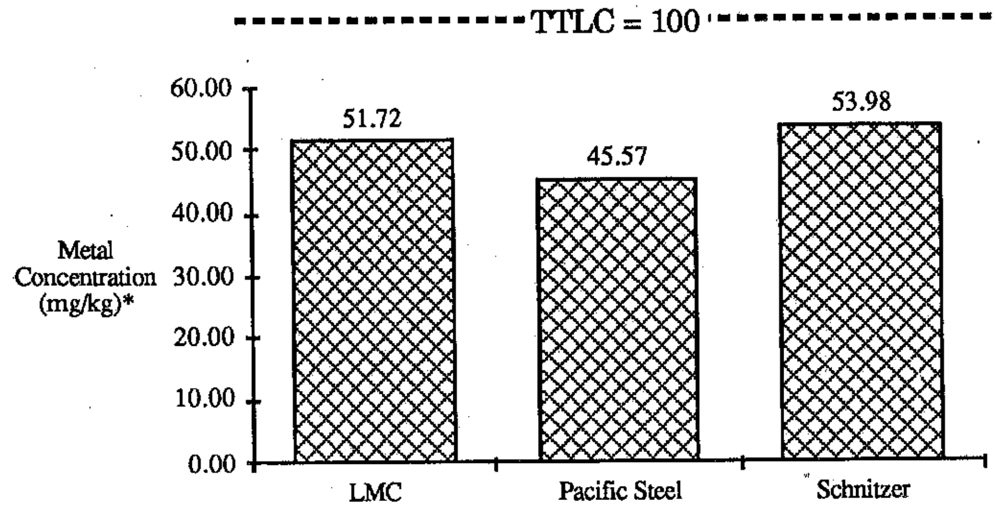
Figure VI-12 shows that the 95 percent confidence interval of total concentration for mercury in untreated ASW is below the hazardous level (TTLC = 20 mg/kg). Figure VI-13 shows that the 95 percent confidence interval of total concentration for nickel in untreated ASW is below the hazardous level (TTLC = 2000 mg/kg).

Figure VI-14 shows that 95 percent confidence interval for total concentration of Zinc in untreated ASW is above the hazardous level (TTLC = 5000 mg/kg).

<u>Summary of Untreated Waste</u>

The untreated auto shredder waste is hazardous because of extractable levels of four metal compound: cadmium, copper, lead, and zinc. The total concentrations of several metals, including copper, lead, and zinc, also cause auto shredder waste to be considered hazardous.

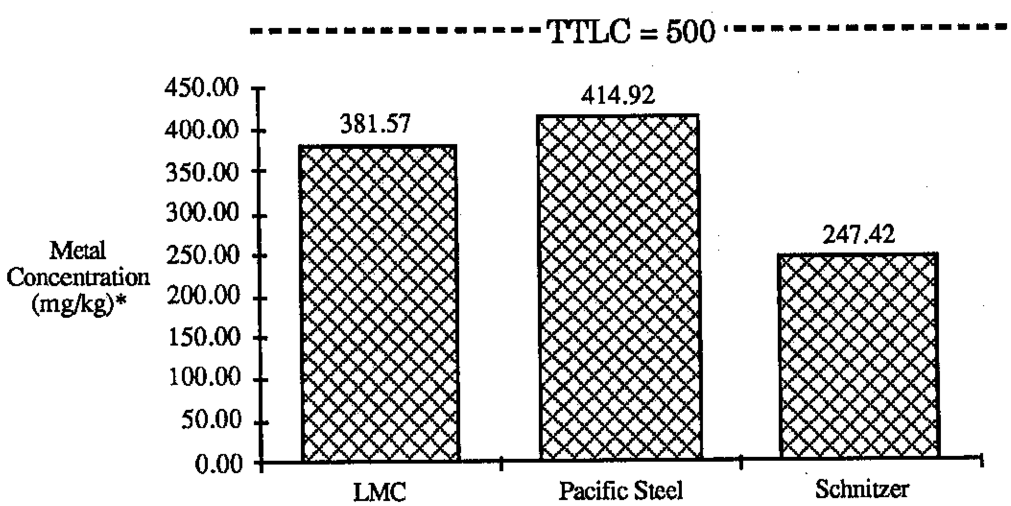
Figure VI-8
Total Concentration of Cadmium in Untreated ASW



95% Confidence Interval

*Determined by Waste Extraction Test (WET)

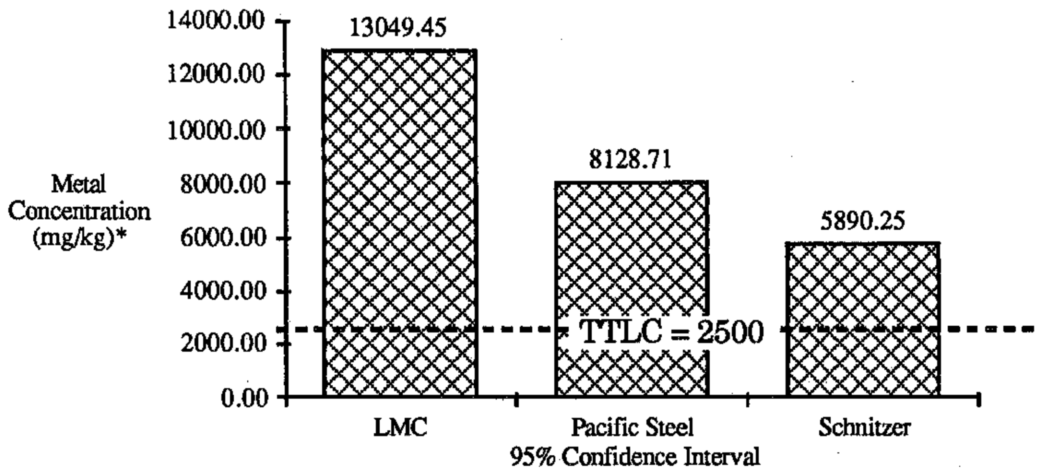
Figure VI-9
Total Concentration of Chromium in Untreated ASW



95% Confidence Interval

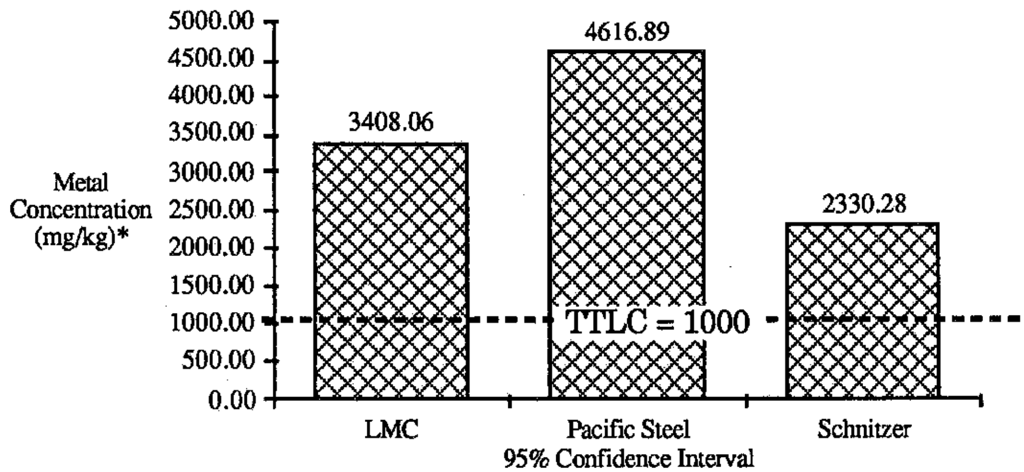
*Determined by Waste Extraction Test (WET)

Figure VI-10
Total Concentration of Copper in Untreated ASW



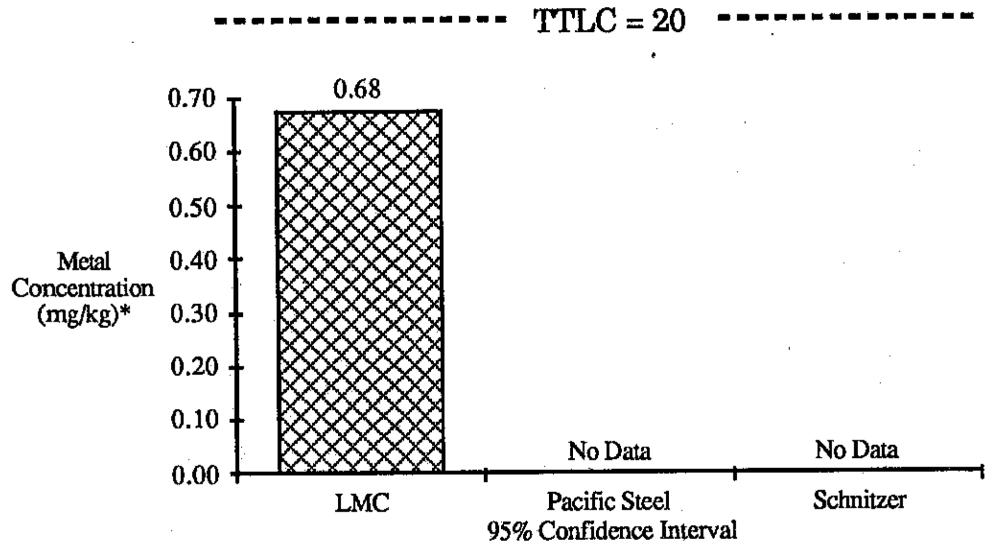
*Determined by Waste Extraction Test (WET)

Figure VI-11
Total Concentration of Lead in Untreated ASW



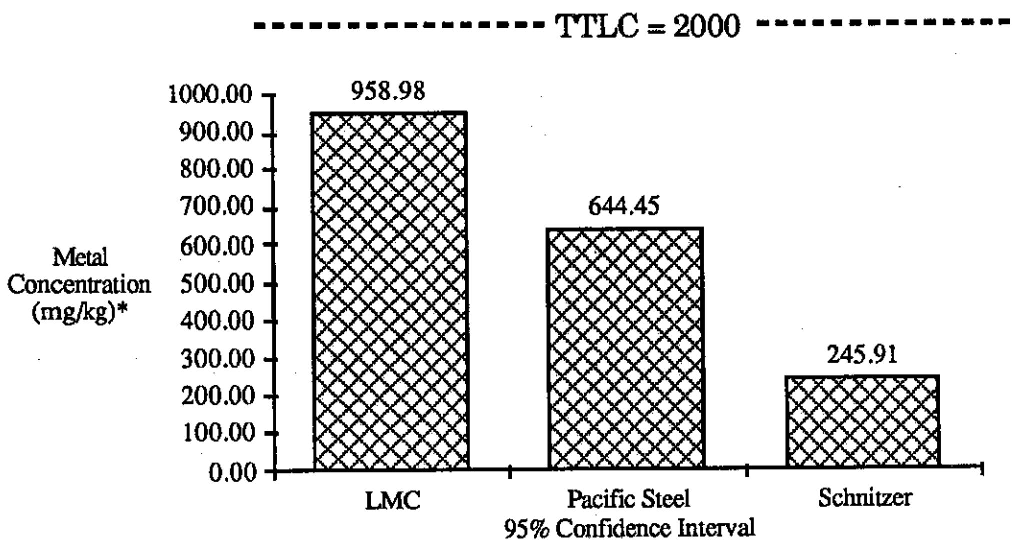
*Determined by Waste Extraction Test (WET)

Figure VI-12
Total Concentration of Mercury in Untreated ASW



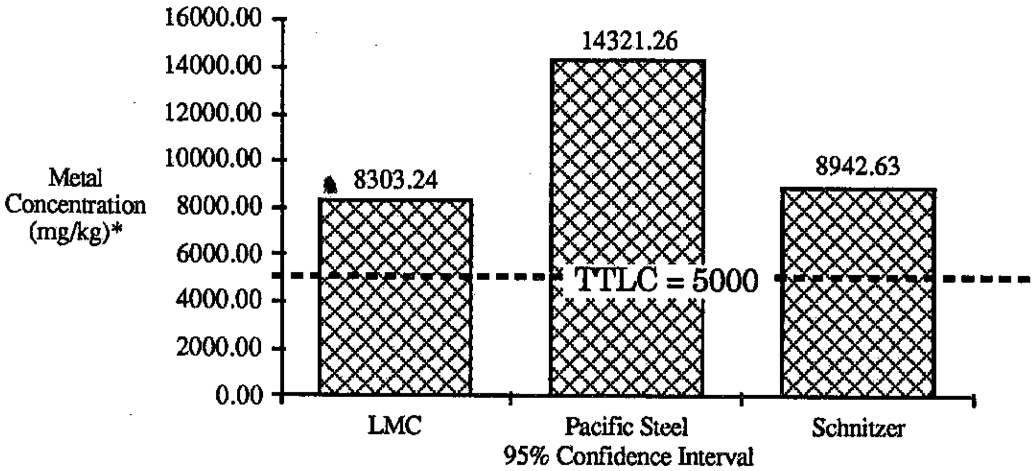
*Determined by Waste Extraction Test (WET)

Figure VI-13
Total Concentration of Nickel in Untreated ASW



*Determined by Waste Extraction Test (WET)

Figure VI-14
Total Concentration of Zinc in Untreated ASW



*Determined by Waste Extraction Test (WET)

VII. Demonstrated Treatment Technologies-Chemical Stabilization

Five auto shredder facilities are now treating their waste. Four of these are using a chemical stabilization technology called the Trezak Process (also known as K-20). Orange County Steel Salvage is using ToxCo Inc. treatment process which renders the treated ASW nonhazardous.

The Trezak Process which generally does not result in a substantial volume increase is based on the use of a silicate-based system with a cementing agent, such as lime. The Trezak process was first demonstrated at the Hugo Neu-Proler auto shredder facility located at Terminal Island. The untreated residue from the auto shredding process contained soluble lead concentrations of 100 to 300 mg/l. Concentrations of other metals, including cadmium, and zinc, were found to have the following soluble levels, cadmium, 0.8 to 4.0 mg/l and zinc, up to 2000 mg/l.[8]

The silicate used is the brand name K-20/Lead In Soil contaminated control system by Lopate Enterprises, Inc. Typically, K-20 consist of an equal mixture of silicate solution and a catalyst, which usually contains a dispersing agent. The mixture is prepared prior to use and treatment is completed by mixing the silicate-wetted residue with a cementing agent. The mix ratio of K-20 and the cementing agent is optimized and controlled to achieve satisfactory levels of metal. The developer of the Trezak Process postulates that a lead metasilicate, which is an insoluble precipitate, is formed during the treatment.

The treatment process is incorporated into the auto shredding process after the shredded material is screened to separate the larger fluff (greater than 1 inch) from the smaller. The smaller is then fed to a pugmill or blender, along with 3 to 5 percent cement agent, a silicate solution and water. The treated material is passed under a metal separator for further recovery before being stockpiled. The material is then allowed to dry and cure for 2-4 days before testing. The larger nonhazardous material is disposed at a local landfill.

Without the cementing agent, the treatment does not adequately reduce the cadmium and zinc. Lime or other cementing agents may be added at the pugmill mixing. This treatment reduces the soluble level of metals as follows: lead, 92 to 43 mg/l; cadmium, 3.4 to 0.2 mg/l; and zinc, 1900 to 240 mg/l.

The ToxCo treatment process at Orange County Steel Salvage is incorporated inline similar to the other facilities. The silicate solutions used were developed by ToxCo and contain the similar chemicals as in Lopate. The system is similar to the Trezak process and results in fixation and stabilization of the metal constituents.

Treatment Cost

The following costs were submitted to the Department by the auto shredder facilities and treatment vendor in responses to a survey.

ToxCo, Inc. estimated that their fluff treatment system had a capital cost of $25,000 to $75,000 depending on the size of the unit and an operating cost of $10.00 per ton of auto shredder fluff. ToxCo estimates a plant life of 5 years.

Schnitzer Steel installed a treatment unit in 1987. A capital cost of $120,000 was needed for the unit that's designed to treat 35,000 tons per year. The treatment cost is $10 per ton of ASW. Schnitzer Steel disposal cost is $35 per ton which includes a transportation cost of $7 per ton of ASW.

Ferromet installed a treatment unit in 1987 at a capital cost of $70,000. They expect the plant life of 15 years. The combined treatment and disposal cost is $27 per ton of ASW.

Treatment Capacity

Because the treatment process for ASW are inline, all auto shredder facilities that have this treatment can treat newly generated waste without a hazardous waste facility permit. The facilities have the option, as some have exercised, to receive a permit variance to treat stored ASW or to apply for hazardous waste treatment permit.

Trezak Group, Inc. has a transportable treatment unit which can treat at a rate of 65 tons per hour. The unit has as yet treated auto shredder waste only at a pilot plant, but staff believes that the process could treat ASW to a nonhazardous level. Only three facilities remain to implement a treatment process; staff found that stabilization processes are readily available and estimates that such systems can be installed at each facility within a year of the date of promulgation. Because no hazardous waste facility permit is required for inline treatment, staff believes an effective date of 1 year after promulgation of the regulations is adequate for auto shredder facilities to find applicable treatment for their wastes.

VIII. Determination of Treatment Levels

To determine the feasible levels of treatment, staff collected analytical data on treated ASW from: Schnitzer Steel, Ferromet, Clean Steel, and Hugo Neu-Proler data. Data on Schnitzer Steel treated ASW came from its nonhazardous waste classification submittal. The data from the other three facilities is required as part of the Los Angeles Regional Water Quality Control Board monitoring of the BKK landfill. The data in Appendix B were reported in the 1987 annual report and March 1988 report. All four facilities are working with the Trezak Process and have received nonhazardous waste classifications from the Department.

The following graphs represent extractable metal concentrations for treated ASW. Figure VIII-1 gives the 95 percent confidence interval for cadmium concentrations found in ASW. The chart shows that all of the treated waste is below the STLC level of 1.0 mg/l. The proposed treatment standard for cadmium in ASW is 1.0 mg/l.

Figure VIII-2 gives the 95 percent confidence interval for chromium concentrations found in ASW. The chart shows that level of treated waste is below the STLC level of 5.0 mg/l for hexavalent chromium. The proposed treatment standard for hexavalent chromium in ASW is 5.0 mg/l. The proposed treatment standard for total chromium is 560 mg/l.

Figure VIII-3 gives the 95 percent confidence interval for copper concentration found in ASW. All of the treated waste is below the STLC level of 25 mg/l. The proposed treatment standard for copper in ASW is 25.0 mg/l.

Figure VIII-4 gives the 95 percent confidence interval for lead concentration found in ASW. All of the treated waste is above the STLC level of 5.0 mg/l. The proposed treatment standard for lead in ASW is 50 mg/l. This value is being proposed to be consistent with the Department's historical policy of classifying ASW as nonhazardous if the lead concentration is above 5.0 but less than 50 mg/l and all other hazardous criteria are acceptable.

Figure VIII-5 gives the 95 percent confidence interval for mercury concentrations found in ASW, which is below the STLC level of 0.2 mg/l. The proposed treatment standard for mercury in ASW is 0.2 mg/l.

Figure VIII-6 gives the 95 percent confidence interval for nickel concentrations found in ASW, which is below the STLC level of 20 mg/l. The proposed treatment standard for nickel in ASW is 20 mg/l.

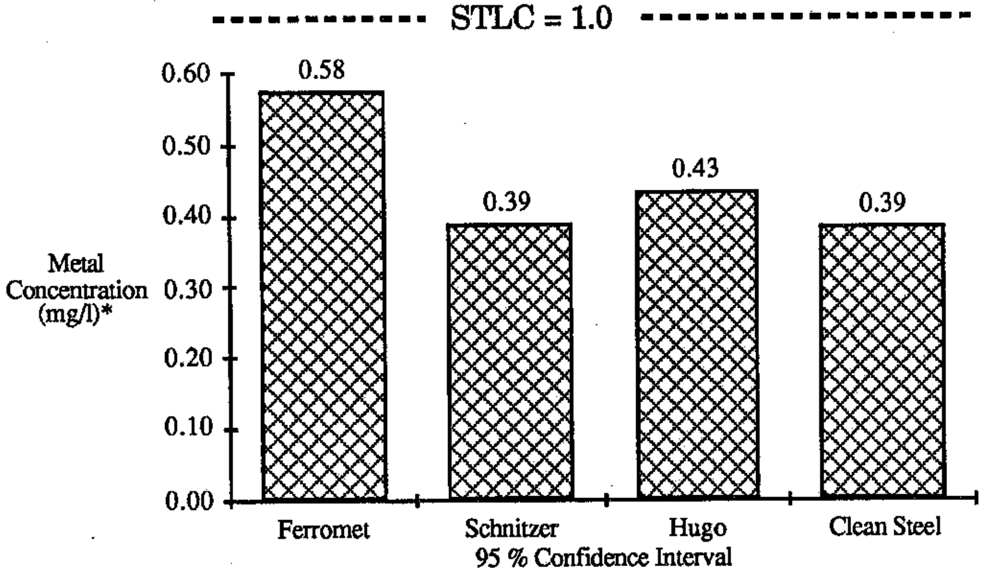
Figure VIII-7 gives the 95 percent confidence interval for zinc concentrations found in ASW, which is below the STLC level of 250 mg/l. The proposed treatment standard for zinc in ASW is 250 mg/l.

The proposed treatment standard levels are as follow:

Metal	Proposed Treatment Standard (mg/l)	STLC(mg/l)
Cadmium	1.0	1.0
Hexavalent Chromium	5.0	5.0
Chromium	560	560
Copper	25	25
Lead	50	5.0
Mercury	0.2	0.2
Nickel	20	20
Zinc	250	250

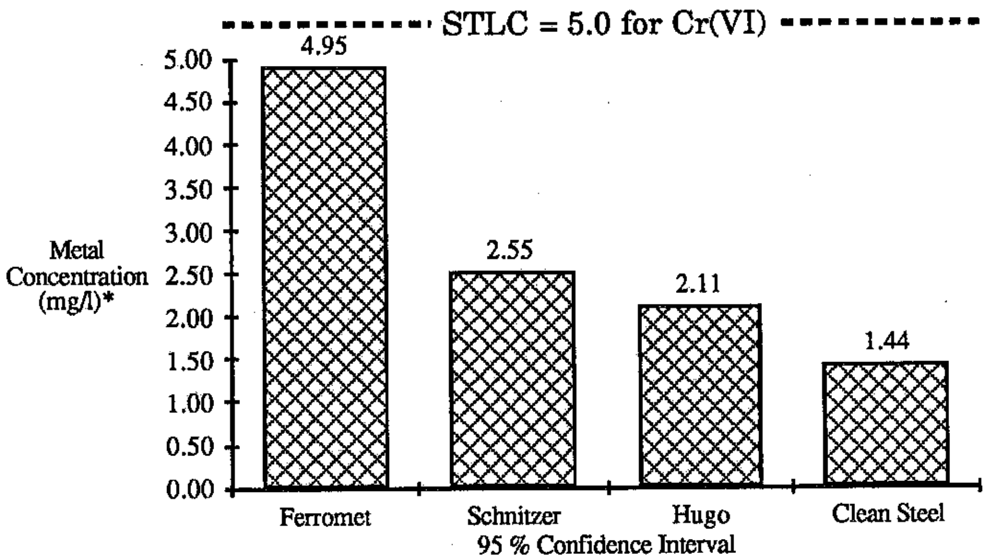
Because the applicable treatment processes cannot reduce the total concentration of metals, except by dilution, the treatment standard will only require that the extractable levels be met. To determine compliance with the proposed treatment standards, any sample of ASW must not exceed the proposed levels. All samples must be extracted using the Waste Extraction Test referenced in Article 11, Title 22, CCR and the extract must be analyzed using atomic absorption or inductively coupled plasma atomic emission spectrometry to determine the levels of metal compounds.

Figure VIII-1
Extractable Levels of Cadmium in Treated ASW



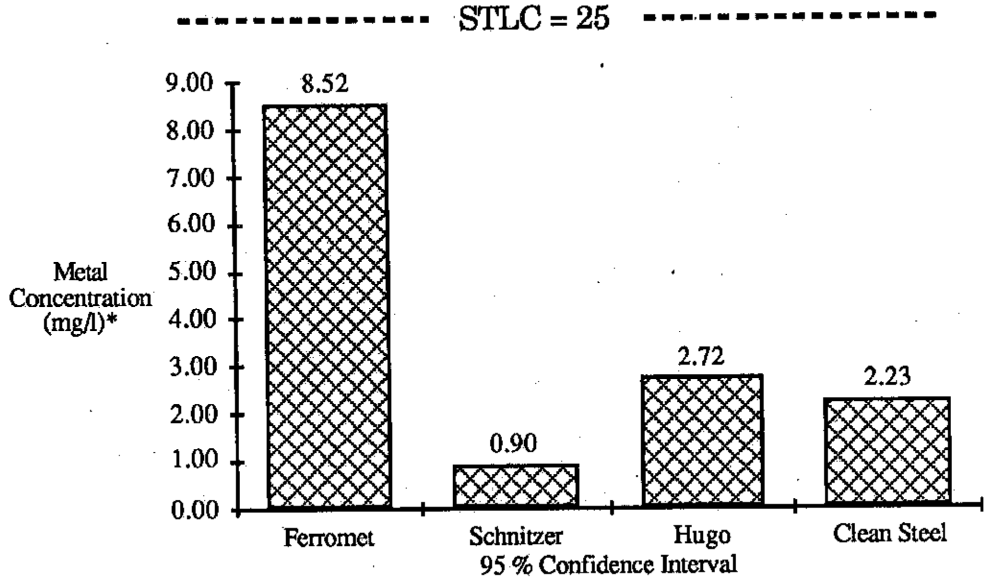
*Determined by Waste Extraction Test (WET)

Figure VIII-2
Extractable Levels of Chromium in Treated ASW



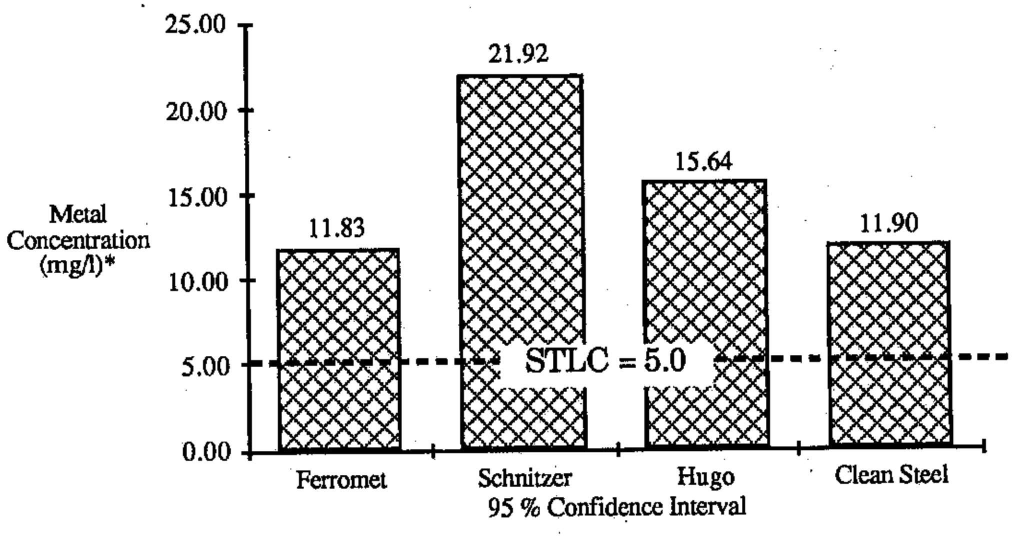
*Determined by Waste Extraction Test (WET)

Figure VIII-3
Extractable Levels of Copper in Treated ASW



*Determined by Waste Extraction Test (WET)

Figure VIII-4
Extractable Levels of Lead in Treated ASW



*Determined by Waste Extraction Test (WET)

Figure VIII-5
Extractable Levels of Mercury in Treated ASW

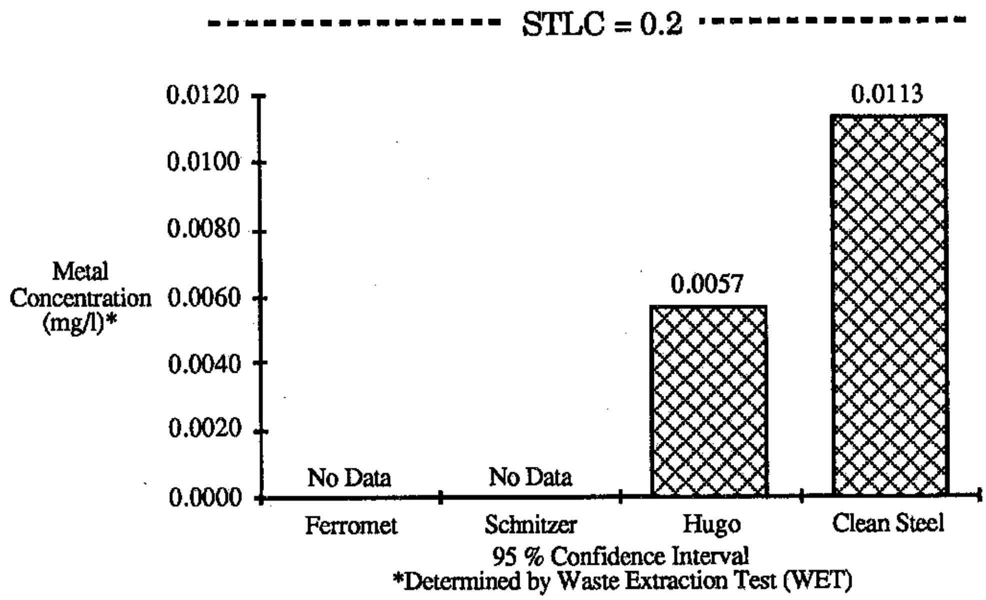


Figure VIII-6
Extractable Levels of Nickel in Treated ASW

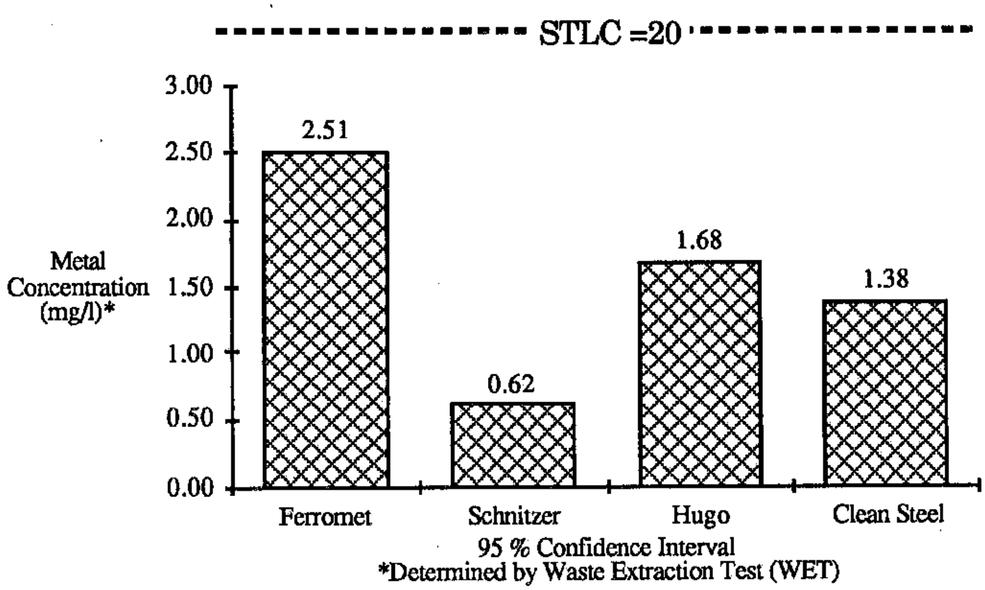
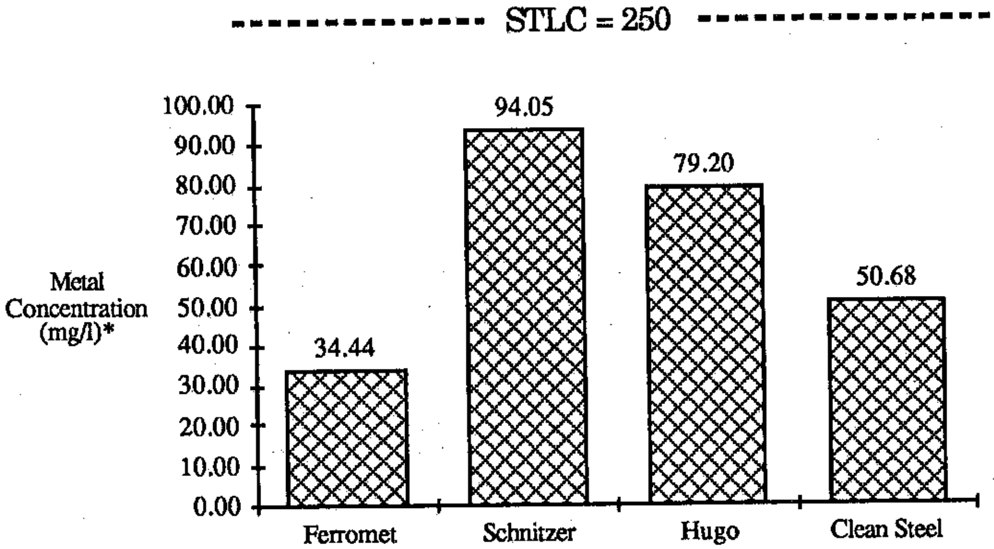


Figure VIII-7
Extractable Levels of Zinc in Treated ASW



95 % Confidence Interval
*Determined by Waste Extraction Test (WET)

IX. Impacts of Treatment Standards

The auto shredder industry is unique in that it has taken the initiative to treat its hazardous waste to nonhazardous levels. This was encouraged due to the economics of disposing of the large volumes generated. As mentioned, five of the eight auto shredder facilities in the state have inline treatment processes that render their wastes nonhazardous.

The treatment standards proposed in this staff report would only apply to auto shredder waste that is considered hazardous. Pursuant to SB 1500, any hazardous waste is prohibited from land disposal unless the waste is treated to levels specified by the Department or the waste is a solid hazardous waste generated by an approved cleanup. Land disposal means any placement of hazardous waste in or onto the land, including a Class III landfill. Even though hazardous ASW are allowed to be disposed in Class III landfills, these wastes also need to meet the proposed treatment standard levels. All auto shredder wastes with disposal variances would still need to meet treatment standards levels, even though they are disposed in a Class II or III landfill, unless a variance has been issued pursuant to HSC Section 25179.8 or Section 25179.10.

<u>Environmental Effect of Treatment Standard</u>

Staff analyzed the proposed treatment standard for potential adverse environmental impacts and has concluded that no significant adverse environmental impacts would result from implementation of the proposed treatment standard. In fact, staff has determined that the proposed treatment standards will significantly improve the environment by reducing the toxicity of 160,000 tons of auto shredder waste. This would result because the proposed regulation will require generators to reduce the mobility of metal constituents in auto shredder waste prior to land disposal.

The only negative impact that staff identified was a minor impact that would result from construction of new treatment units. This would result in more electrical power consumption and increase use of stabilizing chemicals. However, increased air pollution emissions that would result from the extra electrical power used to operate the treatment unit will be insignificant when compared to the overall electrical power consumed by the auto shredding industry.

Additionally, the chemicals to be used are all non-hazardous, and consist of cement and silicate solution. The amount used at an average size facility is approximately 70 pounds of these chemicals for each ton of treated waste.

X. Public Workshop

A workshop was held on March 1, 1989 in Long Beach, to discuss the proposed treatment standard for ASW. Over 60 representatives from companies ranging from landfill operators to auto shredder owners were mailed a workshop notice. (Appendix E) Twenty people from the auto shredding industry and other agencies attended the workshop. The comments received were in support of the proposed treatment standards. There were comments regarding how the data on specific facilities were used in the development of the proposed treatment standard.

Comments were solicited from affected industry as well as other regulatory agencies. Staff responded to the comments received in writing and modified the final staff report where needed. Appendix E contains a summary of written comments with staff responses.

XI. References

1. "Bureau of Mines Research on Recycling Scrapped Automobiles," K.C. Dean, J.W. Strener, M.B. Shirts and L.J. Froisland, U.S. Bureau of Mines, Research Center, Salt Lake City, UT 1986.

2. "Automobiles Recycling Offers Renewable But Changing Resources," Automotive Engineering, May 1979, V87, N5.

3. "Reduction of Automobile Waste to Product Gas via Autothermal Pyrolsis," Sur-Lite Corporation Proposal to California Department of Health Services Waste Reduction Program.

4. "The Need for Long Term Additional Disposal Capacity for Shredder Waste," California Waste Management Board, March 1987.

5. Order No. 88-081, California Regional Water Quality Control Board, Los Angeles Region, Revision July 25, 1988.

6. Department of Health Services files of site visits to auto shredder facilities.

7. <u>Chemical Engineer's Handbook, 5th Edition</u>, Perry, R & Chilton, C. 1973 pp 2-66.

8. "Field Experience with Silicate-Based Systems for the Treatment of Hazardous Waste", Trezak, G.J., Wotherspoon, J. and Leu, D.J., The Proceedings of the 7th National Conference on Management of Uncontrolled Hazardous Waste Sites, Hazardous Materials Control Research Institute, Silver Springs, MD., 1986, pp. 303-305.

Appendix A

Critical Values of the t Distribution

Degrees of Freedom	Alpha value
1	6.314
2	2.920
3	2.353
4	2.132
5	2.015
6	1.943
7	1.895
8	1.860
9	1.833
10	1.812
11	1.796
12	1.782
13	1.771
14	1.761
15	1.753
16	1.746
17	1.740
18	1.734
19	1.729
20	1.725
21	1.721
22	1.717
23	1.714
24	1.711
25	1.708
26	1.706
27	1.703
28	1.701
29	1.699
inf.	1.645

Appendix B

Analytical Data on Treated Auto Shredder Waste

	Sample	Chromi	Cadmiu	Copper	Lead	Mercur	Nickel	Zinc
Januar	4037	3	0.06	5.3	2.2	0.01	0.97	5.1
Januar	4035	2.7	0.06	5.1	2.6	0.001	0.94	5.5
Januar	4038	3.2	0.36	2	20	0.002	1.4	87
Januar	4039	0.09	0.78	0.11	1.3	0.002	0.5	1.1
Januar	4040	0.11	0.79	0.07	1.8	0.002	0.49	1.9
Januar	4041	3.1	0.89	1.6	2	0.002	1	18
Januar	4042	1.6	0.88	0.88	3.8	0.051	1.1	23
Januar	4043	1.3	0.82	0.54	2.1	0.001	0.79	6.1
Januar	4045	1	0.06	9.6	8.3	0.04	0.05	20
Januar	4046	1	0.06	6.5	7.4	0.001	0.05	20
Januar	4053	0.3	0.6	9.7	6	0.001	1.1	14
Februa	4054	2.3	0.6	8.5	30	0.001	2.3	183
Februa	4056	1.5	0.6	5.7	13	0.001	0.4	6
Februa	4057	2.2	0.6	2.6	12	0.001	0.4	26
Februa	4058	4.5	0.6	3.2	7.9	0.001	0.4	6
Februa	4059	2.6	0.11	2	4.7	0.001	1.04	46
Februa	4060	1.7	0.13	0.56	15	0.002	0.92	49
Februa	4054	0.9	0.06	0.81	5.1	0.001	0.05	30
Februa	4044	2.3	0.11	5.5	2.7	0.001	0.83	12
Februa	4055	0.7	0.06	1.4	2.6	0.001	0.05	13
Februa	4051	3.4	0.06	0.4	2.4	0.001	12	170
Februa	4052	2.8	0.06	0.4	2.2	0.003	0.7	104
Februa	5001	3.1	0.75	1.9	30	0.001	2.2	173
March	5002	1.9	0.06	0.4	6.8	0.002	1	95
March	5003	2.3	0.06	1.3	3.3	0.001	0.96	26
March	5005	1.5	0.06	2	19	0.001	0.65	92
March	5006	1.2	0.06	0.58	6.5	0.001	0.59	55
March	5007	1.8	0.06	1.1	6	0.001	0.1	31
March	5008	1.3	0.06	0.6	6.5	0.001	0.6	33
March	5010	3.3	0.6	1.3	4.1	0.003	1.9	48
March	5009	3.6	0.53	1.1	4.1	0.003	2.6	240
March	5012	1.2	0.34	0.17	15	0.001	1.5	137
March	5013	1.8	0.79	0.6	9.4	0.001	2.4	183
March	5015	1.4	0.72	2.8	47	0.002	2.1	116
April	5015	1.4	0.72	2.8	47	0.002	2.1	116
April	5016	0.97	0.23	1.9	14	0.002	0.69	21
April	5019	0.53	0.24	0.62	15	0.001	0.63	47
April	5021	1.7	0.44	0.86	14	0.001	0.96	43
April	5017	1.4	0.19	1.5	11	0.001	1	8.4
April	5020	2.1	0.68	0.55	20	0.001	2.6	159
May	5020	2.1	0.68	0.55	20	0.001	2.6	159
May	5022	5.1	0.76	0.76	17	0.001	3.4	220
May	5023	0.01	0.01	0.12	0.07	0.001	0.02	2.7
May	5035	1.8	0.81	0.18	44	0.002	2.3	210
June	5027	1.9	0.5	2.4	33	0.001	0.95	30
June	5028	1.9	0.25	3	26	0.001	0.67	31
June	5031	1	0.33	5.4	15	0.001	0.46	36
June	5032	0.97	0.43	2.8	19	0.001	0.69	61

June	5033	1.2	0.56	3.6	24	0.001	1.1	85
June	5035	1.3	0.64	1.1	35	0.02	0.54	116
June	5036	1.2	0.64	1.9	24	0.024	1.6	180
June	5034	2.8	0.31	2.8	23	0.002	1.5	37
June	5042	0.95	0.73	1.5	22	0.001	2.2	104
July	5041	3.4	0.91	1.3	48	0.001	2	79
July	5029	2.3	0.6	0.9	21	0.002	1.1	81
July	5030	2.4	0.9	2.9	33	0.003	1.2	121
August	5030	2.4	0.9	2.9	33	0.003	1.2	121
August	6002		0.2		7.7			13
August	6003		0.02		2.5			7
August	5053		0.1		8.2			142
August	6004		0.1		13.1			98
Septem	6000		0.1		13.1			47.6
Septem	6006		0.1		19.2			78.9
Septem	5052		0.1		25			101
Septem	6011		0.42		18.1			56.1
October	6017		0.4		7.3			23.7
October	6008		0.1		1.4			6.7
Novemb	6024	1.8	0.2	0.27	2.5	0.001	1.4	160
Novemb	6028		0.46		16.7			49.1
Novemb	6027		0.47		4.9			73.4
Decemb	6033		0.2		2.5			2.8
Decemb	6029		0.11		5.8			23.6
Decemb	6027		0.47		4.9			73.4
Decemb	6029		0.11		5.8			23.6
March	6048		0.42		2.5			0.44
March	6046		0.1		2.3			101
March	6045		0.1		5.4			2.7
March	6043		0.37		5.6			56.8
Mean		1.885	0.379	2.223	13.4	0.004	1.327	67.75
Stan dev		1.047	0.29	2.296	12.02	0.009	1.625	61.48
count		58	78	58	78	58	58	78
min		0.01	0.01	0.07	0.07	0.001	0.02	0.44
max		5.1	0.91	9.7	48	0.051	12	240

Sample	Chromiu	Cadmium	Copper	Lead	Mercury	Nickel	Zinc
31788	2.3	0.14	0.64	39		0.1	140
31888	2.5	0.17	0.34	16		0.23	23
31988	2.2	0.26	0.64	7.1		0.28	12
32288	2.7	0.2	0.65	19		0.44	53
32588	2.5	0.11	0.95	19		0.63	110
32988	2.4	0.85	0.39	19		1.1	160
40188	1	0.48	0.19	31		0.07	82
40588	0.65	0.6	0.01	25		0.46	140
40888	1.5	0.25	1	5.5		0.22	12
41288	1.2	0.05	1.4	6.4		0.75	7.6
41588	2.6	0.03	1.2	3.5		0.66	12
41988	1.7	0.06	0.74	5.8		0.28	30
42288	4.1	0.3	0.95	19		0.8	81
Mean	2.1038	0.2692	0.7	16.562		0.4631	66.354
Stan Dev	0.8996	0.2412	0.4009	10.835		0.3076	56.033
Count	13	13	13	13		13	13
Min	0.65	0.03	0.01	3.5		0.07	7.6
Max	2.7	0.85	1.4	39		1.1	160

FERROMET TREAT

Sample	Chromium	Cadmium	Copper	Lead	Mercury	Nickel	Zinc
4	2.03	0.2	8.05	7.46		2.35	9.17
1	2.12	0.44	5.56	4.31		1.63	8.67
29-Feb	3.85	0.52	7.14	7.39		1.89	7.95
26-Feb	5.96	0.46	5.89	4.18		1.75	4.38
24-Feb	2.79	0.82	6.07	17.5		1.84	26.1
23-Feb	5.13	0.22	4.29	1.77		1.77	2.06
22-Feb	4.68	0.95	12.1	28.3		3.67	110
18-Feb	7.38	0.2	3.06	0.2		1.55	0.2
15-Feb	3.92	0.74	13.5	12		4.23	43.2
5-Feb	3.03	0.2	6.51	1.87		0.26	0.5
29-Jan	3.39	0.2	5.88	3.2		0.58	0.93
28-Jan	5.12	0.31	5.36	3.09		1.72	3.47
Mean	4.116666667	0.4383333	6.950833	7.6058		1.9367	18.053
Stan dev	1.604472914	0.2691682	3.023777	8.1449		1.1058	31.617
count	12	12	12	12		12	12
min	2.03	0.2	3.06	0.2		0.26	0.2
max	7.38	0.95	13.5	28.3		4.23	110

CLEAN Treat

MONTH	Sample #	Chromium	Cadmium	Copper	Lead	Mercury	Nickel	Zinc
September	1001	0.39	0.12	0.18	4.3	0.03	0.59	5.3
October	1002	0.74	0.14	0.4	5.3	0.03	0.68	8.9
October	1008	2.3	0.2	1.4	10.8	0.03	1.3	4.3
October	5003	2.6	0.98	0.1	25.4	0.003	3.6	221
October	5004	1.6	1	2.7	22.69	0.003	1.4	127
October	6001	0.7	0.2	0.2	3.2	0.003	0.6	2.4
October	8001	1.3	0.25	1.7	3.2	0.003	1.2	1.3
October	9001		0.5	0.86	8.2		1.6	22.7
October	9002		0.5	0.51	13.7		1.5	19.3
October	2011		0.5	0.5	1.4		2.5	232
October	2013		0.95	0.66	21.7		1.2	25
November	2014	1.1	0.22	1.1	4.3	0.003	1.3	8.2
November	2013	0.95		0.66	21.7		1.2	25
November	2015	0.61	0.1	0.63	17.2	0.006	0.53	42.9
November	2016		0.2		16.7		0.74	26.2
November	2018	0.9	0.14	1	13.5	0.003	0.35	20.1
November	2019		0.18		11.7		0.41	21.2
November	2020	1.2	0.14	1.6	14.4	0.003	0.37	29.6
November	2021	0.55	0.07	0.42	4.8	0.003	0.37	27
November	2022		0.35	1.1	9		0.97	13.4
November	2023		0.7	15.5	5.3		2.5	6.5
November	2024	0.1	0.1	0.12	4.7	0.003	0.7	4.3
November	2025		0.1	0.3	2.6			4.7
December	2057	1	0.34	0.52	5.6	0.003	1	53.4
December	2061		0.52	1.2	23.9		1.6	75.4
December	2059		0.14	0.65	2.9		0.96	0.7
December	2060	2.6	0.1	0.92	6.2	0.003	0.8	3.8
December	2064	1.3	0.06	4.1	5.4	0.003	1.2	1.8
December	2056		0.39	1.1	2.5		1.1	32.3
December	2062		0.18	0.9	5.5		0.62	12.4
December	2066	0.67	0.56	0.67	13.7	0.003	1.7	96.8
	2089		0.1		5.5			9.8
	2088		0.41		1.5			0.66
	2087	1.2	0.1	0.86	6.9	0.001	1.1	2.9
	2086		0.26	0.82	15.4		1.6	81.9
	2085	1.7	0.1	2.9	17.1	0.003	1.8	8.9
Mean		1.1755	0.3114	1.4463	9.9414	0.0073	1.1845	35.529
Stan dev		0.6932	0.2649	2.7034	7.1266	0.0101	0.6999	55.278
count		20	35	32	36	19	33	36
min		0.1	0.06	0.1	1.4	0.001	0.35	0.66
max		2.6	1	15.5	25.4	0.03	3.6	232

Appendix C

Analytical Data on Untreated Auto Shredder Waste

Sample	Chromium	Cadmium	Copper	Lead	Mercury	Nickel	Zinc
31788	5.7	2.9	0.21	65		5	950
31888	4.6	2.6	0.09	73		3.6	780
31988	3.9	2.4	0.27	93		2.8	570
32288	3.4	1.8	0.17	73		2.4	530
32588	2.5	1.4	0.24	48		2.2	440
32988	3.8	1.8	0.38	65		3.6	37
40188	1	0.75	0.12	34		0.16	180
40588	1.4	0.45	0.14	24		0.16	150
40888	2.4	0.8	0.12	31		0.93	260
41288	1.3	0.78	0.33	36		1	240
41588	2.8	0.59	0.047	25		1.9	450
41988	3.5	1.5	0.08	30		1.8	590
42288	2.4	1.1	0.13	47		3.2	480
Mean	2.97692308	1.4515385	0.179	49.54		2.2115	435.154
Stan Dev	1.35901548	0.8062759	0.10094	22.14		1.4371	259.985
Count	13	13	13	13		13	13
MAx	5.7	2.9	0.38	93		5	950
Min	1	0.45	0.047	24		0.16	37

PAC STL UNTREAt

Sample	Chromiu	Cadmium	Copper	Lead	Mercury	Nickel	Zinc
4104	2.8	2.2	41	120		14	640
4105	4.3	3.6	37	180		20	880
4106	2.8	2.7	0.8	430		8.6	690
4107	4.1	2.3	13	140		14	810
4108	1.8	2.4	120	110		9	650
4109	4.4	1.9	0.3	170		12	520
4110	3.6	2.5	52	130		12	615
4111	2.1	2.1	83	170		10	600
4112	2.1	2.1	60	380		9	450
4113	2.5	3.3	58	110		19	830
4114	2.6	2.1	34	120		10	410
4115	2.4	3	15	130		12	710
4116	2.86	2.6	5.7	160		11	630
4117	2.5	2	40	130		13	630
4118	3.2	1.8	9	140		5.3	600
4119	1.7	3.1	44	140		24	1100
4120	2.4	0.17	0.3	140		20	690
4121	1.4	0.11	0.3	83		13	570
4122	2.2	0.13	0.3	950		10	680
4123	1.4	2.7	88	400		15	840
4124	1.9	0.1	0.3	210		11	320
4125	2.2	3.6	50	220		20	1000
4126	2.3	2.2	33	170		15	590
4127	2.6	3.1	56	530		20	570
4128	2.3	3	110	120		15	670
4129	2.6	2.8	35	170		16	730
4130	2.4	0.1	0.3	16		16	430
4131	1.6	0.72	0.3	250		14	360
4132	6.3	0.62	0.3	150		22	710
4133	3.9	2.6	1.8	140		12	780
Mean	2.708667	2.055	32.9567	210.3		14.0633	656.8333
Stan Dev	1.048371	1.10359835	34.4518	178.14		4.48265	174.6942
Count	30	30	30	30		30	30
Min	1.4	0.1	0.3	16		5.3	320
Max	6.3	3.6	120	950		24	1100

Sample	Chromium	Cadmium	Copper	Lead	Mercury	Nickel	Zinc
8060243	6.7	3	0.46	17	0.001	8.8	590
8041309	5	1.9	0.11	18	0.001	3.7	630
8040400	2.4	1.6	0.86	53	0.001	1.1	320
8040904	2.1	2.1	1.5	72	0.001	2.3	640
8040025	6.5	2.7	0.22	53	0.001	7.2	790
8032012	3.4	1.5	0.37	15	0.001	4.2	530
8031543	3.8	2.3	0.14	60	0.001	3.5	600
8031144	3.7	2.9	0.67	53	0.001	3.7	490
8021341	2.7	1.7	0.14	45	0.001	3.5	510
8021864	5.2	3.1	0.76	82	0.001	5.8	740
8021635	2.1	3.2	0.35	94	0.001	3.2	680
8030283	3.7	2.5	0.52	77	0.001	3.6	53
8030823	3.6	2.2	0.43	53	0.001	3	450
8020234	2.5	2.8	0.63	140	0.001	2.2	330
8020461	3.5	1.7	0.41	30	0.001	2.9	630
8020796	2.2	2.5	1.6	100	0.001	2.6	360
8020976	3.2	1.1	0.09	16	0.001	4.7	500
8021210	2.3	2	0.15	54	0.001	3.3	460
8021341	2.7	1.7	0.14	45	0.001	3.5	510
8012003	2.6	2	0.97	110	0.001	3.1	590
8011796	3	2.4	0.83	39	0.001	3.8	1100
8011444	3.4	1.6	0.38	30	0.001	3.6	510
8011090	3.7	2.9	0.77	49	0.001	3.5	630
8010632	2.8	1.4	0.86	32	0.001	2	290
8010371	4.6	2.4	0.2	41	0.001	5.7	700
8010260	2.4	1.4	0.4	22	0.001	4.4	490
7122180	2.8	2	0.16	87	0.01	3.2	550
7121813	2	0.8	0.41	31	0.001	3.7	300
7120979	2.1	1.6	0.36	43	0.02	3	330
7121388	2.5	1.9	0.48	99	0.01	2.2	320
7121221	2.4	2.9	0.3	49	0.01	4.1	330
7121057	2.5		0.3	30	0.01	2	250
7120500	2.7	2.2	0.53	42	0.01	3.6	420
7111785	1.8	1.6	0.3	44	0.01	3.6	510
7111490	2.9	2.7	0.46	88	0.01	3.5	470
7111053	3.7	2.3	2.6	81	0.01	5.3	650
Mean	3.2	2.1314286	0.55167	55.39	0.00353	3.6972	507.03
Stan Dev	1.16888225	0.6023344	0.49697	29.87	0.00472	1.4563	187.02
COUNT	36	35	36	36	36	36	36
MAX	6.7	3.2	2.6	140	0.02	8.8	1100
MIN	1.8	0.8	0.09	15	0.001	1.1	53

SCHN Untreat TTL

Sample	Chromiu	Cadmium	Copper	Lead	Mercury	Nickel	Zinc	
31788	500	76	5400	2900		390	1400	
31888	350	52	8600	2400		200	12000	
31988	200	56	6900	2400		230	9800	
32288	230	54	6500	3200		210	11000	
32588	78	20	6800	970		120	5100	
32988	230	100	7500	1900		200	8500	
40188	100	26	1300	1000		140	6500	
40588	200	35	2600	1100		250	8300	
40888	110	29	1600	1300		290	9000	
41288	84	17	2000	660		130	3100	
41588	110	20	3300	1000		240	5700	
41988	95	21	2000	790		69	6800	
42288	140	35	5600	3900		200	9400	
Mean	186.69	41.615	4623.1	1809.2		205.31	7430.8	
Stan Dev	122.87	25.025	2563.9	1054.3		82.156	3059	
Count	13	13	13	13	0	13	13	
MAx	500	100	8600	3900	0	390	12000	
Min	78	17	1300	660	0	69	1400	

Sample	Chromiu	Cadmium	Copper	Lead	Mercury	Nickel	Zinc	
8060243	640	52	1270	1400	1.2	340	6000	
8041309	350	60	3500	7100	0.019	570	8700	
8040400	320	50	17000	1800	0.12	460	7400	
8040904	190	33	19000	2400	0.066	290	6200	
8040025	240	57	5400	4400	0.23	520	11000	
8032012	300	63	4400	3000	0.97	290	9800	
8031543	330	53	2900	6200	0.087	410	9200	
8031144	400	48	10000	2600	0.45	450	8300	
8021341	180	56	11000	3000	0.001	270	10000	
8021864	190	53	2700	3300	0.34	430	7900	
8021635	230	44	3900	5400	0.29	560	8300	
8030283	38	26	1000	1400	0.81	510	3600	
8030823	390	52	21000	2500	0.59	410	7200	
8020234	290	53	27000	3300	0.11	350	7800	
8020461	900	47	5800	1500	0.45	750	6700	
8020796	260	58	30000	3200	0.01	1200	9800	
8020976	130	32	15000	1600	0.06	250	8400	
8021210	330	43	4000	2300	0.001	850	7500	
8021341	180	56	11000	3000	0.001	270	10000	
8012003	550	66	6200	3400	0.035	880	9600	
8011796	370	54	8500	3900	0.057	950	13000	
8011444	180	35	960	2500	0.7	300	6400	
8011090	120	44	48000	1400	0.06	290	6300	
8010632	200	43	6100	2800	0.18	680	6600	
8010371	360	42	7400	6000	0.53	6600	5800	
8010260	360	46	36000	1500	0.22	620	7400	
7122180	220	75	3000	3200	1	350	10000	
7121813	110	25	4200	1700	0.01	670	6700	
7120979	190	39	4300	2400	1.3	270	7400	
7121388	230	52	3900	3400	0.22	630	7300	
7121221	1400	37	3900	2000	0.033	710	5400	
7121057	140	39	2000	1600	1.6	260	5200	
7120500	230	55	1000	2200	0.67	500	6700	
7111785	180	35	25000	3000	2	420	7000	
7111490	340	75	1600	4800	1.5	470	8100	
7111053	250	47	1800	3400	2.4	480	8100	
Mean	314.39	48.472	9992.5	3017	0.5089	673.89	7800	
Stan Dev	245.04	11.836	11150	1428	0.6183	1039.8	1835.5	
Count	36	36	36	36	36	36	36	
MAX	1400	75	48000	7100	2.4	6600	13000	
Min	38	25	960	1400	0.001	250	3600	

Sample	Chromium	Cadmium	Copper	Lead	Mercury	Nickel	Zinc
4104	230	39	1900	3500		780	13000
4105	190	37	2800	2300		750	14000
4106	300	53	11000	3500		550	13000
4107	150	35	16000	2500		430	7600
4108	770	48	2100	3200		730	15000
4109	190	51	2200	2900		650	9000
4110	260	40	1100	2900		460	19000
4111	140	34	12000	5700		370	8800
4112	210	51	6800	3000		550	12000
4113	360	51	2600	4300		840	12000
4114	700	43	2600	2700		410	9400
4115	120	39	1300	5000		570	10000
4116	150	40	15000	5400		620	23000
4117	440	42	6800	8400		450	11000
4118	580	36	2000	2700		510	10000
Mean	319.33333333	42.6	5746.667	3866.7		578	12453
Stan Dev	210.21983958	6.5224886	5238.848	1650		146.15	4108.2
Count	15	15	15	15		15	15
min	120	34	1100	2300		370	7600
Max	770	53	16000	8400		840	23000

Appendix D

Survey

Auto Shredder Generators and Treatment Vendor

STATE OF CALIFORNIA—HEALTH AND WELFARE A CY

GEORGE DEUKMEJIAN, Governor

DEPARTMENT OF HEALTH SERVICES
714/744 P STREET
P.O. BOX 942732
SACRAMENTO, CA 94234-7320
(916) 324-1807

October 13, 1988

Dear

The California Department of Health Services' (Department) staff is conducting a survey on available treatment technologies for treating auto shredder waste as part of our effort to develop treatment standards. We understand that your facility treats or your company offers technologies for treating auto shredder waste. We are surveying facilities using such technologies or vendors of these technologies to collect information to identify available treatment processes and associated demonstrated performance levels. Your response to the survey, Attachment 1, would greatly assist us in this effort.

The "Hazardous Waste Management Act of 1986" (SB 1500), became effective January 1, 1987. This law requires the Department to prohibit on or before May 8, 1990, the land disposal of any hazardous waste, unless it has been treated to established treatment standards. Our treatment standard for auto shredder waste will be partially based on information collected from this survey and will promote the use of treatment technologies such as yours. Generators of auto shredder waste will only be required to use technologies which have been demonstrated and are available.

We would appreciate receiving your response by November 18, 1988, so we may consider your treatment process in the development of the treatment standard for auto shredder waste. If you have any questions or need additional information, please contact Ed Nieto of my staff at (916) 322-7893.

Sincerely,

James T. Allen

James T. Allen, Ph.D. Chief
Alternative Technology Section
Toxic Substances Control Division

Enclosure

cc: Jan Radimsky
Alternative Technology Section

Watson Gin
Alternative Technology Section

JTA:EN:lkm (SAME LETTER SENT TO ATTACHED LIST)

Attachment 1

Auto Shredder Survey

Please send your response to:

Mr. Ed Nieto
Department of Health Services
Toxic Substances Control Division
Alternative Technology Section
714/744 P Street
P.O. Box 942732
Sacramento, CA 94234-7320
(916) 322-7893

1. Name of company, mailing address, technology contact, and phone number.

2. For the Auto Shredding Process:

    a. Typical block flow diagram of auto shredding process that illustrates the point of treatment.

    b. What type of standard equipment is used?

    c. Capacity of each unit, minimum and maximum, and ratio of appliances to automobiles.

    d. What size is the material after each unit operation?

3. For the treatment process:

    a. Detail description of process including maximum capacity, feed rates for fluff, ratio of binding agents (lime, cement...), water, and additives to waste.

    b. Technical paper presented (please attach copies).

    c. Describe final state of material (i.e. solid, semi-solid).

    d. How long is material allowed to set before testing?

    e. Please attach copies of the laboratory analysis of your untreated and treated waste including results for PCB and the following metals, cadmium, chromium, copper, lead mercury, nickel, and zinc. Please state the analytical method used.

f. Please respond to the following questions to help us compare treatment cost of your technology with others. For minimum, maximum and typical size units:

i. Life cycle average cost ($/ton)

ii. Capital cost

iii. Nominal plant life

iv. Quantity and disposal cost of residue

v. Quantity and cost of chemicals

vi. Utilities cost in $/(yr)(ton) include consumption and cost for power, air and water and associated equipment.

vii. Labor cost

viii. Maintenance cost, $/(yr)(ton)

g. Please provide a list of facilities that are using your treatment process, including telephone number and names of contact persons.

Robert Lewon
Executive Vice President
LMC Corporation
600 S. Fourth Street
Richmond, CA 94804

Tom Hightower
Ferromei Inc.
8222 Etiwanda Ave.
Etiwanda, CA 91739

Harry Favorsham
Clean Steel, Inc.
2061 East 220th Street
Long Beach, CA 92806

George Adams, Jr.
President
Orange County Steel Salvage
3200 East Frontera Street
Anaheim, CA 92806

Allen Daniels
President
Golden State Metals
2000 East Brundage Street
Bakersfield, CA 93307

William J. McLaughlin
President
TOXCO
P.O. Box 396
Claremont, CA 91711

George Trezek
President
2210 Canyon Oak Lane
Danville, CA 94526

Nick Andrusyshyn
Schnitzer Steel Products
Foot of Adeline Street
Oakland, CA 94607

Danny Ayala
Pacific Steel, Inc.
1700 Cleveland Ave.
National City, CA 92050

Jim Wotherspoon
Hugo Neu-Proler
901 Dock Street
Terminal Island, CA 90731

Dr. David J. Leu
Mittelhauser Corp.
23272 Mill Creek Dr., #300
Laguna Hills, CA 92653

Appendix E

Public Workshop

STATE OF CALIFORNIA—HEALTH AND WELFARE AGENCY

GEORGE DEUKMEJIAN, Governor

DEPARTMENT OF HEALTH SERVICES
714/744 P STREET
P.O. BOX 942732
SACRAMENTO, CA 94234-7320

January 25, 1989

To: All Interested Parties

Subject: MEETING TO DISCUSS PROPOSED TREATMENT STANDARDS FOR AUTO SHREDDER WASTE PURSUANT TO SB 1500 (1986 ROBERTI)

This is to invite you to attend a meeting to discuss the Department of Health Services' (Department) proposed treatment standards on auto shredder waste classified as hazardous. Pursuant to Section 25179.6 of the Health and Safety Code (SB 1500, 1986) the Department must adopt treatment standards which will reduce the hazardous characteristics of the land disposed waste. The Department is consulting with various interested parties before determining the final treatment standards.

The Department staff is proposing a treatment standard that will require hazardous auto shredder waste be treated to specified levels prior to land disposal. The proposed levels of treatment are based on treatment processes currently used in California.

The primary purpose of the meeting will be to discuss the proposed treatment standards for auto shredder waste. Attached for your review is a copy of the draft report supporting the proposed treatment standards levels for land disposal of auto shredder waste. The analytical data on treated auto shredder waste will be available upon request.

The meeting will be held from 9:00 a.m. to 12:00 p.m. on March 1, 1989 at:

<u>Meeting Location</u>

Department of Health Services
Auditorium
245 West Broadway
Long Beach, CA 90802

<u>Mailing Address</u>

Department of Health Services
Toxic Substances Control Division
Alternative Technology Section
Attn: Ed Nieto
714/744 P Street
P.O. Box 942732
Sacramento, CA 94234-7320

If you plan to attend the meeting, please notify staff in advance. If you are not able to attend, staff will accept written comments until March 10, 1989. If you have any questions, please contact Ed Nieto of my staff at (916) 324-1807.

Sincerely,

James T. Allen, Ph.D., Chief
Alternative Technology Section
Toxic Substances Control Division

Attachment

Mark Langowski
Chemical Waste Management
P.O. Box 471
Kettleman City CA 93239

Mike Belliveau
Citizens for a Better Environment
942 Market Street, Ste. #505
San Francisco CA 94102

Environmental Defense Fund
Rockridge Market Mall
Oakland CA 94618

Bradley Davis
Greenpeace
Fort Mason Bldg E
San Francisco CA 94123

F.De Falco
League of Women Voters
117 Natalie Drive
Moraga CA 94556

Matt Miller
Silicate Technology
14455 N. Hayden Rd. Ste.218
Scottsdale AZ 85260

Jody Sparks
Toxic Assessment Group
2609 Capitol Avenue
Sacramento CA 95816

Nancy Worst
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Martinez CA 94553

Larry Butler
International Technology Corporation
P.O. Box 158
El Centro CA 92281

Barabara Fogerson
Contra Costa County/Occupational Health
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Martinez CA 94553

Jon Carrol
Casmalia Resources
124 West Carmen Lane
Santa Maria CA 93454

Cal Council for Environmental & Economic Balance
1512 14th Street
Sacramento CA 95814

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4585 Pacheco Blvd.
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Diane Takvorian
Environmental Health Coalition
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San Diego CA 92102

Mike Paparian
Sierra Club
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Sacramento CA 95814

David Long
Yenvirotek
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Ventura CA 93003

Pierre Mattys
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16901 Armstrong Ave.
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Kurt Kruger
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Wilmington CA 90744

Jeet Sabherwal
Ensotech, Inc.
7949 Ajay Dr.
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Department of Health Services
Public Workshop

March 1, 1989
245 West Broadway, Auditorium
Long Beach, California

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send copy of sign-in sheet

Summary of Comments

Below is a summary of written comments received and staff responses on the draft staff report, Treatment Levels for Auto Shredder Waste.

Comment #1 & #2:

> The report lacks mention of ToxCo, Inc's. development of a successful chemical fixation system at Orange County Steel Salvage.

Response:

> Your comments concerning the lack of mention of ToxCo, Inc. involvement at Orange County Steel Salvage are valid. At the time we believed that Orange County Steel Salvage had developed their own treatment process. We have revised the staff report to reflect your comments.