Waste Analyses Project for Auto Dealerships

Sump Sludge Summary

Introduction

Most automotive repair facilities have floor drains in the shop area or in a wash bay. Floor drains are usually equipped with a sump, the purpose of which is mainly to trap debris and prevent it from being flushed with the wastewater into the sewer system. Wastewater discharged to the floor drain commonly carries with it grease and grime from cleaning the floors or in the case of a wash bay, from cleaning vehicles. Running water flows over the pit allowing the grime and particles to settle out of the water before it is discharged to the sewer system. This process ensures the discharged water is cleaner than the water sent down the floor drain. Over time, sump sludge accumulates in the pit and requires removal and disposal.

Sump sludge has the potential to be a hazardous waste due to the presence of toxins being washed down the drain with wastewater. In automotive repair facilities, toxins usually result from spills of products such as used motor oil, gasoline, solvent, antifreeze and other automotive fluids.

The IWRC recommends Toxicity Characteristic Leaching Procedure (TCLP) analysis for sump sludge since it has the potential to be hazardous. TCLP testing is required to determine whether the waste is hazardous or non-hazardous. Follow-up regarding this recommendation revealed that small businesses rarely characterize waste sump sludge, most likely due to costs associated with laboratory analysis. This lack of testing bases disposal decisions on incomplete data that does not often lead to regulatory compliance or implementation of pollution prevention (P2) alternatives.

The *Waste Analyses Project for Auto Dealerships* conducted TCLP analysis on sump sludge from Iowa automotive dealerships. The primary objective of the project was to improve the implementation rate of P2 practices by first making a hazardous waste determination to categorize wastes and then determine the proper P2 action and disposal method at volunteer facilities. The secondary purpose of the project was to collect enough data to produce a study report that dealerships could use in lieu of an individual test from each shop on each waste, if the data supported such a statement. Like all other services the IWRC provides, the *Waste Analysis Project for Auto Dealerships* maintained client confidentiality.

The study did <u>not</u> support a generalized statement that automotive dealerships should no longer make a hazardous waste determination through TCLP analysis on waste sump sludge. The presence of toxins at any level may be construed as reason to continue TCLP testing at each facility.

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Sampling & Testing

Using the EPA's Decision Error Feasibility Trials (DEFT) tool and published data from a test of metals in the wastes, a sample population of 49 facilities was derived as being statistically significant to draw a generalized conclusion from the data. Members of the Iowa Automotive Dealership Association (IADA) were approached and 56 facilities agreed to participate in the study. IWRC staff was trained and collected all samples used in the study to help eliminate sampling error. The study collected 62 samples of sump sludge from shop floor drains and shop wash bay drains.

While the TCLP includes 40 test parameters, wastes need only be tested for the toxins likely to be present. In this study, TCLP testing parameters were limited to the heavy metals and volatile organic compounds (VOCs) listed in **Table 1**.

Table 1: TCLP Testing Parameters.
The eight heavy metals and ten VOCs tested for in the Sump Sludge Study.

TCLP Parameter	Regulatory Level*	EPA Number
Metals		
Arsenic	5.0 mg/L	D004
Barium	100.0 mg/L	D005
Cadmium	1.0 mg/L	D006
Chromium	5.0 mg/L	D007
Lead	5.0 mg/L	D008
Mercury	0.2 mg/L	D009
Selenium	1.0 mg/L	D010
Silver	5.0 mg/L	D011
VOCs		
Benzene	0.5 mg/L	D018
Carbon Tetrachloride	0.5 mg/L	D019
Chlorobenzene	100.mg/L	D021
Chloroform	6.0 mg/L	D022
1,2-Dichloroethane	0.5 mg/L	D028
1,1-Dichloroethene	0.7 mg/L	D029
Methyl Ethyl Ketone (MEK)	200.0 mg/L	D035
Tetrachloroethene	0.7 mg/L	D039
Trichloroethylene	0.5 mg/L	D040
Vinyl Chloride	0.2 mg/L	D043

* Samples exceeding these levels are hazardous

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Sump Sludge Results Summary

In the data set the sites determined to have hazardous sump sludge were those that tested positive for the presence of Tetrachloroethene above the regulatory limit. In all cases those shops were using chlorinated brake cleaner, often as a general cleaning agent, and the toxin was also often present in their antifreeze. In one case a shop that had Tetrachloroethene above the regulatory threshold also tested positive for Trichloroethene.

Table 2: Antifreeze TCLP Test Results Summary

Heavy Metals:	
Arsenic	Not detected in sump sludge.
Barium	Detected at low levels in most samples.
Cadmium	Detected at low levels in eight cases.
Chromium	Detected at low levels in one case.
Lead	Detected in over 1/3 of the samples below the threshold.
Mercury	Not detected in sump sludge.
Selenium	Not detected in sump sludge.
Silver	Detected in one case.
VOCs	
Benzene	Detected at low levels in 5 cases.
Methyl Ethyl Ketone	Detected at very low levels in 6 cases.
Carbon Tetrachloride	Not detected in sump sludge.
Chlorobenzene	Not detected in sump sludge.
Chloroform	Detected at low levels in 3 cases.
1,2-Dichloroethane	Not detected in sump sludge.
1,1-Dichloroethene	Not detected in sump sludge.
Tetrachloroethene	Detected in 10 samples 6 were hazardous.
Trichloroethene	Detected in one sample that was hazardous.
Vinyl Chloride	Not detected in sump sludge.

Waste Analyses Project for Auto Dealerships

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Conclusions

The study identified threThe study showed it is not likely heavy metal contamination would occur at high enough concentrations to render the waste hazardous. Five of the eight heavy metals (arsenic, barium, cadmium, chromium and lead) were detected at measurable levels, but well below the regulatory threshold. Three of the eight heavy metals were undetected (mercury, selenium and silver).

The study showed it is likely VOC contamination will occur at levels above the regulatory threshold. Two of the ten VOCs were detected at concentrations above the regulatory limit (tetrachloroethene and trichloroethene.) Although the reason for the hazardous results are not definitive, it is plausible that the high levels of tetrachloroethene and trichloroethene are due to the liberal use of chlorinated brake cleaner in those facilities. Restricted use or elimination of chlorinated brake cleaner may decrease the chance of generating hazardous sump sludge waste.

Seven samples showed results warranting further testing (benzene, carbon tetrachloride, 1,2-dichloroethane, 1,1-dichloroethene, tetrachloroethene, trichloroethene and vinyl chloride). These results were inconclusive because the lowest detectable level was at or above the corresponding regulatory limit. Such results may occur due to interference during testing or discrepancies in the sample.

Overall, the study did <u>not</u> support a generalized statement that automotive dealerships should no longer make a hazardous waste determination through TCLP analysis on waste sump sludge. Some toxins were present in the waste stream. It is therefore recommended that all facilities conduct TCLP testing once on a representative sample of waste sump sludge.

Recommendations

In Iowa, the US EPA regulates hazardous waste. The federal hazardous waste management standards require that a hazardous/non-hazardous waste determination be made for any waste with the potential to be hazardous.

The most useful information gained from this study was the likely link between the use of chlorinated brake cleaner and hazardous sump sludge (due to tetrachloroethene and trichloroethene in the brake cleaner). To decrease the chance of sump sludge contaminated with chlorinated VOCs, facilities are encouraged to use chlorinated brake cleaner sparingly, or eliminate its use altogether.

Eliminating chlorinated brake cleaner has many advantages in addition to possibly eliminating a large hazardous waste stream. Switching to aqueous brake cleaners purchased in bulk and used in refillable spray cans has been shown to have payback periods in as little as five months, and may reduce aerosol use by up to 84%. That translates into huge cost savings for any small business. Cost savings include decreased disposal fees, decreased chemical purchasing costs and reduced liability (inherent in solvent

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use)[1]. The cost-benefit worksheet at http://www.montgomerycountymd.gov/deptmpl.asp?url=/content/dep/Factsheets/aerosol.asp can help determine if switching to aerosol cleaners makes financial sense. A study conducted by the Institute for Research and Technical Assistance (IRTA) of ten repair facilities concluded that aqueous brake cleaner, even at low concentration levels were adequate in almost all brake cleaning scenarios[2]. The IWRC can assist in finding vendors of bulk cleaners and refillable spray cans.

Environmental benefits from decreasing or eliminating solvent brake cleaner use are also numerous. Propellants in aerosol cans are known 'greenhouse gases' and contribute to smog and ozone formation in the atmosphere. Used aerosol cans may themselves be considered hazardous waste. In addition, many brake cleaners contain F-listed chemicals, which means that any waste that is contaminated with even just one drop of the brake cleaner becomes a hazardous waste[1]. Eliminating use of such products is a smart move fiscally and environmentally.

If TCLP results show any parameter at a concentration level equal to or greater than its corresponding regulatory level, the sump sludge must be managed as hazardous waste. Hazardous waste must be stored in sealed, labeled containers and disposed by an EPA-permitted hazardous waste management company. Hazardous sump sludge must also be included in the facility's hazardous waste inventory and managed on-site in compliance with the applicable generator regulations.

Some good housekeeping and pollution prevention measures such as sweeping the floor before a wash down and using drip pans and/or oil absorbent material to keep spills off the floor could be implemented to reduce the amount of contamination in the wastewater discharged to the floor drains to prevent sump sludge from becoming hazardous in the first place.

If the TCLP test results of the representative sample show concentrations less than regulatory level for each parameter, then the sump sludge is non-hazardous. The following waste disposal options exist for the management of non-hazardous sump sludge:

1) The waste can be removed from the facility by a local septic/sump sludge hauler.
2) The waste can dried and land applied, in which case special rules exist to govern that activity.
3) The waste can be dried and landfilled as a special waste by submitting an SWA application. Application for an SWA requires completion of the form and submittal of three copies to the receiving landfill. The application should also include TCLP data or other information to document the waste is non-hazardous. The landfill will review the application and, if approved, will forward it to the DNR. Upon DNR approval, an SWA will be issued to the applicant and landfill and disposal may begin.

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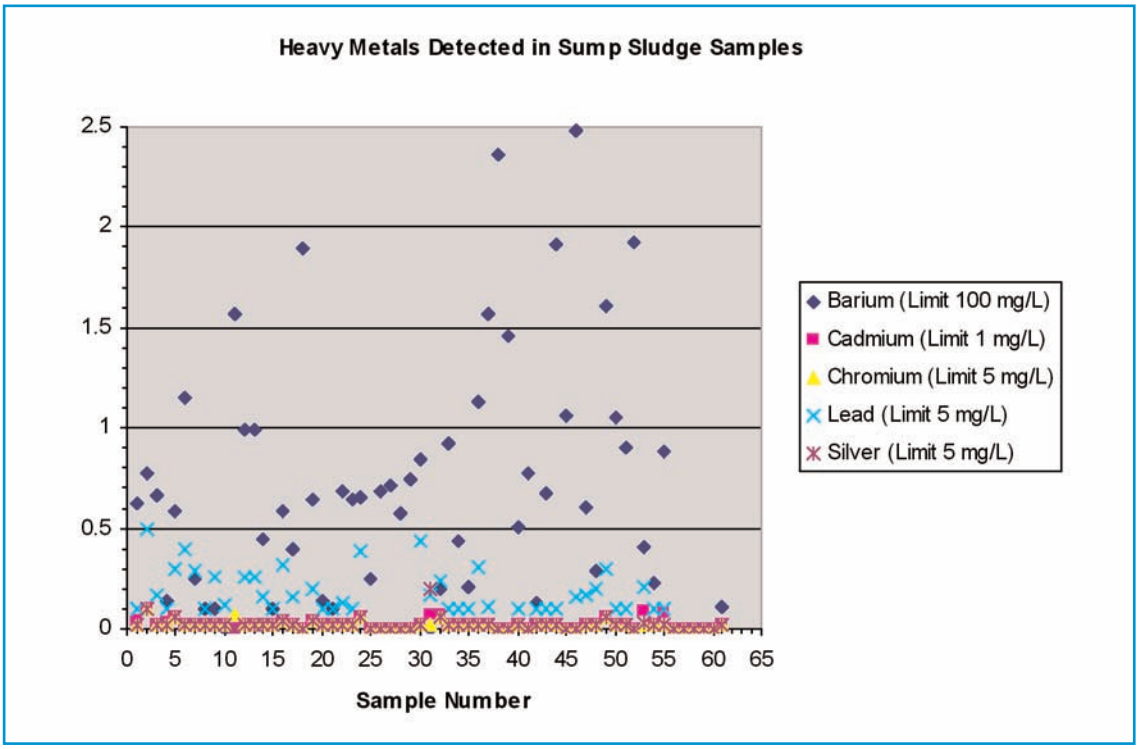
An SWA application is available at http://www.iowadnr.com/waste/sw/files/specialauthoriz.pdf or by calling the Iowa Waste Reduction Center.

Results

Heavy Metals

TCLP test results on the 62 samples of sump sludge (from shop drains and wash bay drains) showed that none had heavy metal concentration at or above the corresponding regulatory threshold.



Figures 2 through 4 show the individual results. It is important to note that in the testing of both heavy metals and VOC's, several samples returned with inconclusive results. More specifically, due to possible interference during the testing procedure, or discrepancies in the sample itself, the result was reported not as a specific quantity, but as 'less than' the lowest detectable level (i.e., <0.02 mg/L.) These results can be interpreted as 'non-detectable or zero,' however in the figures they are visualized as the lowest detectable level (i.e., 0.02 mg/L etc.). Also, data points visualized as zero represent instances where the toxin was not actually detected. All such cases are noted in the figure descriptions.

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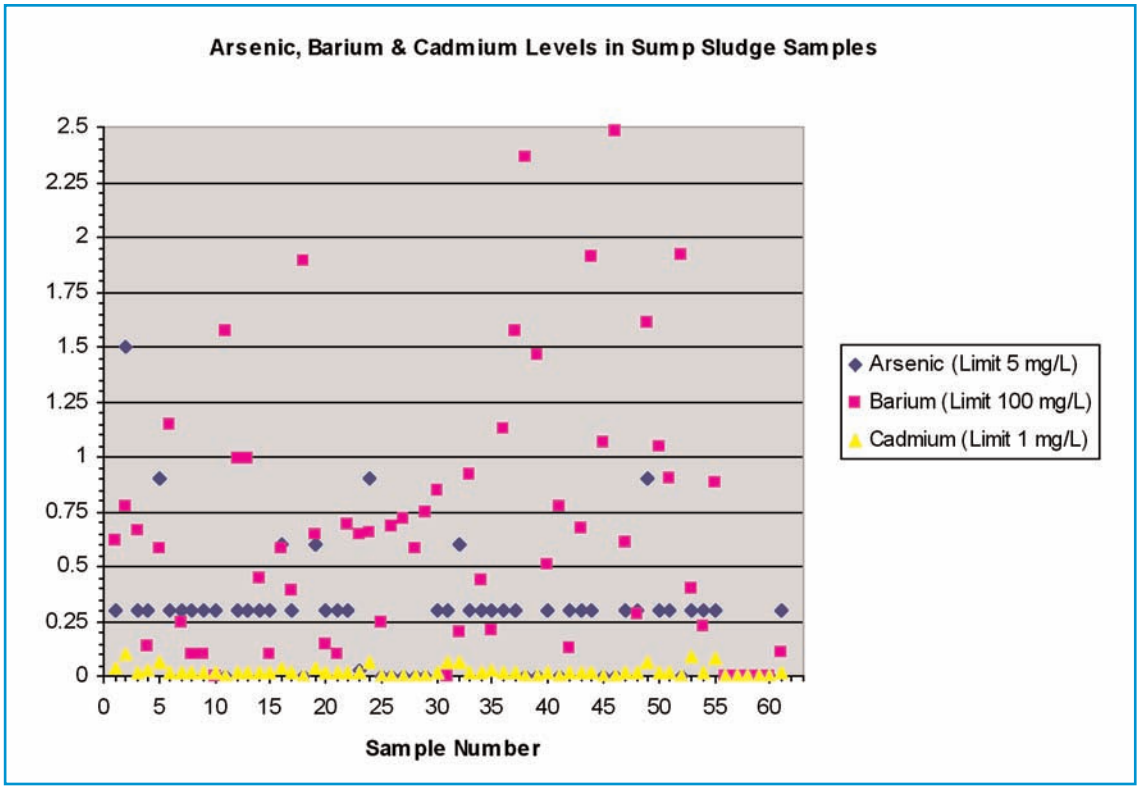

Figure 2. Arsenic, Barium & Cadmium Concentrations in Sump Sludge Samples. The regulatory limit for arsenic is 5.0 mg/L. There were no actual detections of arsenic in any of the samples. Arsenic could not be detected at concentrations less than 1.5 mg/L in one sample, less than 0.9 mg/L in four samples (6.5%), less than 0.6 mg/L in three samples (4.8%), less than 0.3 mg/L in 36 samples (58.1%) or less than 0.025 mg/L in one sample (shown as 1.5 mg/L, 0.9 mg/L, 0.6 mg/L, 0.3 mg/L and 0.025 mg/L respectively.) Sixteen samples (25.8%) had no detectable concentrations of arsenic (shown as 0.0 mg/L.) The regulatory limit for barium is 100.0 mg/L. The highest detected concentration was 2.97 mg/L. Barium could not be detected at concentrations less than 0.2 mg/L in one sample or less than 0.1 mg/L in four samples (6.5%, shown as 0.2 mg/L and 0.1 mg/L respectively). Barium was the most detected heavy metal, however at very low levels compared to the regulatory threshold. The regulatory limit for cadmium is 1.0 mg/L. The highest detected concentration was 0.0892 mg/L. Cadmium could not be detected at concentrations less than 0.1 mg/L in one sample, less than 0.06 mg/L in four samples (6.5%), less than 0.04 mg/L in two samples (3.2%) or less than 0.02 mg/L in 30 samples (48.4%, shown as 0.1 mg/L, 0.06 mg/L, 0.04 mg/L and 0.02mg/L respectively.) Sixteen samples (25.8%) had no detectable concentrations of cadmium (shown as 0.0 mg/L.)

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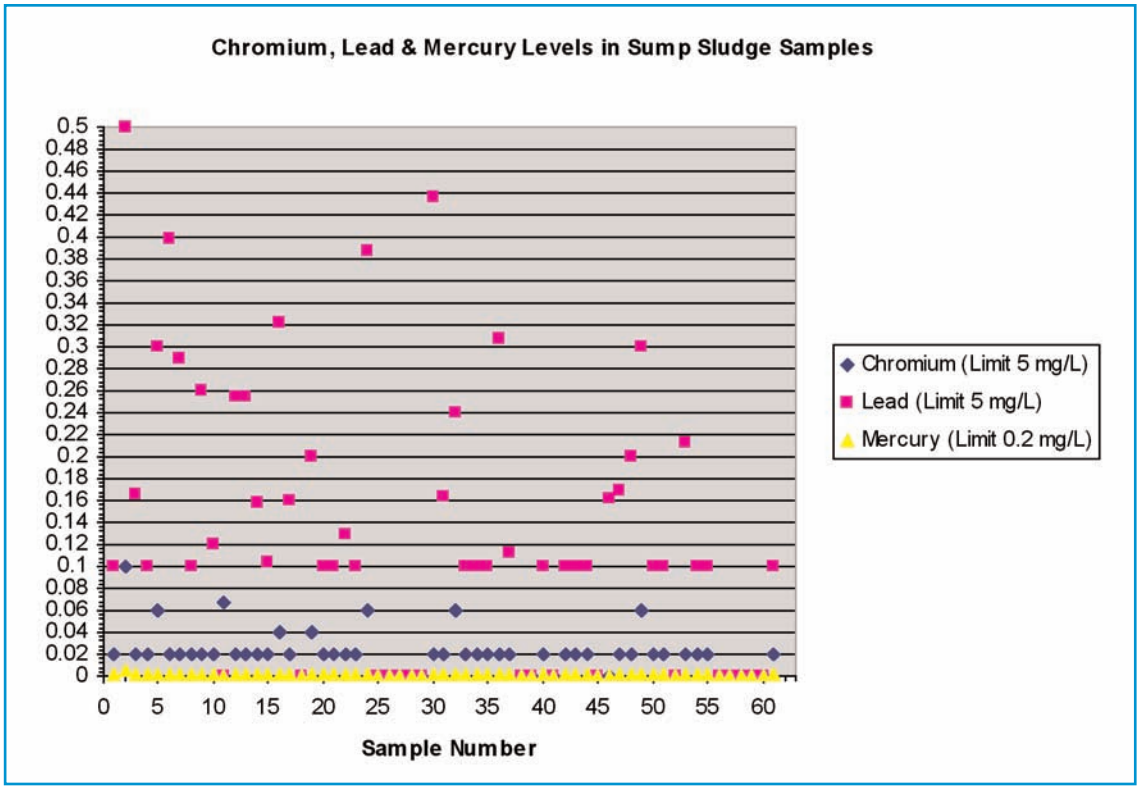

Figure 3. Chromium, Lead & Mercury Concentrations in Sump Sludge Samples. The regulatory limit for chromium is 5.0 mg/L. Only one sample had a detectable concentration of chromium at 0.068 mg/L. Chromium could not be detected at concentrations less than 0.1 mg/L in one sample, less than 0.06 mg/L in six samples (9.7%), less than 0.04 mg/L in two samples (3.2%) or less than 0.02 mg/L in 37 samples (6.0%, shown as 0.1 mg/L, 0.06 mg/L, 0.04 mg/L and 0.02 mg/L respectively.) Fifteen samples (24.2%) had undetectable levels of chromium (shown as 0.0 mg/L.) The regulatory limit for lead is 5.0 mg/L. The highest detected concentration was 0.437 mg/L. Lead could not be detected at concentrations less than 0.5 mg/L in one sample, less than 0.3 mg/L in three samples (4.8%), less than 0.2 mg/L in one sample or less than 0.1 mg/L in 19 samples (30.6%, shown as 0.5 mg/L, 0.3 mg/L, 0.2 mg/L and 0.1 mg/L respectively.) Fifteen samples (24.2%) had no detectable concentrations of lead (shown as 0.0 mg/L.) The regulatory limit for mercury is 0.2 mg/L. There were no actual detections of mercury in any of the samples. Mercury could not be detected at concentrations less than 0.006 mg/L in one sample or less than 0.002 mg/L in 44 samples (71.0%, shown as 0.006 mg/L and 0.002 mg/L respectively.) Sixteen samples (25.8%) had undetectable levels of mercury (shown as 0.0 mg/L.)

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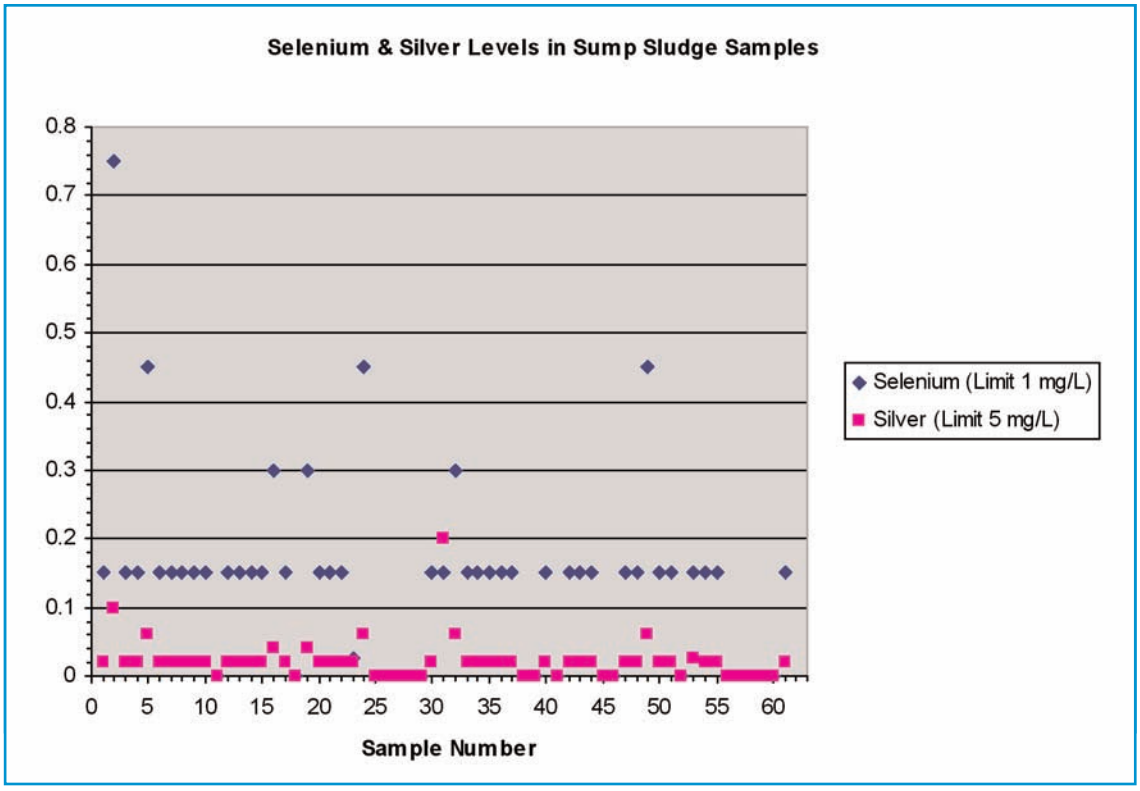

Figure 4. Selenium and Silver Concentrations in Sump Sludge Samples.
The regulatory limit for selenium is 1.0 mg/L. There were no actual detections of selenium in any of the samples. Selenium could not be detected at levels less than 0.75 mg/L in one sample, less than 0.45 mg/L in four samples (6.5%), less than 0.3 mg/L in three samples (4.8%), less than 0.15 mg/L in 36 samples (58.1%) or less than 0.025 mg/L in one sample (shown as 0.75 mg/L, 0.45 mg/L, 0.3 mg/L, 0.15 mg/L and 0.025 mg/L respectively.) Sixteen samples (25.8%) had no detectable concentrations of selenium (shown as 0.0 mg/L.) The regulatory limit for silver is 5.0 mg/L. Only one sample had a detectable concentration of silver at 0.0266 mg/L. Silver could not be detected at concentrations less than 0.2 mg/L in one sample, less than 0.1 mg/L in one sample, less than 0.06 mg/L in five samples (8.1%), less than 0.04 mg/L in two samples (3.2%) or less than 0.02 mg/L in 35 samples (56.5%, shown as 0.2 mg/L, 0.1 mg/L, 0.06 mg/L, 0.04 mg/L and 0.02 mg/L respectively.) Sixteen samples (25.8%) had undetectable levels of silver (shown as 0.0 mg/L.)

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VOCs

TCLP test results on the 62 samples of sump sludge (from shop drains and wash bay drains) showed that six samples had tetrachloroethene concentrations above the corresponding regulatory threshold and one sample with trichloroethene concentration above the corresponding regulatory threshold. **Figures 5 through 13** show the individual results. It is important to note that in the testing of both heavy metals and VOCs, several samples returned with inconclusive results. More specifically, due to possible interference during the testing procedure, or discrepancies in the sample itself, the result was reported not as a specific quantity, but as 'less than' the lowest detectable level (i.e., <0.02 mg/L.) In most cases, this can be interpreted as 'non-detectable or zero,' but in some cases the lowest detectable level of toxin in the sample was reported above the regulatory threshold. This was the case with seven samples and seven VOCs (benzene, carbon tetrachloride, 1,2-dichloroethane, 1,1-dichloroethene, tetrachloroethene, trichloroethene and vinyl chloride.) Also, data points visualized as zero actually represent instances where the toxin was not detected. All such cases are noted in the figure descriptions.

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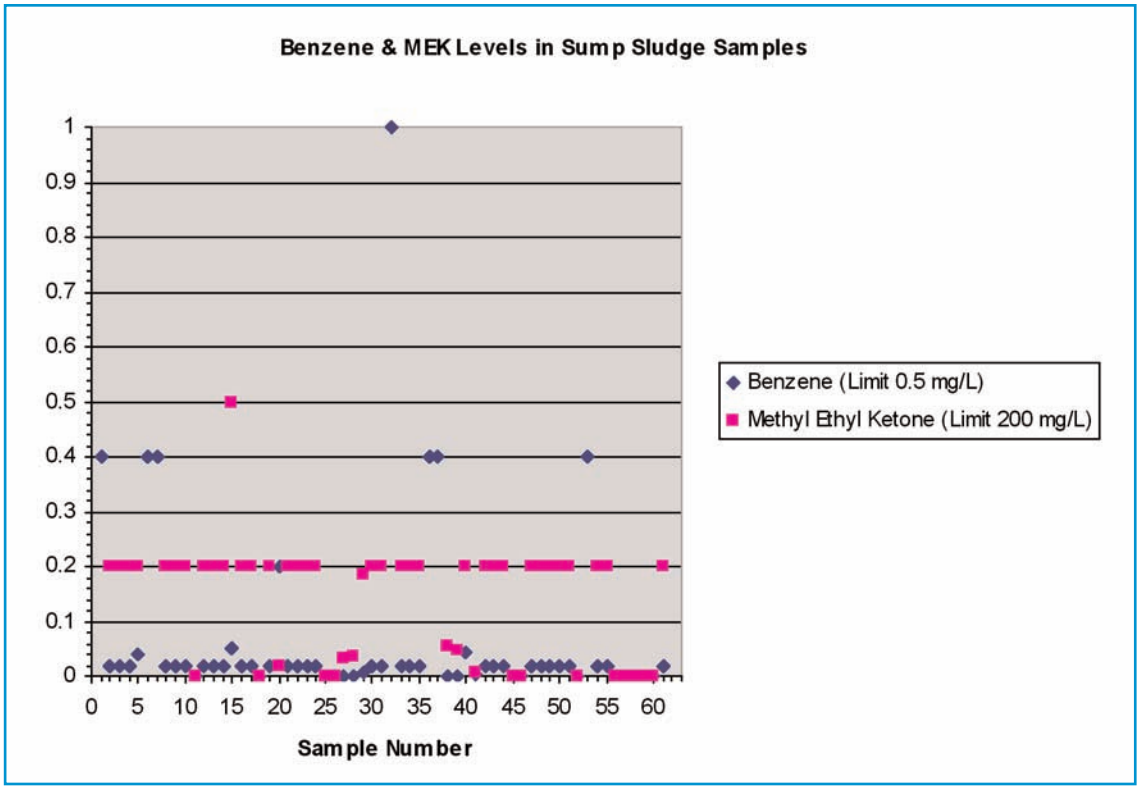

Figure 5. Benzene & Methyl Ethyl Ketone (MEK) Concentrations in Sump Sludge Samples. The regulatory limit for benzene is 0.5 mg/L. One sample showed results warranting further investigation. In this sample, benzene could not be detected at concentrations lower than 1.0 mg/L. This case is noteworthy in that the lowest detectable level is above the regulatory limit. This sample may or may not be representative of a hazardous waste. Additionally, benzene could not be detected at concentrations less than 0.4 mg/L in six (10.0%) samples (shown as 0.4 mg/L.) This is close to the regulatory limit. Benzene could not be detected at concentrations less than 0.2 mg/L in one sample, less than 0.05 mg/L in one sample or less than 0.02 mg/L in 34 samples (54.8%, shown as 0.2 mg/L, 0.05 mg/L and 0.02 mg/L respectively.) Thirteen samples (21.0%) had undetectable levels of benzene (shown as 0.0 mg/L.) The regulatory limit for MEK is 200 mg/L. The highest detected concentration of MEK was 0.187 mg/L. MEK could not be detected at concentrations less than 10.0 mg/L in one sample, less than 4.0 mg/L in six samples (9.7%), less than 0.5 mg/L in one sample, less than 0.2 mg/L in 36 samples (58.1%) or less than 0.02 mg/L in one sample (shown as 10.0 mg/L, 4.0 mg/L, 0.5 mg/L, 0.20 mg/L and 0.02 mg/L respectively). Ten samples (16.1%) had undetectable levels of MEK (shown as 0.0 mg/L.)

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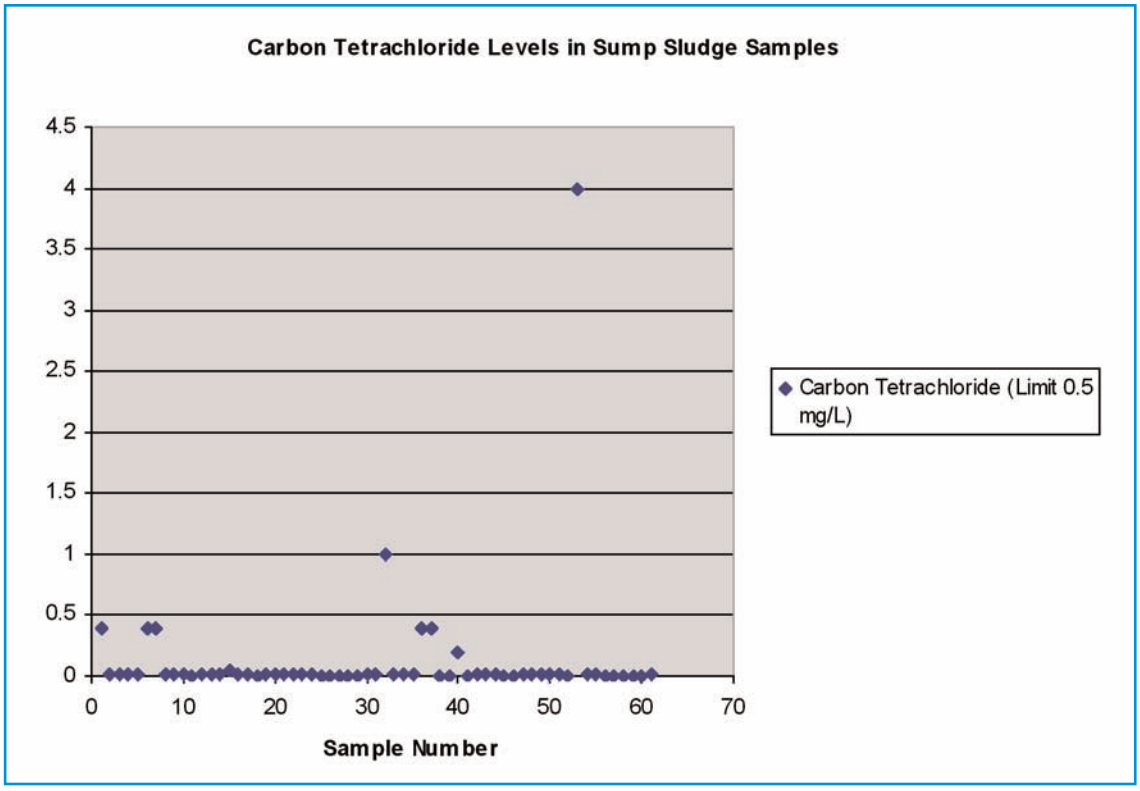

Figure 6. Carbon Tetrachloride Concentrations in Sump Sludge Samples.
The regulatory limit for carbon tetrachloride is 0.5 mg/L. There were no actual detections of carbon tetrachloride in any of the samples. Two samples showed results warranting further investigation at less than 4.0 mg/L and less than 1.0 mg/L (shown as 4.0 mg/L and 1.0 mg/L.) These cases are noteworthy in that the lowest detectable level is above the regulatory limit. These samples may or may not be representative of a hazardous waste. Additionally, carbon tetrachloride could not be detected at concentrations less than 0.4 mg/L in five samples (8.1%, shown as 0.4 mg/L.) This is close to the regulatory limit. Carbon tetrachloride could not be detected at concentrations less than 0.2 mg/L in one sample, less than 0.05 mg/L in one sample and less than 0.02 mg/L in 37 samples (60.0%, shown as 0.2 mg/L, 0.05 mg/L and 0.02 mg/L respectively.) Sixteen samples (25.8%) had undetectable levels of carbon tetrachloride (shown as 0.0 mg/L.)

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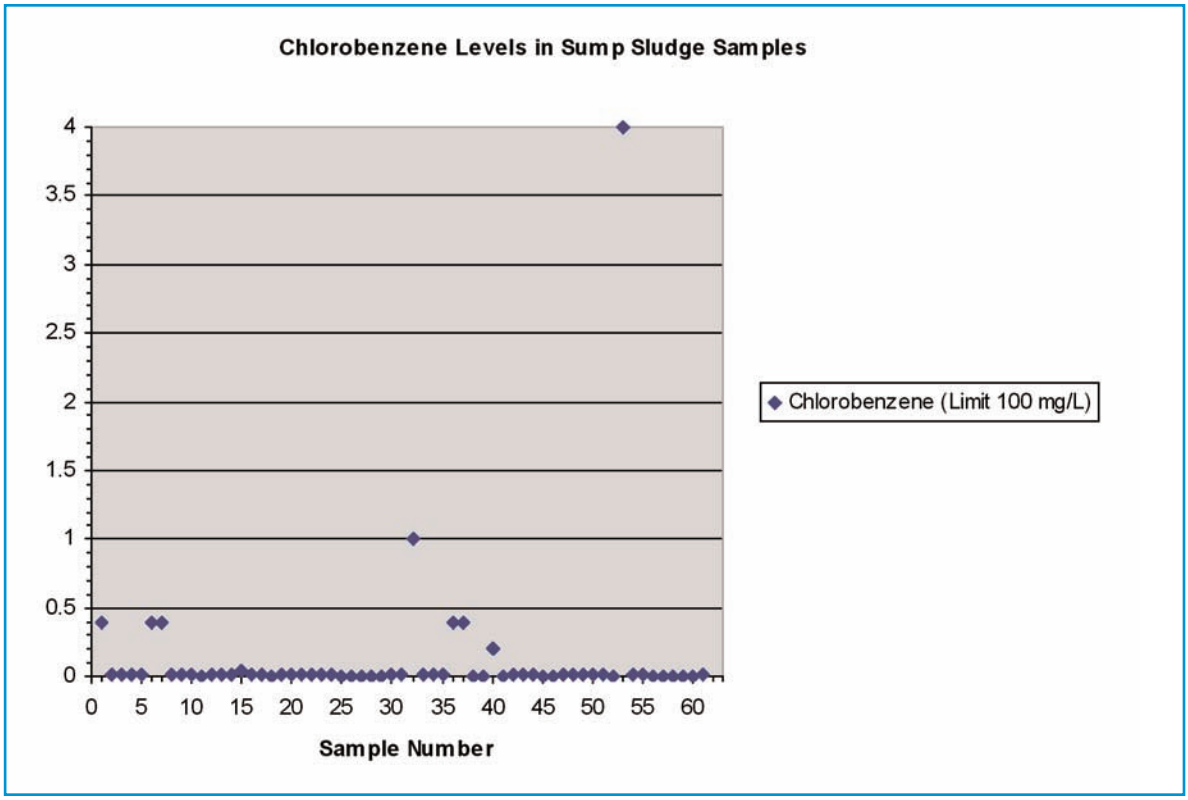

Figure 7. Chlorobenzene Concentrations in Sump Sludge Samples.
The regulatory limit for chlorobenzene is 100 mg/L. There were no actual detections of chlorobenzene in any of the samples. Chlorobenzene was undetected at concentrations less than 4.0 mg/L in one sample, less than 1.0 mg/L in one sample, less than 0.4 mg/L in five samples (8.1%), less than 0.2 mg/L in one sample, less than 0.05 mg/L in one sample and less than 0.02 mg/L in 37 samples (60.0%, shown as 4.0 mg/L, 1.0 mg/L, 0.4 mg/L, 0.2 mg/L, 0.05 mg/L and 0.02 mg/L respectively.) Sixteen samples (25.8%) had undetectable levels of chlorobenzene (shown as 0.0 mg/L.)

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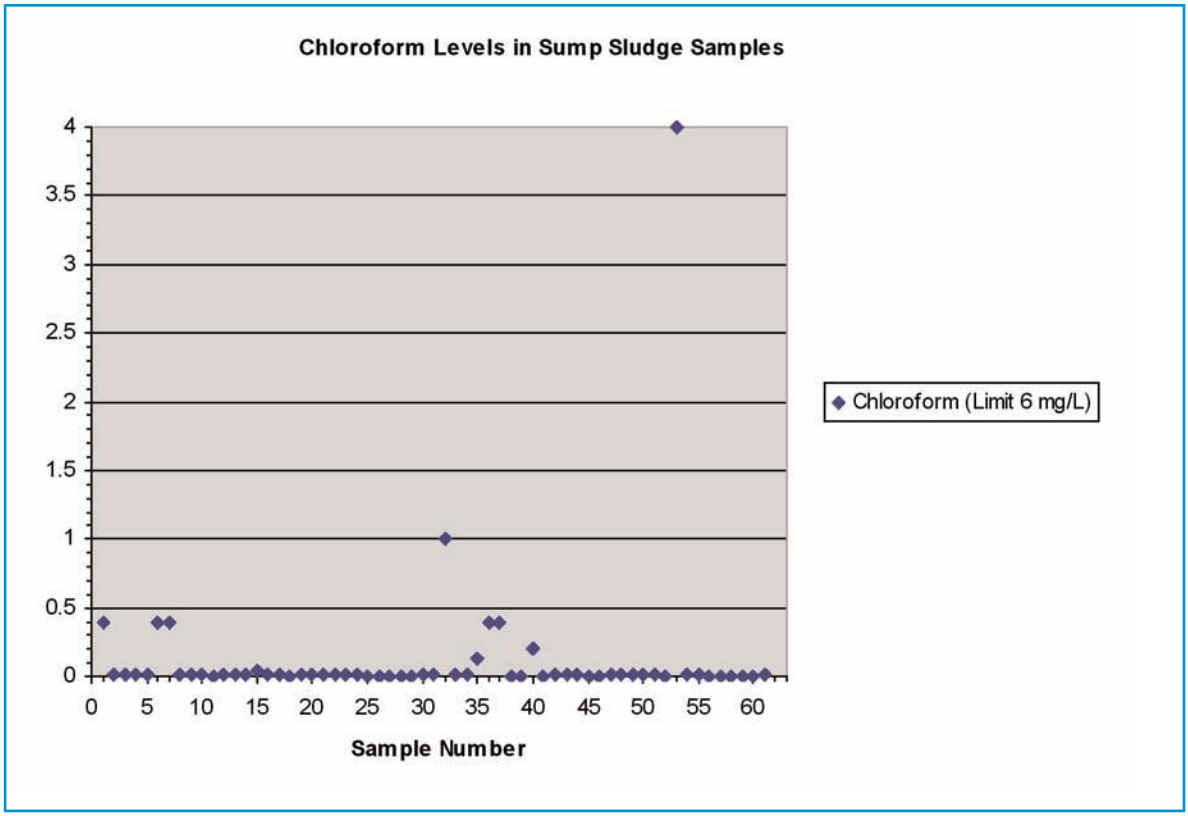

Figure 8. Chloroform Concentrations in Sump Sludge Samples.
The regulatory limit for chloroform is 6 mg/L. The highest detected concentration of chloroform was 0.131 mg/L. Chloroform was undetected at concentrations less than 4.0 mg/L in one sample, less than 1.0 mg/L in one sample, less than 0.4 mg/L in five samples (8.1%), less than 0.2 mg/L in one sample, less than 0.05 mg/L in one sample and less than 0.02 mg/L in 36 samples (58.1%, shown as 4.0 mg/L, 1.0 mg/L, 0.4 mg/L, 0.2 mg/L, 0.05 mg/L and 0.02 mg/L respectively.) Fourteen samples (22.6%) had undetectable levels of chloroform (shown as 0.0 mg/L.)

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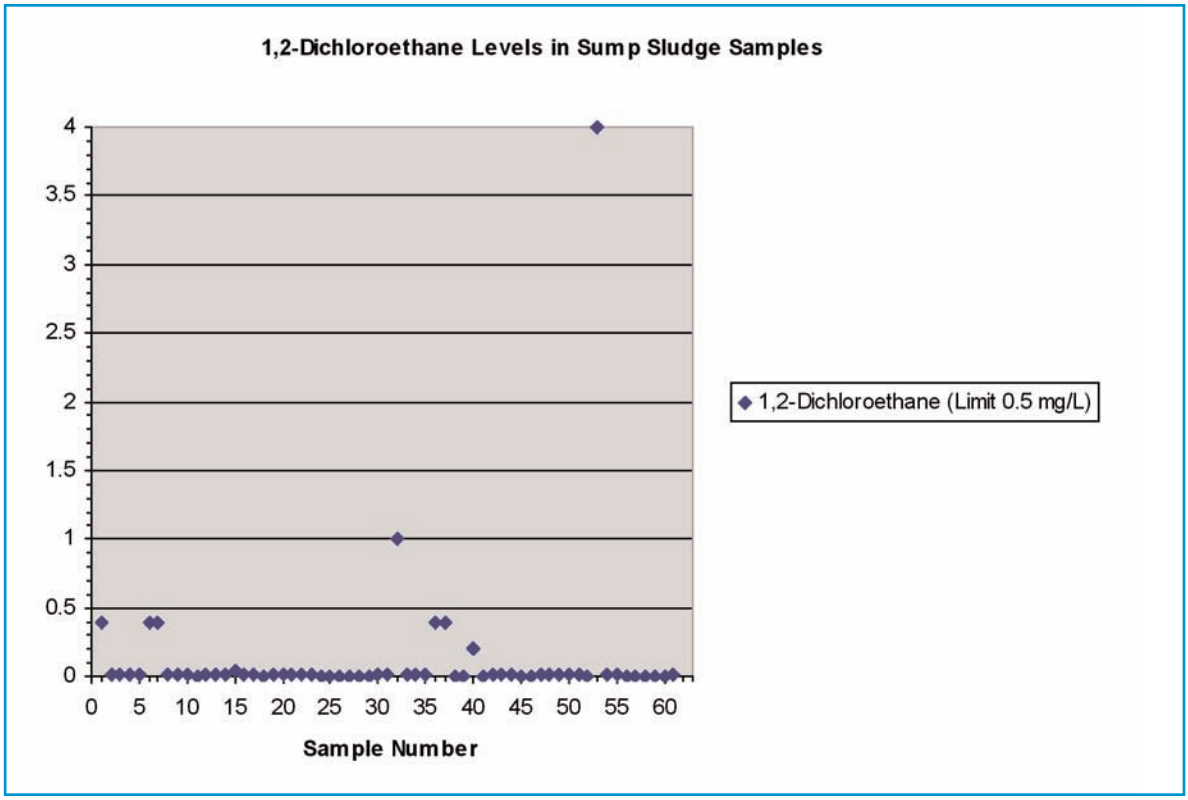

Figure 9. 1,2-Dichloroethane Concentrations in Sump Sludge Samples.
The regulatory limit for 1,2-dichloroethane is 0.5 mg/L. There were no actual detections of 1,2-dichloroethane in any of the samples. Two samples showed results warranting further investigation at less than 4.0 mg/L and less than 1.0 mg/L (shown as 4.0 mg/L and 1.0 mg/L.) These cases are noteworthy in that the lowest detectable level is above the regulatory limit. These samples may or may not be representative of a hazardous waste. Additionally, 1,2-dichloroethane could not be detected at concentrations less than 0.4 mg/L in five samples (8.1%, shown as 0.4 mg/L.) This is close to the regulatory limit. 1,2-dichloroethane could not be detected at concentrations less than 0.2 mg/L in one sample, less than 0.05 mg/L in one sample or less than 0.02 mg/L in 37 samples (60.0%, shown as 0.2 mg/L, 0.05 mg/L and 0.02 mg/L respectively.) Sixteen samples (25.8%) had undetectable levels of 1,2-dichloroethane (shown as 0.0 mg/L.)

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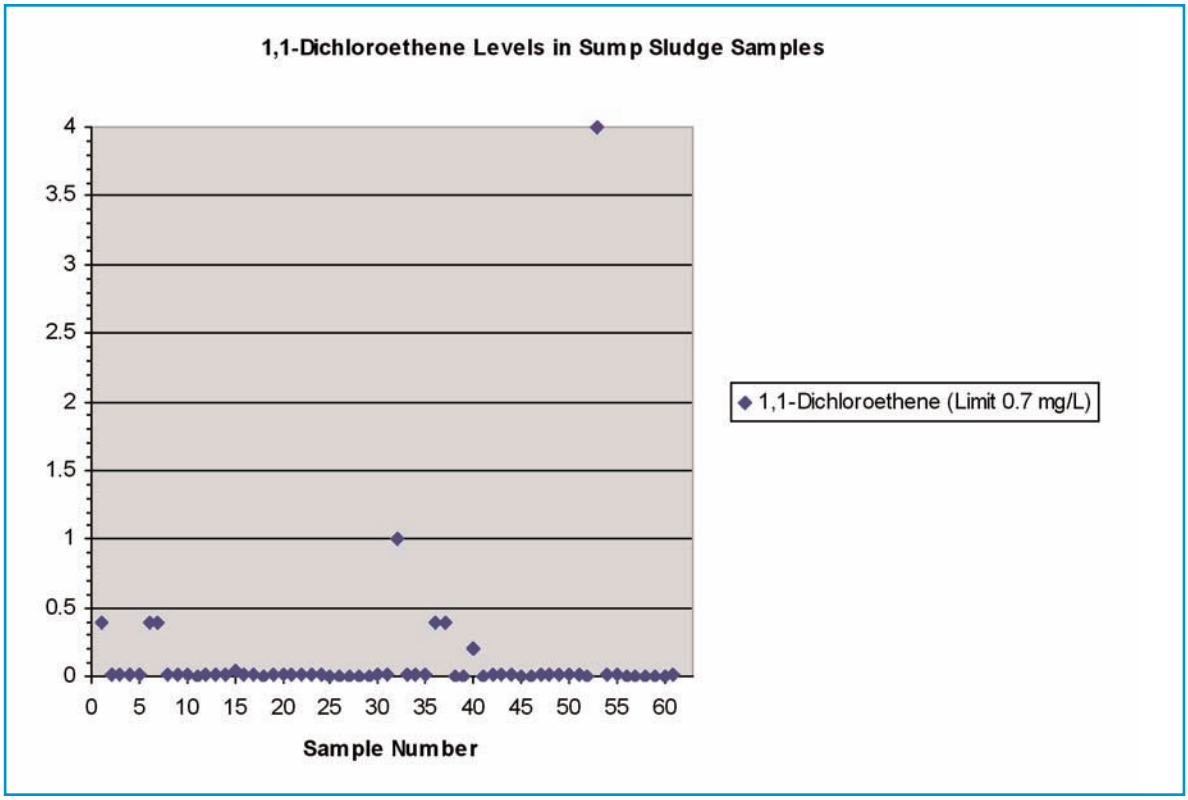

Figure 10. 1,1-Dichloroethene Concentrations in Sump Sludge Samples.
The regulatory limit for 1,1-dichloroethene is 0.7 mg/L. There were no actual detections of 1,1-dichloroethene in any of the samples. Two samples showed results warranting further investigation at less than 4.0 mg/L and less than 1.0 mg/L (shown as 4.0 mg/L and 1.0 mg/L.) These cases are noteworthy in that the lowest detectable level is above the regulatory limit. These samples may or may not be representative of a hazardous waste. 1,1-dichloroethene could not be detected at concentrations less than 0.2 mg/L in one sample, less than 0.05 mg/L in one sample or less than 0.02 mg/L in 37 samples (60.0%, shown as 0.2 mg/L, 0.05 mg/L and 0.02 mg/L respectively.) Sixteen samples (25.8%) had undetectable levels of 1,1-dichloroethene (shown as 0.0 mg/L.)

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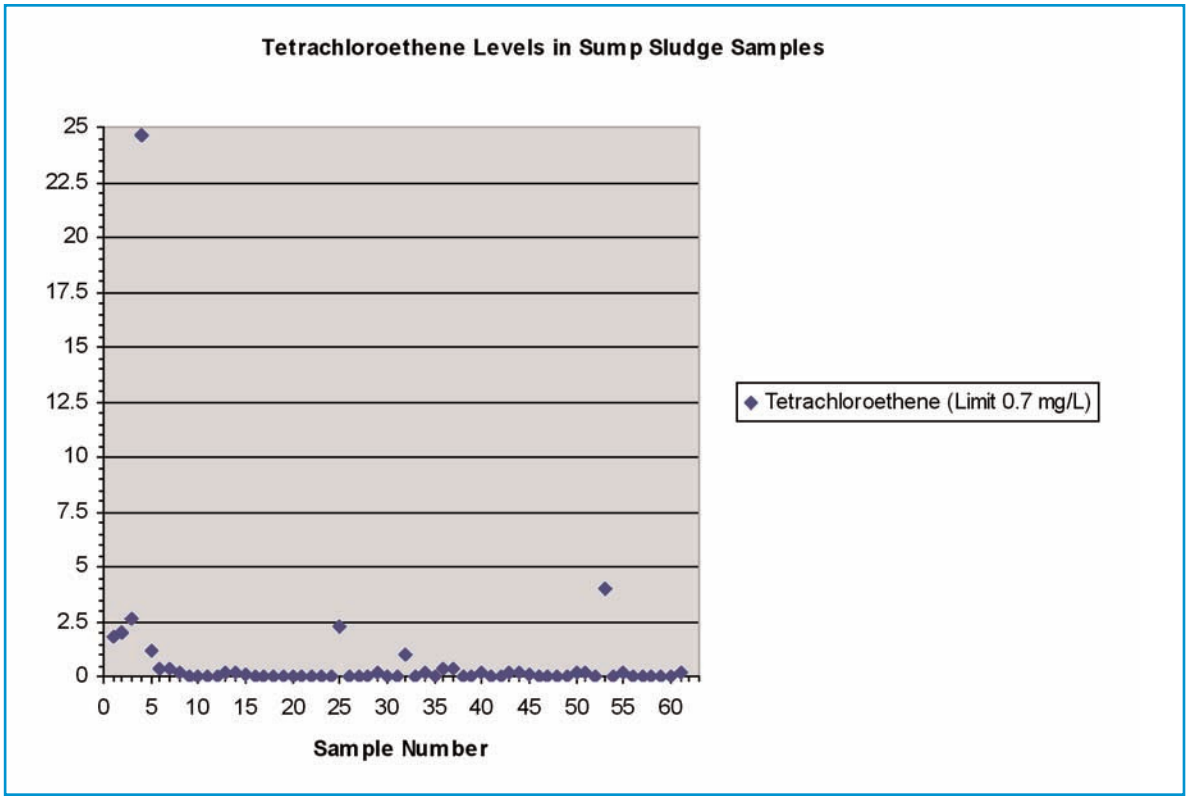

Figure 11. Tetrachloroethene Concentrations in Sump Sludge Samples.
The regulatory limit for tetrachloroethene is 0.7 mg/L. ***Six samples showed tetrachloroethene concentrations higher than the regulatory limit (24.6 mg/L, 2.68 mg/L, 2.3 mg/L, 2.03 mg/L, 1.86 mg/L and 1.15 mg/L.)*** Two samples showed results warranting further investigation. In these samples, tetrachloroethene could not be detected at concentrations lower than 4.0 mg/L or 1.0 mg/L. These two cases are noteworthy, in that the lowest detectable level is above the regulatory limit. These samples may or may not be representative of a hazardous waste. Tetrachloroethene could not be detected at concentrations less than 0.51 mg/L in one sample, less than 0.4 mg/L in four samples (6.5%), less than 0.2 mg/L in thirteen samples (21.0%), less than 0.05 mg/L in one sample and less than 0.02 mg/L in 18 samples (29.0%, shown as 0.51 mg/L, 0.4 mg/L, 0.2 mg/L, 0.05 mg/L and 0.02 mg/L respectively.) Thirteen samples (21.0%) had undetectable levels of tetrachloroethene (shown as 0.0 mg/L.)

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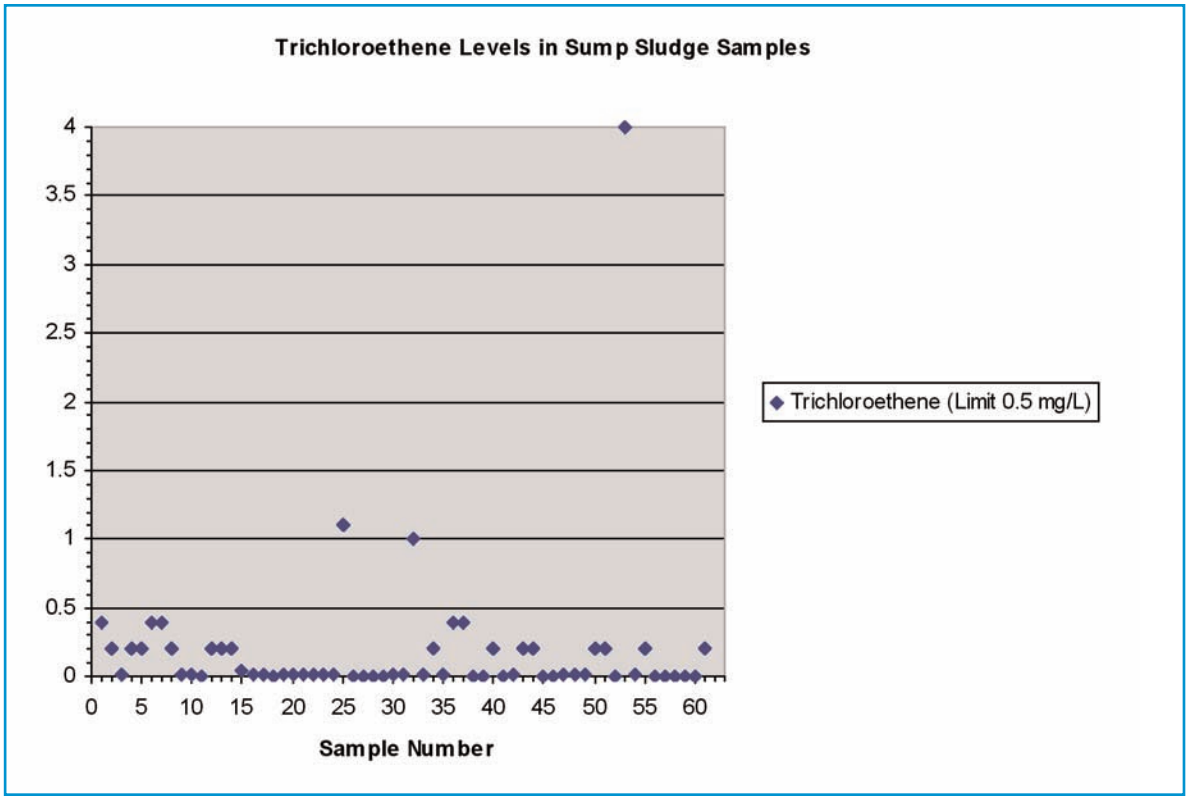

Figure 12. Trichloroethene Concentrations in Sump Sludge Samples.
The regulatory limit for trichloroethene is 0.5 mg/L. ***One sample showed trichloroethene concentration higher than the regulatory limit at 1.11 mg/L.*** Two samples showed results warranting further investigation. In these samples, trichloroethene could not be detected at concentrations lower than 4.0 mg/L or 1.0 mg/L. These cases are noteworthy in that the lowest detectable level is above the regulatory limit. These samples may or may not be representative of a hazardous waste. Additionally, trichloroethene could not be detected at concentrations less than 0.4 mg/L in five samples (8.1%, shown as 0.4 mg/L.) This is close to the regulatory limit. Trichloroethene could not be detected at less than 0.2 mg/L in 18 samples (29.0%), less than 0.05 mg/L in one sample or less than 0.02 mg/L in 20 samples (32.3%, shown as 0.2 mg/L, 0.05 mg/L and 0.02 mg/L respectively.) Fifteen samples (24.2%) had undetectable levels of trichloroethene (shown as 0.0 mg/L.)

Sump Sludge Summary

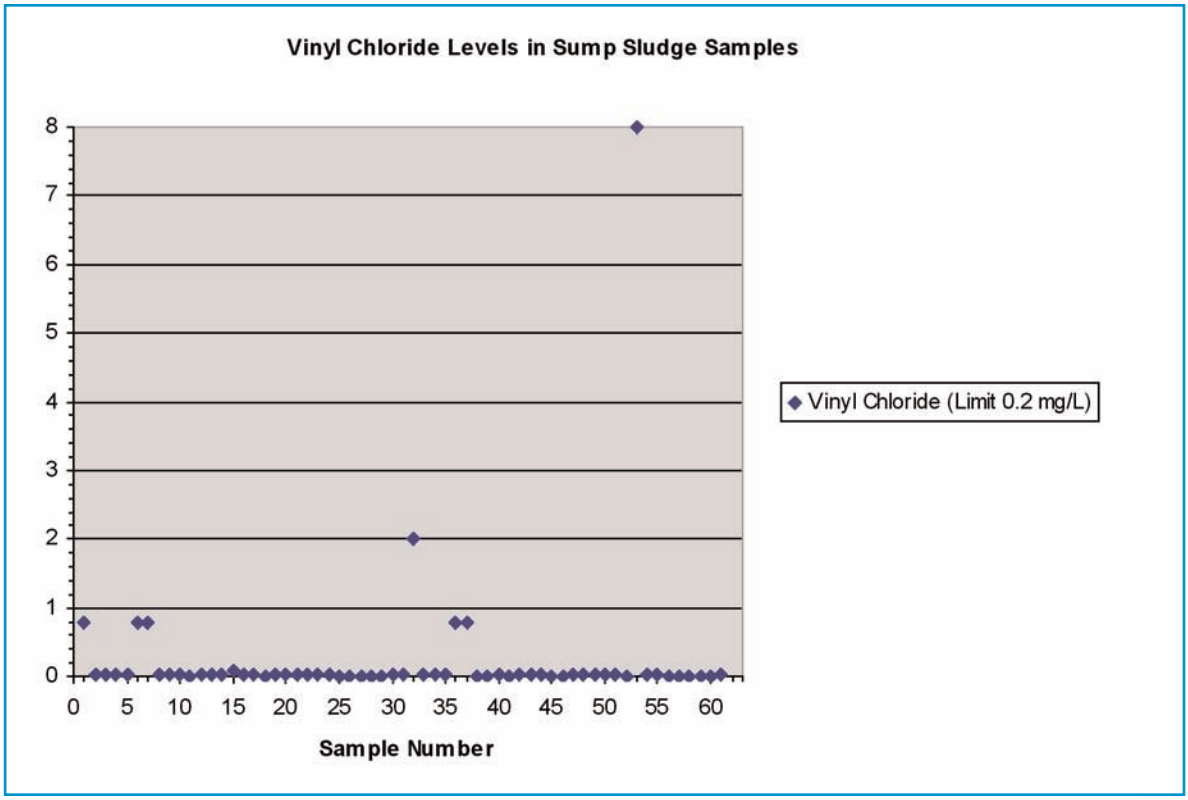

Figure 13. Vinyl Chloride Concentrations in Sump Sludge Samples.
The regulatory limit for vinyl chloride is 0.2 mg/L. There were no actual detections of vinyl chloride in any of the samples. Seven samples showed results warranting further investigation. In these samples, vinyl chloride could not be detected at concentrations lower than 8.0 mg/L, 2.0 mg/L or 0.8 mg/L. These cases are noteworthy in that the lowest detectable level is above the regulatory limit. These samples may or may not be representative of a hazardous waste. Vinyl chloride could not be detected at concentrations less than 0.1 mg/L in one sample, less than 0.04 mg/L in 30 samples (48.4%) or less than 0.02 mg/L in seven samples (11.3%, shown as 0.1 mg/L, 0.04 mg/L and 0.02 mg/L respectively.) Sixteen samples (25.8%) had undetectable levels of vinyl chloride (shown as 0.0 mg/L.)

The Iowa Waste Reduction Center (IWRC) is a free, confidential and non-regulatory small business technical assistance program located at the University of Northern Iowa. The IWRC offers a free on-site review of any Iowa business with fewer than 200 employees. Contact the IWRC at 319-273-8905 or on the web at www.IWRC.org.

Sump Sludge Summary

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2. Wolf, Katy, Mike Morris, *Brake Cleaning with Water-Based Cleaning Systems*, Pollution Prevention Review, Summer 2000.

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