US EPA RECORDS CENTER REGION 5
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FOREWORD

This report is a confidential lawyer-client communication intended for the Board of Directors of Waste Management, Inc. The report contains the results of this firm's investigation of various charges made against the Company in the news media in the Spring of 1983.

In reading this report please keep the following cautionary concerns in mind.

It is common to turn immediately to the conclusions of a report without reading the explanatory text. Conclusions are simply abbreviated summaries of the analysis contained in the text. When read alone without reading the entire text, conclusions are often misinterpreted. Such selective reading is strongly discouraged.

A parallel concern comes from the tendency of many readers to take individual sentences and phrases out of the context of the textual analysis. Again, such out of context references often lead to misunderstanding, and are strongly discouraged.

A final concern arises by reason of the very nature of an investigatory report commissioned by a company that is the subject of the investigation. Exculpatory findings may be viewed as a deliberate "whitewash" of the company. Conversely, any findings of company violations of regulatory requirements may be viewed as a "stab in the back."

The intent of this report is to be neither a "whitewash" nor a "stab in the back" but instead to serve as an objective analysis of what occurred and what if anything should be done in light of our findings.

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INTRODUCTION

A. The Genesis Of This Report

In the late fall and early winter of 1982-83, an avalanche of allegations fell upon officials of the United States Environmental Protection Agency concerning their administration of the Nation's laws concerning hazardous wastes. Not a day passed without some additional charge being leveled involving alleged sweetheart deals, maladministration, incompetence, political favoritism, or specialized treatment of major corporate polluters.

Swept into this avalanche of media charges was Waste Management, Inc., a large national corporation which specializes in the transport and disposal of both municipal wastes and hazardous wastes at locations throughout the United States and foreign countries. Waste Management, Inc., through its corporate subsidiary, Chemical Waste Management, Inc. (referred to collectively in this report as the "Company"), was accused on an almost daily basis throughout March of 1983, of a wide variety of violations of federal and state law.

The most serious allegations hit the Company on March 21 and 22, 1983, in a pair of front page articles by the New York Times. These allegations were in turn republished on March 22, 1983 by the Wall Street Journal. The headlines alone were explosive:

Leader in Toxic Dumps Accused of Illegal Acts

(New York Times, Monday, March 21, 1983).

Illinois Accuses Waste Management, Inc. of Scheme to Hide Illegal Toxic Shipments

(Wall Street Journal, Tuesday, March 22, 1983).

These articles published charges that "senior Company management" had conspired to secretly dispose of a known carcinogen -- dichlorobenzidine (DCB) -- at a hazardous waste landfill near Chicago, Illinois without a permit required by Illinois law.

> The Company's top management consciously and by deception or omission tried to hide the transportation of about 400,000 gallons of waste containing dichlorobenzidine, or DCB...
>
> Wall Street Journal, March 22, 1983

> This cover-up of illegal activities is a case of utter corporate irresponsibility,...According to the suit the Company disposed of 400,000 gallons of toxic wastes for which it did not have a permit. The wastes contained dichlorobenzidine, DCB...
>
> New York Times, March 22, 1983

> ...high level management at Waste Management consciously and by deception and omission attempted to conceal the DCB shipments to the Company's Calumet Industrial Landfill.
>
> * * *
>
> They knew they did not have a permit to bring in the DCB's but to please a customer with whom they

had a 4 million dollar contract, they transported the DCB waste and disposed of it in Illinois.

Chicago Tribune, March 22, 1983

The articles also charged that Company officials at the Company's site in Vickery, Ohio had illegally disposed of polychlorinated biphenyls (PCB) and other chemicals at the Vickery site; and that at the Company's Emelle, Alabama site, the Company had illegally disposed of PCBs and had violated federal regulations for burial of drums. The articles further catalogued a series of charges made by officials in several other states. According to the articles, these charges included:

Alabama - The Alabama Attorney General had charged that the Company's proposal to build PCB storage tanks in a flood plain violated federal law. (Wall Street Journal, March 22, 1983). The Alabama Attorney General had already charged the Company and top EPA officials with "hanky panky" in the decision to allow PCB storage facilities to be built in the flood plain. (Chicago Tribune, March 18, 1983).

Colorado - The articles stated that the Colorado Supreme Court had ordered the Company's hazardous waste disposal facility at the old Lowry Air Force Base to be shut down and paraphrased a letter by Colorado Governor Richard Lamm, charging that the

Company had deliberately withheld information regarding the presence of liquids in a leak detection sump.

Kansas - The articles stated that the State of Kansas had shut down the Company's N.I.E.S. site near Wichita because of leaks from the site. The article further stated that the Company had been fined $19,000.00 for improper handling of PCBs and for failing to keep proper records.

Pennsylvania - The articles charged that the State had shut down the Company's operations at the Lyncott disposal site and charged the Company with 5 violations of state regulations.

Indiana - The articles reiterated a charge that the Company had violated its contract to clean up a waste dump in Seymour, Indiana and that the Company had paid a $3,000.00 penalty.

EPA Favoritism. Finally the articles suggested that the Company had benefited from favoritism from the EPA in decisions made with regard to the permitting of the Vulcanus, an ocean incineration ship owned by the Company. Earlier articles had suggested that the Company had used James Sanderson -- a close confidant of EPA Administrator

Anne Gorsuch -- to assist in the lifting of a ban on liquids in landfills.

The New York Times articles of March 21 and 22, and the Wall Street Journal article of March 22 -- coming on the heels of weeks of day by day allegations in regional media -- created major anxiety in the financial markets. In becoming the largest company in the nation transporting and disposing of municipal and hazardous wastes, Waste Management, Inc. had emphasized a public image of professional skill and strict adherence to the law. The barrage of charges inflicted severe damage on the Company's credibility. Within two days after the New York Times article of March 21, the total value of the Company's stock dropped approximately one billion dollars.

In response to the precipitous loss in stock value, the Company made a public response on March 23, 1983. Senior Company management announced that the Company had retained an independent law firm to investigate the charges and report its findings to the Board of Directors. At the same time, the Company management:

1. denied that the Company had disposed of DCB at CID without a permit;

2. acknowledged that some employees had failed to file shipping manifests as required by law at the CID site;

3. acknowledged that the Company had discovered PCBs in the storage tanks of its Vickery, Ohio (O.L.D.) disposal facility;

4. stated that two senior technical officials at the Emelle, Alabama site denied that PCBs in excess of federal limits had been disposed of, but acknowledged that further investigation of the allegations was necessary;

5. denied that there had been any improper activity with regard to the proposal to build PCB storage tanks in the flood plain at Mobile, Alabama;

6. denied that the Company had improperly tried to influence the regulatory process through its retention of Mr. James Sanderson, a lawyer who had served at various times as a paid advisor to the EPA;

7. acknowledged that there was a dispute between the Company and EPA as to reporting requirements concerning fluid found in a pond sump at the Company's Denver-Arapahoe (Lowry) site;

8. stated that they had disposed of Seymour, Indiana wastes at sites fully permitted to receive the wastes, but acknowledged that some of those sites were not listed in the contract; and

9. stated that the Kansas site and Pennsylvania site had been closed because of errors by prior owners.

At the same time that the Company publicly announced the retention of this firm to conduct the internal investigation of these charges, the Company also announced that the following attorneys had been retained to represent the Company and to insure full compliance with all federal and state requirements:

Joan Z. Bernstein, of the Washington, D.C. law firm of Wald, Harkrader & Ross and formerly general counsel of the Environmental Protection Agency under President Carter, and;

Angus Macbeth and **Jeffrey Miller,** of the Washington, D.C. lawfirm of Bergson, Borklund, Margolis & Adler. Mr. Macbeth was formerly head of the Pollution Control Section of the United States Department of Justice. Mr. Miller was formerly Director of the Enforcement Division of United States Environmental Protection Agency.

B. Scope Of The Investigation

The charge to this law firm was to investigate the principal allegations that had been made against the Company in the media and to report our findings and conclusions to the Board of Directors. The investigators were given access to all Company records and Company personnel were instructed by management to provide full cooperation.

Thousands of Company records pertinent to the allegations were reviewed both at corporate headquarters in Oak Brook, Illinois, and at various sites that were the targets of the allegations.

The investigators conducted numerous personal and telephone interviews with corporate, regional and site personnel at corporate headquarters and in Alabama, Ohio, Colorado and Illinois. The interviews were not conducted under oath.

We did not interview those individuals who were the primary accusers of the Company. These individuals are all currently involved in litigation against the Company. Contact by Company retained investigative counsel while litigation was pending ran the risk of being interpreted as inappropriate or coercive. However, we did review and consider all available transcripts and summaries of statements by these individuals.

I. THE RESULTS OF THE INVESTIGATION

The results of our investigation are set forth in detail in the following pages. Because of the complexity of the facts surrounding the charges at each site, we have made the following qualitative assessments of the charges:

1. There is conduct which has been subject to a charge where there has been no violation of the law or regulations. Some of the charges were in error or resulted from a misunderstanding of the law.

2. We have not observed any conduct, nor have we learned of any conduct at the Company's hazardous waste treatment and disposal sites which represents a threat to the environment, i.e., leakage of any contaminant to the groundwater.

There are instances where predecessors of the Company have engaged in or permitted conduct which led to direct threats or actuality of groundwater contamination for which the Company has been incorrectly blamed.

3. There have been a number of actions at sites which have been taken on the assumption that explicit compliance with the written regulations was not necessary. These assumptions were based in part on a justifiable but undocumented reliance on informal agency approval of the conduct or on the erroneous belief that strict compliance was not necessary. We characterize these as non-serious "technical" violations which did no damage to the environment. However, despite their non-serious nature, these "technical" violations have damaged the Company's credibility.

4. There has been certain conduct which, though not harmful to the environment, has represented serious non-compliance with environmental regulations for which no informal approval of any kind has been given or can be assumed.

A. Calumet City, Illinois (CID)

The Company's CID facility is a treatment, storage and disposal site located in Calumet City, Illinois. CID is permitted for such activities under both state and federal law.

CID has been owned by the Company or its predecessors since before 1970 and has been licensed to accept "special" or hazardous waste since the inception of state and federal regulatory programs.

Wastes received at the site are generally categorized as either corrosive or aqueous. Corrosive streams are neutralized and solidified prior to final disposal. Aqueous streams are de-watered or solidified prior to disposal in the landfill.

The charges contained in the New York Times and Wall Street Journal as well as related charges in other newspapers emphasized the following allegations:

1. that between January 1980 and May 1980 the Company accepted and disposed of wastes containing "DCB" -- dichlorobenzedine -- without a permit as required by Illinois law;

2. That the Company failed to file manifests as required by law;

3. that the Company had accepted loads of waste material that contained flammable "low flash" material.

Related to these charges were allegations of motivation and intent, i.e., that "senior" Company management had conspired to deceive Illinois officials so that DCB wastes could be secretly disposed of at CID. The purported motive for such alleged high level deceit was to please a large corporate customer. Almost lost in the furor over DCB were charges that the Company had received loads of another stream, Oryzalin 1 (OZ-1), without a permit and had failed to file manifests for these loads as well.

1. Receipt Of DCB Wastes

Perhaps the most dramatic charge leveled at the Company was that senior Company management conspired to bring a cancer causing agent into the Company's CID disposal site without a permit, as required by Illinois law. This charge was leveled by a former employee of the Company, Mr. Mahendra Sandesara, who had served as laboratory manager at the CID landfill. The charge was that the CID landfill received waste loads containing DCB without a permit during the period January 1, 1980 through May 1, 1980. According to media reports, the Company had allegedly accepted these

wastes without a permit simply to please a major customer, Lakeway Chemical Company of Muskegon, Michigan ("Lakeway").

We have carefully examined Company records as to the permitting of wastes containing DCB and find no basis for the charge. The factual basis for our conclusion is as follows.

In July 1978, Lakeway sent the Company chemical test results on acid wastes resulting from Lakeway's manufacture of dichlorobenzidine, DCB -- as a prelude to sending the acid waste streams to CID for treatment and disposal. CID has long been permitted to receive waste industrial acids, to neutralize those acids, and to place the neutralized material in the CID landfill. CID is a licensed hazardous waste treatment and disposal site.

The test result data was on three related streams of acid waste. The strongest and most concentrated acid waste stream was called DCB Concentrated Mother Liquor, which the Company gave the shorthand name DCB-1. It contained up to 50% sulfuric acid and less than 1% hydrochloric acid. Listed on Lakeway's data sheet was a notation that the DCB-1 stream contained more than .5%, but less than 1% dichlorobenzidine.

Another stream was called DCB Mother Liquor, or DCB-3. This waste was a dilute form of DCB Concentrated Mother Liquor (DCB-1), from which the water had not been evaporated. The final related stream from the DCB

manufacturing process was called DCB Spent Acid Wash Waste, or DCB-2 (also commonly referred to as Acid Wash Acid).

Upon receipt of these results, the CID lab manager applied for and received a single permit from the State of Illinois covering all three related streams from the DCB manufacturing process. The permit application is dated August 9, 1978, and the permit -- Illinois permit 78-1490 -- was granted on September 13, 1978, with an expiration date of September 13, 1979. The person who signed the August 9, 1978 permit application was Mr. Mahendra Sandesara, the CID lab manager who made the charges in the media.

Company records show that Lakeway did not begin shipping waste acids from the DCB manufacturing process to the CID facility until 1979. In 1978 and early 1979, Lakeway shipped its DCB process waste acids to the Company's acid treatment and disposal facility at Vickery, Ohio (O.L.D.).

Company records show that beginning in the Spring of 1979 and continuing throughout the remainder of the year, all three streams of waste acids from the DCB manufacturing process were received at the Company's CID facility under the single outstanding permit -- 78-1490.

Company records show that a renewal application for permit 78-1490 was filed on August 31, 1979, and that the renewal permit was issued on October 18, 1979, with an expiration date of October 18, 1980.

Company records, including every load receipt ticket (receipt control form) and bill of lading, show that all DCB acid waste streams continued to come into CID under renewed permit 78-1490 through December 1979.

Company records show that the same DCB acid waste streams were received at CID from January 1, 1980 through April 18, 1980, at which time Lakeway ceased using CID and again sent DCB acid waste streams to the Company's O.L.D. facility in Vickery, Ohio.

As set forth above, the media charge that DCB-2 was received without a permit between January 1980 and May 1980 does not hold up to scrutiny of the Company's records. These records show that all three related DCB streams were received under the same permit (78-1490) throughout 1979, and that the same permit was renewed by the State of Illinois to October 18, 1980.

Despite the clear documentary evidence that a valid permit for all three DCB streams was in existence, there are receipt control forms in Company records beginning in January 1980, which state that the Company did not have a permit. Further, there is a handwritten sheet dated January 10, 1980 with the handwritten legend "DCB-2 DCB Acid Wash Waste No Permit". Again, Company records were examined to determine whether there was any explanation for these statements.

Company records contain a series of typewritten tables prepared between January 7 and January 10, 1980, on which

the various waste streams from Lakeway and their respective permit numbers are listed. These typewritten tables were prepared from a handwritten table drafted by Mr. Sandesara. On these tables, DCB Mother Liquor (DCB-1) is identified as being permitted under Illinois EPA permit 78-1490. DCB Acid Wash (DCB-2) is identified as "Dimethyl Formamide Wash", and is identified as being permitted under Illinois EPA permit 78-1243. Illinois EPA permit 78-1243 expired on August 19, 1979. If indeed DCB-2 was "Dimethyl Formamide Wash", and was permitted under 78-1243, the permit had expired, and receipt of DCB-2 after August 19, 1979 would have been illegal.

However, an examination of Company records discloses that Mr. Sandesara made a clerical error in his reconstruction of the permit files. It is evident that permit 78-1243 is indeed for Dimethyl Formamide Wash. However, Dimethyl Formamide Wash -- contrary to Mr. Sandesara's table -- <u>is not</u> DCB. Dimethyl Formamide Wash is a waste product from a process totally separate from the DCB manufacturing plant at Lakeway.

An apparent source of the confusion lies in the common use of alphabetical letters to describe these waste streams and the transposition of these alphabetical letters. The Company used the abbreviation "CDB #2" for Dimethyl Formamide Wash and "DCB-2" for Acid Wash Acid. An examination of Company records indicates that site personnel made a

notation on the bottom of permit 78-1243 (the Dimethyl Formamide Wash permit): "(CDB #2) (DCB)".

In summary, there appears to be no basis for the claim that DCB manufacturing wastes were received at the CID facility between January 1, 1980 and May 1, 1980, without benefit of a permit. There was a permit in effect until October 18, 1980, and it had been consistently used to accept all three related acid streams from Lakeway's DCB manufacturing process.

Finally, it has been contended that the application for permit 78-1490 did not adequately describe the presence of DCB in the waste stream. However, the permit application expressly states that the acid waste is from the "DICHLOROBENZIDINE MFG." process. Most knowledgeable laymen, let alone trained engineering regulatory personnel, would clearly understand that acidic wastes from such a process would likely contain trace amounts of DCB. And indeed that's the amount of DCB in the waste stream in issue -- less than 1%. Moreover, Mr. Sandesara can hardly claim that the permit application form was filled out incorrectly; he is the person who signed the original application for permit 78-1490. In sum, we found no evidence that there was any intent to deceive Illinois officials.

2. Filing Of Manifests

From late January through April 1980, there is no question that Company personnel failed to file approximately 50 manifests as required by Illinois for DCB wastes disposed of at CID. Illinois law requires the owner or operator of a permitted disposal site to send a copy of the manifest for each load of special waste to the Illinois EPA "at the end of each month, or such longer period of time approved by the agency." (Chapter 9, Special Waste Hauling Regulation, Illinois Pollution Control Board). For that reason, and that reason alone, the Company personnel violated the regulations of the Illinois Pollution Control Board.

Under those rules, a manifest consists of six separate copies of a shipping document. The generator keeps one copy and sends in a copy to the agency. The transporter of the waste keeps a copy for its records. Finally, the disposal site is required to keep a copy for its records and send a copy to the agency.

Company employees at the site admitted that they had intentionally retained the manifests for DCB-2 shipments between late January 1980 and April 1980. At the same time, they continued to send into Illinois EPA all the required manifests for DCB-1, which contained even greater concentrations of acid and higher amounts of DCB.

Put bluntly, the Company has no excuse for not sending in the manifests. Without some recorded form of EPA approval for holding the manifests, the Company was exposed to liability for failure to follow the letter of the law.

It should be noted that Mr. Michael Shannon, the Company employee accused of withholding the manifests, does have a plausible explanation as to why the manifests were not turned into the State. He explains that when Mr. Sandesara first asserted that DCB-2 was permitted under 78-1243 instead of the permit it had been coming in under, 78-1490, there was an obvious need to obtain confirmation of which permit number to use. There was concern that the generator, Lakeway Chemical Company, might put one permit number on a manifest and that the disposal site might put a different permit number on the same manifest for the same shipment. Mr. Shannon explained that CID and Lakeway officials decided to hold the manifests until Mr. Sandesara cleared up the question of the permit numbers with the agency. Mr. Sandesara in turn kept delaying obtaining clarification of the permits until he received final test results on the DCB content of the wastes.

The manifests were forgotten because of a shift in all the DCB waste streams from CID to the Company's O.L.D. facility on April 18, 1980. This shift occurred because Mr. Shannon -- at Mr. Sandesara's urging -- erroneously cut-off Lakeway's DCB waste streams on April 18, 1980. The Shannon/Sandesara error was two-fold.

First, they relied on an alleged requirement stated by Mr. Sandesara that DCB streams containing more than 1% DCB could not be disposed of at CID. No such legal requirement existed. Second, they relied on erroneous laboratory results which showed DCB percentages in the waste streams greater than 1%, when in fact, the same laboratories later admitted that the percentages of DCB were under 1% and that they had used the wrong analytical procedures. Because of this laboratory mix-up, Mr. Shannon erroneously cut-off all DCB shipments on April 18, 1980. Since no DCB shipments were coming in, the manifests were forgotten in the shuffle of events, and they were never turned in to the agency.

Mr. Shannon's explanation of the need to clear up the permit numbers is believable. Any inference that either the Company or Lakeway was trying to hide DCB shipments from the state during this period is belied by the fact that all the manifests for DCB-1, a much stronger waste acid, were sent into the State from CID throughout this period.

As noted above, however, despite this explanation, the decision to hold the manifests without getting Illinois EPA approval constitutes a violation of Illinois regulations.

3. Receipt Of OZ-1 (Oryzalin Acid)

The next charge against the Company is the receipt of Oryzalin Acid (OZ-1) from Lakeway without a permit. Oryzalin is the active ingredient of a soybean herbicide and is widely used in agriculture.

Company records disclose a significantly different picture than portrayed in the press. On June 30, 1978, the CID lab applied for a permit to receive, treat and dispose of sulfuric and nitric acid wastes from the Lakeway Oryzalin manufacturing process. The permit, No. 78-1249, was granted on August 19, 1978, and had an expiration date of August 19, 1979. On June 7, 1979, the CID lab applied for a renewal of permit 78-1249. The permit was renewed on July 19, 1979, with an expiration date of July 19, 1980.

Pursuant to this permit, 78-1249, hundreds of loads of OZ-1 were received, treated and disposed at the CID facility through 1979 and up to and through July 19, 1980. However, after July 19, 1980, approximately 50 loads of Oryzalin Acid (OZ-1) continued to be received until August 22, 1980.

The renewal permit for OZ-1 was applied for by the CID lab on August 1, 1980, and was not formally denied until September 3, 1980. The current CID lab manager who applied for the renewal believes that the CID lab must have received telephone notice on or about August 22, 1980 that the renewal would be rejected, and upon such notice, stopped taking loads of OZ-1.

According to the letter of the regulation, the loads were received without a permit from July 20, 1980 through August 22, 1980, and such receipt constitutes a violation. However, there is strong evidence of an informal practice whereby the Agency would give telephone approval to accept loads coming into a facility where a permit had formally expired and where renewal paperwork was pending.

The informal practice of allowing loads to come in while a permit renewal application was pending was a practice that has been confirmed by numerous Company employees, and by former agency employees. Such approval was normally obtained by a simple telephone call by CID lab personnel.

We do not fault the need for such rapid and informal extension or temporary variance authority. It is clearly better to accept such loads at a licensed facility where they can receive proper treatment and disposal than to create the risk of improper storage and disposal while the paperwork on a renewal is pending.

Our concern is that the practice was not expressly authorized in the regulations, and the Company had little or no documentation demonstrating agency approval in specific instances. Even in the best of circumstances, the Company would be vulnerable to charges that it violated the regulations, despite the informal undocumented agency approval.

In the case of OZ-1, the Company has no documentation that informal permission was given.

According to Mr. Shannon, the regional manager at the time, he probably relied on this informal practice and assumed that Mr. Sandesara would make informal telephone arrangements to take the loads while the renewal application was pending. However in the case of OZ-1, just as he had done on the DCB loads, Mr. Sandesara instructed lab personnel and receipt control clerks to write "no permit" on the receipt control forms. His explicit instructions to these personnel were to write "per Mike Shannon No Permit," instead of making the telephone arrangement to take the load as he would have been expected to do.

Again, the error in hindsight was in failing to obtain written documentation that the CID site had permission to continue taking the loads while the permit renewal was pending.

A second charge concerning OZ-1 related to the manifests for OZ-1 during the period July 20, 1980 through August 22, 1980. The charge was that the manifests were not filed. However, Company records indicate that the manifests for OZ-1 for that period were sent to the Agency.

4. Receipt Of OZ-3 Through 10

Though not a part of any formal charges, there is an episode relating to the OZ-1 events which give added credence to the existence of an informal practice of allowing loads to be received when the permit had expired and the renewal paperwork was pending. In addition to the Oryzalin Acid stream (OZ-1), Lakeway sent another mixed stream of aqueous waste from the Oryzalin process to CID for disposal. This waste stream was called OZ-3 through 10, acetone and water waste.

The CID lab first applied for a permit for this acetone and water waste on June 30, 1978. Permit 78-1246 was awarded on August 19, 1978, with an expiration date of August 19, 1979. The CID laboratory applied for a renewal of permit 78-1246 on June 7, 1979; and the renewal permit 78-1246 was granted on August 2, 1979, to expire on August 2, 1980.

Company records show that the CID lab applied for a permit renewal of 78-1246 (OZ-3 through 10) on August 1, 1980, and that the permit renewal was denied on September 3, 1980. On September 8, 1980, Mr. Sandesara reapplied for another permit for the acetone and water waste (using the wrong permit number), and that renewal permit was granted on September 29, 1980, to last for 90 days.

Despite the fact that the permit expired on August 2, 1980, the site continued to take in loads of OZ-3 through

10 throughout the period of August 2 through September 29, 1980. When questioned on this point, the receipt control clerk stated that Mr. Sandesara told him to accept the loads because the paperwork was pending.

Again, the Company has no documentation that this informal approval practice existed, nor any documentation that it existed in this particular case. However, the testimony of Company employees and former EPA permit officials is that such a policy did exist. In this case, there is no written documentation that it was exercised by EPA, although the circumstantial evidence strongly suggests that the informal permission was relied upon.

Again, Company records indicate that the manifests for the OZ-3 through 10 loads from August 3, 1980 to September 29, 1980 were sent in to the EPA.

5. Receipt Of Low Flashpoint Materials

There were also newspaper charges that the Company had received and accepted highly volatile waste loads at the CID site that violated regulations prohibiting the receipt of low flashpoint loads. Our investigation discloses the following.

Prior to the adoption of RCRA requirements in May 1980, there were no formal regulatory requirements for low flash loads. There was a Company requirement and an

unwritten Illinois EPA policy against the receipt of loads with a flashpoint less than 100 degrees fahrenheit. There was a further Company policy against the receipt of loads with a flashpoint less than 40 degrees above the ambient outside temperature. This Company policy was developed after a low flash load had caused the destruction of equipment at the site.

Contrary to the charges, there is substantial evidence that low flashpoint materials were not received and disposed of in the landfill. It is true that some loads from a variety of companies, including Lakeway, would come in and the tankers would test out at less than 100 degrees. In the case of Lakeway, this was often due to the presence of toluene, a solvent, in the waste load. The tanker would be loaded at Lakeway's Muskegon, Michigan facility and would be tested for flashpoint in a fully mixed state. Because of the fully mixed status of the tanker, it would pass the flashpoint test. En route from Muskegon to CID, the tanker load would stratify with the lighter solvent low flashpoint material rising to the top. When the tanker was tested at CID, a sample would be taken from the top where the low flash layer had stratified.

We have interviewed numerous CID personnel familiar with this issue, and they all concur that low flash loads would not be taken and dumped on the landfill. Instead, employees would use one of a variety of techniques to address the problem:

1. If most of the load turned out to be solvent, the entire load was sent back to Lakeway.

2. Other times, the tanker hatch was left open to let the low flash solvent evaporate.

3. Where the tanker passed the 100 degree test, but there was not a 40 degree difference from ambient temperature, the load would be held until the ambient temperature would go down and the load would then pass the test.

4. The final technique used by CID personnel was to separate out the low flash solvent from the acceptable higher flash material. This was done either by emptying the tanker of the acceptable material from the bottom or by vacuum pumping the low flash material from the top of the tanker. The low flash material was then sent back to Lakeway.

Again, while employees apparently took great pains to comply with the low flash prohibition, there is little documentation demonstrating that these practices actually took place. And because the loads were separated and disposed of in different locations away from the lab building, there is confusion as to whether all low flash loads received this treatment.

Apart from our concern over lack of documentation, we find no evidence that the flashpoint requirements were violated. We again emphasize the need for contemporaneous written records of all specialized practices and the agency authorization of such practices. Otherwise, the Company is vulnerable to a charge of violating the regulations.

B. Ohio Liquid Disposal (O.L.D.)
Fremont, Ohio

The Company's Ohio Liquid Disposal, or O.L.D. facility, is located in northwestern Ohio near the town of Vickery. The site consists of 420 acres of land with 120 acres actually being used for storage, treatment and disposal of hazardous wastes. Historically, O.L.D. has received liquid wastes including waste acids and waste oils. High quality waste oils would be immediately segregated on receipt and, if necessary, heated to remove the impurities. The reclaimed oil is then sold for a variety of purposes.

Waste acids and highly emulsified oils are placed in a series of ponds. The acid in the ponds causes the emulsions to break down, allowing the oil to break out of the emulsions and rise to the surface of the ponds. The oil is then skimmed off the lagoons, placed in storage tanks, and either given further treatment in the oil reactor, or sold directly as reclaimed oil.

The remaining liquid in the lagoons is then provided a long residence time, followed by filtration of the liquid in state-of-the-art filtration equipment. After filtration, the treated liquid is then injected into one of four deep wells. These deep wells inject the treated wastewater into a sandstone layer approximately 2900 feet under the surface. This is a geologic formation approved by the State of Ohio for deep well injection.

The site has been receiving waste oil for reclamation since 1958. The acid lagoons were opened in the 1960s and the first deep well was opened in 1976. The Company purchased the site in 1978, and the site is a licensed interim status facility under RCRA.

The New York Times story of March 21, 1983 listed a number of charges by Mr. Peter Phung, a former chemist at the site. These charges included:

1. that the Company had disposed of wastes received from Canada.

2. that the Company sent wastes containing arsenic down the deep well when it should have been buried in drums;

3. that the Company illegally disposed of high concentrations of PCB; and

4. that the Company altered or destroyed test results which revealed high levels of toxic chemicals;

5. that the Company took in loads at night;

1. Waste Loads From Canada

Site personnel acknowledge that waste streams were received from a Canadian generator. Nothing in the receipt of the waste was incompatible with the facilities at O.L.D. However, the RCRA regulations expressly require that the owner of the facility notify the regional administrator in writing at least four weeks in advance of the date of receipt of the waste from a foreign source. 40 C.F.R. Section 265.12. On one occasion in late 1980, the site failed to give the required notice and was fined for this violation by federal authorities.

2. Deep Welling Of Arsenic Waste

According to the New York Times story of March 21, 1983, Mr. Phung charged that the Company illegally deep-welled waste containing arsenic. Instead, according to the article, "arsenic is supposed to be buried in drums."

We have examined the records of the Company on this matter, and do not find any violation of law. First, the Company has a Part A interim status license to receive and dispose of hazardous wastes. Included on the list of hazardous wastes on the Part A RCRA permit, is D004, which is the EPA code number for arsenic.

Second, contrary to Mr. Phung's charge, it would have been improper to bury drums of liquid arsenic at the O.L.D. facility. The O.L.D. site has no facilities for burial of liquids in drums. Moreover, under current RCRA regulations, burial of containerized liquids is prohibited.

Finally, there is no limit, other than injection pressure, placed on disposal of treated wastewater in the deep well.

3. Receipt Of PCBs

The New York Times printed Mr. Phung's charge that impermissible concentrations of PCB were accepted at the site and referred to test results of 35,978 parts per million in wastes from Hammermill Paper Company. We have examined the historical records of the Company on these charges. There is no question that loads of waste oil were received in the period May through August 1980 from Hammermill Paper which contained PCBs. Nor is there any question today that samples from those loads tested out at concentrations well above 500 parts per million.

However, there is considerable dispute as to whether, in the summer of 1980, there was knowledge that the PCBs in the loads exceeded the 50 ppm threshold under the PCB regulations. Results from tests run by independent laboratories on split samples from the same loads ranged from as low as .5 ppm to more than 35,000 ppm. Given these disparate results, it is debatable whether receipt of the waste oil at the site was illegal at the time of receipt.

However, it is clear that soon after the Hammermill oil was on the site, site personnel became aware that oil with PCB concentrations over 50 ppm was present at several locations on the site. It is also clear that site personnel then decided to dispose of this oil by blending it down through dilution to achieve the 50 ppm limit.

EPA regulations allow the sale of oils containing less than 50 ppm PCBs. However, the action of site personnel in diluting the oil to less than 50 ppm PCBs was in direct violation of the PCB regulations. 40 C.F.R. Section 761.1 specifically provides:

> Any chemical substances and combination of substances that contain less than 50 ppm PCBs <u>because of any dilution</u>, shall be included as PCB and PCBs unless otherwise specifically provided. Substances that are regulated by this rule include, but are not limited to, dielectric fluids, contaminated solvents, oils, <u>waste oils</u>, heat transfer fluids,.... (Emphasis added).

Further, once it became known that PCB concentrations greater than 50 ppm were on the site, the site became subject to the storage requirements of the PCB regulations 40 C.F.R. Section 761.65 and the chemical waste landfill requirements of Section 761.75. There was no compliance with these regulations.

4. <u>Altering Or Destruction Of Test Results</u>

All site personnel questioned stated that the Company did not alter or destroy test results that revealed high levels of toxic chemicals.

5. Receipt At Night Of Loads Rejected During The Day

The site manager and technical manager at the time of Mr. Phung's employment stated that Mr. Phung often made decisions not to accept wastes that the facility was permitted by state and federal authorities to receive and dispose of. The site manager and technical manager both stated that when they learned of an erroneous rejection of a load of waste by Mr. Phung they would overrule the decision and accept the waste. Some of these decisions by the site manager and chief chemist were made during the day and some were made during the night shift. The O.L.D. facility operates twenty-four hours a day.

C. Emelle, Alabama

Emelle, Alabama is a 2400 acre treatment storage and disposal facility located in west central Alabama. The site was opened in 1977 by Resource Industries of Alabama and purchased by the Company in 1978. Of the 2400 acres in the total site, approximately 340 are currently being used for waste treatment and disposal with the remainder being held for future development. The processes at Emelle are straightforward. Solid wastes coming into the site are buried in trenches dug into the ground. Liquid wastes come into the site either in bulk tankers or in drums. The liquid in the drums is decanted, i.e., removed from the barrels; the barrels are crushed; and the liquid is solidified and placed into the trenches.

The geological conditions under the site are reported to be a layer of Selma chalk approximately 500 feet thick, and the geological integrity of the site appears to be very great. Consistent with its geology, the Emelle site has been given approval by EPA as a chemical waste landfill approved for permanent burial of Polychlorinated Biphenyls (PCBs).

Under the regulations governing PCBs, 40 C.F.R. Part 761 et seq., an approved chemical waste landfill can be used to bury solid and liquid PCB materials. Under the regulations, solid PCB materials can be buried whatever their concentration -- up to and including several hundred

thousand parts per million. Liquid PCB material, on the other hand, cannot be buried if its concentration exceeds 500 parts per million.

Liquid PCBs over 500 ppm cannot be solidified to circumvent the rules, but must instead be stored for incineration. The federal regulations require incineration of PCB liquids in concentrations over 500 ppm.

Mr. Ed Brashier, who was first employed at the Emelle site as a chemist in August 1979 and who was technical manager of the site when he left the Company in February 1982, made a series of allegations concerning the site. The following charges were reported in the New York Times on March 21, 1983:

1. Chemicals were buried without adequate space between drums, or by packing inadequate earth.

2. The Company did not always comply with federal law requiring that wastes be tested before they were buried.

3. Mr. Brashier had spoken with site officials about illegal dumping, including illegal solidification of material from Lagoon No. 1 having PCB contamination in excess of 500 ppm.

4. Handling of wastes at the site was endangering the health of workers.

The following related allegations by Mr. Brashier were reported in the Chicago Sun Times on March 23, 1983:

1. From August 1979 to February 1982, truckloads of wastes were buried on several occasions without sampling, in defiance of federal regulations.

2. Full transformers were sometimes buried without being drained of PCBs and rinsed.

3. Rinsings from tank trucks, though contaminated with PCBs in excess of 500 ppm were sometimes solidified and buried illegally.

4. The Company violated a federal requirement that the location of each type of waste be recorded on a trench map to avoid mixing of incompatible wastes.

5. Workers were sometimes drenched in PCBs while loading and unloading shipments.

Shortly after Mr. Brashier's allegations were reported, the Washington Post made the following further allegations concerning the Emelle facility on March 30, 1983:

1. The Company failed to adequately protect workers against exposure to acutely hazardous substances.

2. The Company has failed to account for 8 drums of PCB contaminated oil that were shipped from a site in Kansas to Alabama in January 1981. The oil appears to have been solidified, even though it had concentrations of up to 630,000 ppm of PCBs.

Finally, there was a great deal of press in Alabama concerning the Alabama Department of Environmental Management (ADEM) orders of March 24 and March 29, 1983, in which the Department found that the Company had not completed the leachate collection system required for trench 17, had improperly stored PCB containing transformers and canisters, and had failed to properly map the location of wastes in trench 17. The orders required prompt correction of these items.

1. **Acceptance Of Wastes Without Adequate Testing**

We found that in the daily operations of the facility, each load of waste is given fingerprint testing pursuant to the facility's Waste Analysis Plan prepared in accordance with the RCRA interim status regulations. However, as to two major cleanup jobs of contaminated soil, the Company only did sporadic testing of the loads that arrived at the facility: the Aniston, Alabama special projects cleanup and the Miami-Dade cleanup. The Aniston cleanup involved the cleanup of a sanitary landfill in which the Army had placed

chlorinated solvents and non-chlorinated solvents and paint wastes. The Aniston site was excavated and transported in dump trucks at a rate of approximately 50 trucks per day. The Miami-Dade cleanup was also a cleanup of chlorinated solvents.

There is no question that, with respect to these loads, the Waste Analysis Plan filed with the EPA said the site would sample every load. However, there is no apparent environmental reason why each load from these cleanup operations had to be tested because all the loads were basically the same. Further, there is nothing in the nature of the fingerprint test which would have been useful in sampling every load. Many people erroneously believe that testing of individual loads will detect the presence of illegal organic chemicals. Absent extremely complex organic and inorganic chemical testing of every load, which is both financially and technically unfeasible, the fingerprint test is of limited utility; especially when prior testing has identified the nature of the contaminants.

There was a third cleanup job where loads came in and were disposed of without proper testing. The Emelle site contracted to clean up a PCB contaminated pond in Davenport, Iowa. Each load was tested as it was received at the Emelle site to determine if it contained over 500 ppm PCB. However, several loads were solidified at Emelle prior to the test results being completed. This resulted in the solidification of several loads of liquid PCBs over 500

parts per million at Emelle in violation of the PCB regulations. 40 C.F.R. Sections 761.75(b)(8) and 761.60(a)(1).

After the majority of the liquid was removed from the pond, Company personnel solidified the remainder, including some materials in excess of 500 ppm PCBs, in place. We have examined the records of the Company regarding that particular job and find inadequate documentation to affirmatively establish compliance with the requirements of the PCB regulations.

2. PCBs From The Lagoons And Wash Rack

The PCB regulations are very specific about prohibiting the solidification of liquids containing more than 500 ppm PCBs. Technically, neither the wash rack nor the evaporation lagoons should have had PCBs in concentrations over 500 ppm. The wash racks are only supposed to be used for trucks containing less than 500 ppm PCBs. Trucks which are used for carrying PCB liquids greater than 500 ppm probably qualify as containers under 40 C.F.R. Section 761.79 and should be cleaned with a solvent.

The washing of trucks containing more than 500 ppm PCBs at the wash rack appears to have been the source of PCB liquids in the wash rack which have been measured at over 500 ppm. Under the regulations, these liquid PCBs at

the wash rack in excess of 500 ppm should have been removed from the wash rack and held for incineration. We have been told by site management that such removal and storage was standing Company policy. However, other employees have stated they personally observed liquids from the wash rack containing greater than 500 ppm PCBs being sent to the trenches for solidification.

The same allegations regarding the wash rack and solidification of over 500 ppm PCBs was made regarding liquid skimmed from the surface of the evaporation ponds. There should not be any PCBs in the evaporation ponds. However, employees stated that water from the truck washing rack was periodically pumped to the evaporation ponds and liquid PCBs from the trucks could be the source of liquid PCBs on the ponds.

Again, site management stated that standing orders were to skim off the PCB oil from the surface of the ponds and put the oil in storage. However, other site employees have stated that PCB contaminated oil from the evaporation ponds has been solidified.

3. Spacing Of Drums

Another allegation made in the media was that drums of waste were deposited in the trenches without proper spacing and packing of earth around them as required by federal law. The only federal requirement we found that relates to these charges is a requirement under the PCB regulations that each container be surrounded by sufficient absorbent material to absorb the content of the drum if the drum should leak. 40 C.F.R. Section 761.75(b)(8). This requirement was elaborated upon in an October 9, 1979 letter from Region IV EPA to the site technical manager which approved the site's operating plan for PCB management and disposal. That letter states:

> Sufficient absorbant (sic) material will be placed around the drums so that the entire contents of the drums can be absorbed....In either case, rows of drums may be placed no closer than six (6) inches to one another.

This was a requirement for the burial of containerized liquid PCBs which the Company no longer buries. Site management said that field foremen were instructed as to spacing requirements. However, Company employees stated that there had been some instances where drums of PCBs had been placed in the trenches without the required spacing. There is no way to verify whether the spacing was or was

not consistently performed, because the drums are now buried.

Again, this spacing requirement does not appear to have any environmental significance at Emelle, given the existence of several hundred feet of clay beneath the site. However, the absence of a record to demonstrate explicit compliance with the regulation, coupled with oral accusations that practices took place, leaves the Company vulnerable to charges of non-compliance and subsequent loss of public and regulatory credibility.

4. Burial Of Transformers Filled With Oil

All site personnel interviewed categorically deny that any transformers filled with oil were ever buried.

It does appear, however, that from time to time transformers filled with oil have been stored in burial trenches before they were properly drained and flushed and the transformer carcasses were ready for burial. This practice is one of the subjects of ADEM's March 29, 1983 Order.

Transformers have also been stored at other locations on the site without strict compliance with the storage requirements of 40 C.F.R. Section 760.65(b)(2). Again, given the large geological factor of safety present at Emelle, these actions did not appear to jeopardize the

environment. We emphasize, however, that such transformers must be stored in strict compliance with the regulations.

5. Record Of Location Of Disposed Of Wastes

From the time the RCRA interim status regulations went into effect in November of 1980, the Emelle facility has been required to record the location of all wastes disposed of in its trenches on a trench map. 40 C.F.R. Section 265.73. This requirement was also incorporated in Section 4-226.22(e) of the Alabama Hazardous Waste Management Regulations.

According to site management, personnel at the Emelle facility site have been directed to map the location of each type and quantity of waste that has been disposed of in each of the trenches that have been active since the regulations went into effect, including trenches 13, 14, 15, 16, 17 and 20 (trenches 18 and 19 are not yet active).

Site management has stated that these maps accurately reflect the location, type and quantity of wastes in each of the trenches except trench 17. Because of the accumulation of rainwater in trench 17 in the fall of 1982, the following winter and the spring of 1983, site personnel were required to move bulk solid wastes disposed of in various layers of trench 17 on several occasions. While

the site can accurately identify the type and quantity of waste disposed of in trench 17, the exact location of some of the bulk solid wastes is not known.

In its Orders of March 24 and March 29, 1983, ADEM found that the Emelle facility had failed to follow previously established mapping procedures for trench 17. Since ADEM's Orders were issued, site management has designated a person on each of the first and second shifts to observe disposal operations and continuously record waste locations. Additionally, a grid system for mapping waste locations was instituted beginning with trench 20, which allows site personnel to map waste locations with more precision than in the past.

6. Leachate Collection System

The Alabama Department of Environmental Management (ADEM) Orders of March 24, 1983 and March 30, 1983 made specific findings that the leachate collection system for trench 17 had not been completed as requested.

The purpose of the leachate collection system is to allow monitoring and removal of liquids which accumulate after the trench is filled and closed. The system for trench 17 includes placement of a layer of sand over the entire bottom of the trench, leveled in such a manner as to direct the flow of liquids to one end of the trench. Along

that end of the trench a collection slot was to be constructed, filled with sand and covered with gravel. The slot is sloped toward one collection point and concrete pipe is to be installed at that point perpendicular to the trench bottom. The pipe is then increased in height as waste layers are added in the trench, until the trench is closed.

According to site management, construction of the leachate collection system was initiated in accordance with the operational plan for trench 17 at the time trench 17 excavation began in July of 1982. Then, in the fall of 1982, the following winter and the spring of 1983, there was more than 80 inches of rainfall at the site, and substantial amounts of water accumulated in trench 17. This standing water delayed completion of the construction of the leachate collection system.

ADEM ordered that the Emelle facility remove the water from trench 17 and complete the leachate collection system by April 30, 1983. Later, at the request of site management, the completion date was extended to June 30, 1983.

The Emelle facility did not meet the June 30, 1983 deadline. An additional fourteen (14) day extension of time was requested by site management in a letter dated June 28, 1983, which cited weather and construction problems. This extension was not allowed by ADEM. Instead, on July 11, 1983, ADEM issued an Order in which it found that the leachate collection system could have been

installed by June 30, 1983. The Order assessed a fine for each day after June 30, 1983 that the leachate collection system was not completed. The work was certified as completed on July 12, 1983 by Emelle's consulting engineers. Site management is protesting the proposed fine in state administrative proceedings.

Apart from trench 17, Company records indicate that a number of other leachate collection system pipes and monitoring wells have been damaged and rendered inoperable in the course of site operations. Operational leachate collection systems and monitoring wells are required by PCB regulations. Site management has directed that the damage be repaired as soon as possible.

7. 8 Drums Of PCB Contaminated Oil Received From A Site In Kansas

Company records show that, on January 28, 1981, Emelle received 7 drums of PCB contaminated material from the Company's NIES site in Wichita, Kansas. According to correspondence by Mr. Ed Brashier, the technical manager at the time (and the individual who made most of the other allegations respecting the Emelle site), the material was certified as a slurry and was disposed of in an approved PCB trench as a PCB solid.

Shortly after the drums were buried, an attorney for the Enforcement Branch of the EPA in Region VII questioned

whether the material buried in the drums was a liquid that should have been incinerated and not a slurry that could be buried as a solid.

EPA regulations allow the burial of PCB solids having concentrations in excess of 500 ppm, while PCB liquids greater than 500 ppm must be incinerated. Exactly what constitutes a solid, as opposed to a liquid, under EPA's PCB regulations, is far from clear. Semi-solid materials such as sludges and slurries could be argued to be either a solid or a liquid.

Mr. Brashier concluded that the material was a solid, and disposed of it in a manner proper for PCB solids. However the practice of treating a slurry as a solid can leave the Company vulnerable to charges of solidifying PCB liquids over 500 ppm. Absent written clarification from EPA, the Company should treat any substance which could arguably be a liquid as a liquid for purpose of regulatory compliance.

8. Worker Safety

According to Mr. Brashier, he had expressed concern to the site manager that the Company's handling of hazardous wastes at Emelle was endangering lives of workers. The site manager and other site personnel all agree that Mr. Brashier was the most concerned of all employees about

worker safety; and if Mr. Brashier felt that equipment or procedures were necessary to protect the workers, management provided the equipment and developed the procedures.

Several employees also mentioned that the safety policies and procedures that were instituted while Mr. Brashier was employed have been substantially improved since the time he left. This firm has not investigated compliance of this or any other Company sites with federal or state occupational health and safety regulations.

D. Port Of Chickasaw, Alabama

In the media, the Alabama Attorney General made various charges of impropriety with respect to EPA's decision to allow the Company to build two 800,000 gallon storage tanks in a 100-year floodplain at the Port of Chickasaw, Alabama, near Mobile. The tanks were to serve as a storage facility for the Vulcanus for PCBs and hazardous wastes. Such a facility brings into play both the RCRA and TSCA (PCB) regulations.

The problem here is due to a serious regulatory inconsistency. RCRA and TSCA regulations clearly allow the placement of hazardous wastes, including PCBs, in the 100-year floodplain. RCRA regulations allow construction of storage facilities for hazardous wastes far more toxic than PCBs within the 100-year floodplain. 40 C.F.R. Section

264.18(b). Such facilities are specially engineered to withstand flood hazards. The TSCA PCB regulations allow the burial of liquid PCBs in containers in a landfill located within the 100-year floodplain. 40 C.F.R. Section 761.75(b)(4).

Moreover, both the RCRA storage regulations and the TSCA PCB landfill regulations expressly authorize variances from even these requirements. 40 C.F.R. Sections 264.18(b) and 761.75(c)(4).

Because of an apparent oversight in drafting, there are no comparable provisions for the storage of PCB liquids. Storage of PCBs within the floodplain is prohibited even though direct landfilling is not. 40 C.F.R. Section 761.65(b)(1)(v).

Faced with these inconsistencies, EPA headquarters adopted ad hoc conditions for the grant of an informal variance to the Company. The EPA characterized this suggested informal variance as "enforcement discretion."

We believe EPA's action in suggesting the availability of this informal variance was correct. However, we emphasize again that there is no formal regulatory authorization for these practices and EPA should amend its regulations to provide such authority. Absent such explicit authorization, EPA and the Company remain vulnerable to charges of "hanky panky" or "sweetheart relationships."

E. Lowry, Colorado

The Lowry "landfill" is really two separate sites located on the old Lowry bombing range near Denver, Colorado. One site is the Section 6 landfill area which is currently used for non-hazardous municipal waste disposal and which was previously used by the City of Denver for hazardous waste disposal. The second site is the Section 32 hazardous waste site built by the Company at Denver's request. The Section 32 site consists of 3 solar evaporation ponds, a barrel decant facility and a drum burial cell.

The various media charges against the site have included the following:

1. that EPA "fined" the site for improper measurement of the corrosivity of a shipment;

2. that the Company illegally withheld information that the evaporation pond was "leaking" and kept "two sets of books" to hide the leak;

3. that the Company failed to control surface water drainage and to collect leachate at its drum burial cell.

4. that the site was ordered "shut down" by the Colorado Supreme Court.

The history of the site is important, because it helps explain the politics of the "Lowry" controversy and the legal and political buzzsaw which the Company walked into in 1980 -- a controversy not of the Company's making, but which was worsened by the Company's response to certain actions.

In 1964, the City of Denver acquired the old Lowry military bombing range from the federal government. The site covered several thousand acres encompassing several sections of land. In 1964, Denver began operating a sanitary landfill in the Section 6 area of the site.

Colorado passed the Solid Wastes Act in 1967 which required the operator of a sanitary landfill to obtain a "certificate of designation" from the county in which the landfill was located. Denver obtained a certificate of designation from Arapahoe County in 1968 designating the entire multi-thousand acre tract for a sanitary landfill operation.

From 1968 to 1980, Denver operated a waste dumping operation at Section 6. According to the Governor's Task Force Report, the practices allowed by Denver represented the worst in hazardous waste management. Denver would allow trucks to pull up to unlined pits and dump industrial waste chemicals directly into the unlined pits. During this period Colorado authorities did little to correct the practices at Denver's operation at Section 6.

In 1979, Denver solicited proposals from private companies to take over the management of the waste disposal operations at Lowry. The Company submitted a proposal which would segregate non-hazardous waste disposal from hazardous waste disposal. The Company proposed to continue landfilling non-hazardous wastes at the Section 6 area and to construct state-of-the-art hazardous waste treatment and disposal facilities in Section 32 which was to the northeast of Section 6. The proposal called for the construction of three solar evaporation ponds with double, five-foot thick, clay liners and a drum burial cell. Both the solar evaporation ponds and the cell were designed by a nationally recognized geotechnical engineering firm, Woodward-Clyde.

The initial reaction of State officials to the Company proposals was highly positive. Prior to entering into a contract with the City of Denver, technical representatives of the Company met with officials of the Colorado Department of Health and with the Governor's Task Force on the Lowry Air Force Base Landfill. On June 13, 1980, the Colorado Department of Health sent a letter to the Denver City Council which stated, inter alia:

> Chemical Waste Management has submitted an excellent proposal which should improve the conditions at the Lowry site.
>
> The Task Force approves of treatment of hazardous wastes at the Lowry site on an indefinite basis.

The letter went on to state that the burial of hazardous wastes should be re-evaluated at the end of a five-year period.

Based in part on the reaction of state officials to its proposal, on July 7, 1980 the Company entered into a ten-year contract to manage and operate both the non-hazardous waste operation in Section 6 and the hazardous waste operation in Section 32.

The Company built hazardous waste treatment ponds on the site in July and August 1980, and began operations in August 1980. At the beginning of the operation, both Denver and the Company believed it was necessary for Arapahoe County to approve the transfer of the 1968 certificate of designation from Denver to the Company. On August 5, 1980, Arapahoe County gave approval for the Company to run the two Lowry operations for 120 days until a public hearing could be held.

Despite the initial positive reaction of the State, hostility developed between the State and the Company over the issue of whether the State had formal regulatory authority over the Company's hazardous waste operations. At the time, Colorado did not have a state law dealing expressly with hazardous waste control.

Paralleling the State's hostility was development of intense media coverage of the Company's proposal to operate this hazardous waste facility and the formation of a citizens' group named Citizens Against Lowry Landfill (CALL).

These citizens were angry about what had gone on at the old Section 6 dump in prior years, and were concerned about another "Love Canal".

In October 1980, the Arapahoe County board scheduled a hearing for November 24, 1980, for determination of the proposed transfer of the certificate. However, that same month, the Board of County Commissioners, on the advice of the County Attorney, decided that a transfer of the certificate of designation was not necessary under the law. The County decided that Denver, as owner of the site, could contract with the Company to operate the site without a transfer of the certificate. The County Board passed a formal resolution stating this position and announcing that the November 24, 1980 meeting would be for informational purposes only -- "to allow information regarding the landfill operations to be made public..." (Arapahoe County Board Resolution 974-80).

Also during October, the State held a number of technical review meetings regarding the Company's proposals. On October 22, 1980, the State wrote to the Company:

> Periodic site visits have generally assured us that the design and construction of the treatment ponds are very good and they are being carefully operated for selected materials.

After a detailed review of the engineering plans and geological reports for the Section 32 evaporation ponds and drum burial cell, the State of Colorado sent a letter

report to Arapahoe County which included the following opinions:

> It is the opinion of the reviewing agencies that the proposed revisions to the operations at the Lowry Landfill, as presented in the submittals referenced on Table 1, can be implemented in accordance with the minimum standards of the Solid Waste Disposal Sites and Facilities Act. Furthermore, the proposed designs and operational modifications which have been reviewed represent, and in some cases exceed, the current 'state-of-the-art' in municipal and industrial waste management. The implementation of these operational revisions at the Lowry Landfill will improve this facility by an order of magnitude.
>
> Letter from Colorado Department of Health to Arapahoe County Board of Commissioners, November 21, 1980.

On November 24, 1980, the Governor's Lowry Landfill Assessment Task Force issued its Report on past and proposed operations at the Lowry site. The report stated:

> The situation has improved greatly with the assumption of operations by Chemical Waste Management, Inc....It was agreed that the handling and disposal practices proposed by CWMI were a vast improvement over the previous operation and can represent state-of-the-art management for hazardous wastes if properly documented and followed.
>
> Report of the Governor's Lowry Landfill Assessment Task Force, pp. 4-5.

The report of the task force's scientific assessment committee stated:

> Using contemporary standards for judging the quality of hazardous waste disposal sites, the Scientific Assessment Committee is unanimous in its belief that the CWM proposal represents current state-of-the-art technology and management practices. The operation of the Lowry site by CWM will represent a substantial improvement over the past operation of the site.
>
> Report of the Scientific Assessment Committee, p. 5.

The technical committee also evaluated the geological safety of the site and made recommendations as to the long-term (what the committee characterized as "well beyond the end of this century", Id., p. 7). The committee found that Lowry was not the "best possible site" for permanent disposal of hazardous wastes. However, the committee also noted a distinction between the long-term "best possible site" and the forseeable future:

> The term 'best practical site' suggests seeking acceptable safety for the forseeable future, in the context of striking a balance with such other factors as convenience, economic costs, and political realities. (Id., p. 6).

Applying these criteria, the committee recommended that some hazardous wastes could be permanently disposed of at the Lowry site, but that "highly toxic" wastes should not be permanently disposed of at Lowry (Id., p. 7). The committee did not define a distinction between "highly toxic" and "hazardous", but stated that that determination should be made by the Company in cooperation with local authorities. Just such a list had been included in an

agreement between the Tri-County Health Department, the Colorado Department of Health, and the Company (see Table 2 to the Colorado Department of Health, letter of October 21, 1980).

On November 24, 1980, a large public meeting was held by the Arapahoe County Board of Commissioners. There was no notice by the County that any licensing or other decision which would affect operation at the site was up for decision. In fact, the resolution of October 27, 1980 stated just the opposite -- the meeting was to be for informational purposes only. At the County Board meeting, a large number of citizens and citizen groups opposed operation of the Section 32 facilities on any basis.

On December 2, 1980 -- again without notice to the Company or to Denver -- the Arapahoe County Board voted to order a shutdown of all Lowry operations within 10 days. The County Board's decision was formalized in resolution 1140-80, passed December 8, 1980, which contained purported findings of facts as to the safety at the site. Apart from the absence of any notice that there was to be a determination of their rights, Denver and the Company never received an opportunity to put on technical evidence addressed to specific technical issues or to cross-examine regarding these issues. The Colorado Supreme Court later determined Arapahoe County's action to be a clear violation of the Company's and Denver's rights to due process:

> Individual license or permit decisions involving adjudicative facts are subject to basic due process guarantees. Colorado Water Quality Control Commission v. Town of Frederick, ___ Colo. ___, 641 P.2d 958 (1982). The due process clause of the Colorado Constitution, Art. II, Sec. 25, "requires at a minimum the same guarantees as those protected by the due process clause of the federal constitution under the fourteenth amendment." Air Pollution Variance Board v. Western Alfalfa Corporation, 191 Colo. 455, 461, 553 P.2d 811, 816 (1976). "The essence of procedural due process is fundamental fairness. This embodies adequate advance notice and an opportunity to be heard prior to state action resulting in deprivation of a significant property interest." Mountain States Telephone and Telegraph Company v. Department of Labor and Employment, 184 Colo. 334, 338, 520 P.2d 586, 588 (1974). See Hide-A-Way Massage Parlor, Inc. v. Board of County Commissioners, 198 Colo. 175, 597 P.2d 564, 566 (1979).
>
> While all the parties disagree in their characterizations of the purpose of the proceedings which resulted in Resolution 1140-80, it is clear that the cease and desist order it contains goes far beyond the result expected from a public informational hearing, which is all the notice given could be interpreted as announcing. The announcements prior to the hearing and the structure of the meeting itself do not meet the requirements of reasonable notice in sections 30-20-103 and -112, nor do they satisfy the due process requirement of fundamental fairness. Because the notice of the hearing was improper for anything other than an informational hearing, the action taken as a result of the hearing, with no further opportunity for public notice and an opportunity to be heard, is invalid.
>
> Decision of June 21, 1982, Colorado Supreme Court, Denver v. Eggert (footnote deleted).

The Arapahoe County Board order shutting down Lowry was formally entered on December 8, 1980. The Supreme Court's decision -- declaring the County's action to be a

flagrant denial of due process of law -- was not rendered until June 21, 1982. During the intervening 18 months, the site remained open pursuant to a series of stay orders.

This 18-month interval is important for several reasons. The County Board decision -- despite the serious violations of due process rights -- became the threshold for subsequent legislative and court disputes. From that point forward, there existed an atmosphere akin to open warfare between the citizen group CALL and the Company, and drawn into this warfare were the State Department of Health, EPA, and the media.

From December 1980 through the Supreme Court's decision in June 1982, the site and the events at the site have been subjected to an endless barrage of publicity which stimulated various government actions, which in turn have generated more publicity. Running throughout the media coverage is a serious misunderstanding of regulatory requirements and a hostile attitude toward the Company. Unfortunately, the Company's response to this hostility only exacerbated the situation.

1. The pH Incident

On March 9, 1981, EPA inspectors engaged in a routine site visit at the Section 32 facility. The inspectors arrived around 11:00 a.m. and were met by a new chemist who had only recently been hired. The chief chemist was temporarily away from the site when the EPA inspectors first arrived.

EPA officials watched the new chemist do a "fingerprint" pH analysis on a drum shipment of aluminum etching wastes which had just arrived on site. EPA requires corrosive wastes having a pH of 12.5 or greater to be treated as hazardous. The new chemist was only aware of litmus paper at the site which would test corrosivity to a pH of 11.

The new chemist, using the litmus paper with a maximum pH of 11, classified the waste as less than 12.5, and sent the wastes to the solids section of the burial cell. At that point, the chief chemist arrived and stated that litmus paper with a pH range of 12-14 was available in the lab. When the sample was analyzed with this paper, the pH turned out to be 14, and thus above the EPA limit.

At no time were the drums placed anywhere but in a hazardous waste disposal facility -- i.e., the burial cell. Despite the relatively innocuous nature of the incident, EPA filed a formal complaint, and the press announced with great fanfare that EPA had "fined" the Company $20,000. Count I of the Complaint charged that the Company had used

an unauthorized method of pH measurement -- litmus paper -- in conducting its "fingerprint analysis" of all wastes. Count II charged that the Company did not have all the equipment necessary to follow the Company's waste analysis plan.

The Complaint was highly publicized; its resolution was not. There was no fine, and EPA dropped Count I completely. As to Count II, the Company agreed to purchase added testing equipment.

In assessing this alleged violation, we conclude that the existence of a violation of the regulations is debatable. The Company had submitted a Waste Analysis Plan which included litmus paper as a method of testing pH for its "fingerprint analysis." Further, fingerprint analysis of each load was voluntary, not mandatory under the regulations. However, since the Company had agreed to do such testing voluntarily, it was bound to follow its Waste Analysis Plan.

In sum, the pH incident was at worst a minor technical violation which could have been handled by letter correspondence. Instead, the EPA Complaint contributed greatly to the growing atmosphere of hostility.

2. Pond 2 -- Liquid In The Sump

Following closely on the heels of the EPA $20,000 "penalty" publicity was a news story in July 1981 regarding leakage from the Section 32 facility. The story stated that state inspectors found indications that the drum burial cell was leaking (July 5, 1981, Rocky Mountain News). The headline read "Lowry Chemical Seepage Confirmed". The main story related to seepage from the old Section 6 Denver operation, but the story included state officials' opinions that the burial cell in Section 32 was leaking. In reality, there was no evidence of leakage from the burial cell in Section 32.

It was in this atmosphere of hostile press and misleading headlines that Company officials decided not to release information indicating that the liquid had been found in the pond 2 sump which was connected to the leachate collection system. This information was first discovered on Thursday, July 16, 1981.

On Monday, July 20, 1981, Company officials made a decision not to release this information. The decision was based on an interpretation that the information was not legally required to be released. The State of Colorado has subsequently confirmed that there was no violation of State law (News Conference by Colorado officials, September 29, 1982.)

EPA has charged the Company with failure to inspect its ponds "for malfunctions and deterioration, operator errors, and discharges which may be causing -- or may lead to: (1) Release of hazardous waste constituents to the environment or (2) a threat to human health." 40 C.F.R. 265.15(a). EPA regulations further provide that the operator must keep operating records of inspections required by Section 265.15. See 40 C.F.R. 265.73(a)(5).

EPA has not charged the Company with any violation of any reporting regulations under 40 C.F.R. 265.77 or any other reporting regulations.

An argument can easily be made that the RCRA regulations were not violated, because there was no threat to human health and no threat of release to the environment. From the standpoint of the letter of the regulation, the Company can arguably be said not to have violated any regulation. There is no evidence that the second five-foot thick liner leaked or was in any danger of leaking.

However, from the spirit of the regulation, and more importantly in light of the need to maintain maximum regulatory and public credibility, Company management made a serious error. Though the public and media were certainly hostile to the Company, the Company's decision to withhold this information from regulatory authorities -- however justifiable from a technical legal point of view -- did serious damage to the Company's credibility. Keeping

separate inspection logs -- though technically legal -- led to the charge of "two sets of books".

There are two often conflicting goals here -- protection of the Company's credibility by a policy of full disclosure versus prevention of unscrupulous and politically motivated misuse of such information through misleading leaks to the media. The answer has to be full disclosure, balanced with a technical education program for regulators, the public, and the media.

3. The Burial Cell

The next series of charges relates to the operation of the drum burial cell in Section 32. The drum burial cell is located in a low-lying portion of Section 32 at the location of an old borrow pit. In May of 1982, after a rainstorm event lasting several days, water collected in the burial pit surrounding some barrels and covering the tops of barrels which had been covered in the previous lift. The EPA charged the Company with failure to control and prevent run-on as required by 40 C.F.R. 265.302, which states:

> Run-on must be diverted from the active portions of the landfill.

There are at least two factors relating to this charge. First, the EPA "interim status" regulations under

Part 265 do not define the level of protection against surface water "run-on" which is required. In contrast, the new facilities regulation Part 264 give express design requirements for run-on protection. 40 C.F.R. Section 264.301(c). The regulatory design requirement is for a 25 year storm. The May 1982 storm events which led to the collection of water in the burial cell may have exceeded the hydrologic limits of a 25 year storm.

The second factor relates to the design and implementation of the burial cell drainage system. There is evidence that the engineered drainage system had not been completely installed at the time of the May 1982 deluge. Further, the selection of a low elevation location site for the burial cell apparently contributed to the volume of run-on reaching the burial cell.

There was a second episode relating to run-on in May of 1983. During that period of time the site was subjected to intense rainfall. Again, given the intensity of the rainfall experienced, it appears that the run-on facilities, even if designed and operated to the current Part 264 standards would not have prevented run-on.

A related charge to the question of run-on at the burial cell arises out of the same series of rainfall events in May of 1983. The charge is that the Company improperly disposed of leachate in violation of a previously agreed order with the EPA.

Company officials were under a commitment to the State of Colorado to keep the sump in the burial cell's leachate collection system in virtually a dry state. This required continual pumping of the leachate collection system. With the serious rainfall events of May 1983, the choice available to Company personnel was to either stop pumping the burial cell leachate from the collection system sump, which would have violated the requirements of the State of Colorado, or to deposit the liquids in a lined area at the decant facility. The volume of the liquids had far exceeded the storage capacity of the storage tank. In the presence of regulatory officials, Company personnel pumped the liquid from the burial cell leachate collection sump to the lined area at the decant facility.

We believe the conduct of site personnel under the circumstances was reasonable given the intensity of the rainfall event; however, the Company should have obtained immediate documented short-term approval from EPA officials. Company personnel at the site state that EPA officials were aware of their pumping of the liquid from the leachate sump over to the decant facility and that EPA officials approved of this practice. However, the Company has no documentation to support this approval.

4. The Colorado Supreme Court Decision

The media reported the Colorado Supreme Court decision of June 1982 as "shutting down" the Lowry facility. As noted above, the decision did nothing of the kind. The Colorado Supreme Court found that Arapahoe County had violated the due process rights of the Company in conducting its hearing of November 24, 1980. However, the Supreme Court held that the Company was required under a subsequently passed State law to obtain approval of the hazardous waste activities. The Company is entitled under that decision to apply to Arapahoe County for such approval.

F. National Industrial Environmental Services (NIES), Kansas

1. Site Closure

The NIES facility is located approximately ten miles east of Wichita, Kansas, and consists of two evaporation ponds, four treatment ponds and two disposal trench areas. The Company purchased the site in mid-1979 in reliance on an earlier geological evaluation by a prominent hydrologic expert that the site was geologically sound. In 1981, it was discovered that pollutants were leaking to a groundwater stratum. Both the groundwater stratum and the leakage had been missed in the earlier geological evaluation.

As soon as the leaks were discovered, the site was closed by order of the governor of Kansas. In response to the discovery the Company has undertaken a major engineering design effort to cure the leaks and to prevent any future problems. With respect to the Company's willingness to address the problem, Kansas officials stated as follows after the site was ordered closed:

> Their policy appears to be one of attacking the problem with the best resources available until corrections have been accomplished. There has never been any difficulty in obtaining technically sound action on their part. In many instances they appear to go beyond the call of duty for the benefit of increased safety or for the benefit of public relations.
>
> Letter of Melville W. Gray, Deputy Director, Division of Environment, September 10, 1982.

The State of Kansas has hired CH2M Hill, a nationally recognized engineering firm, to review the proposals of the Company with respect to remedial action at the site. The reaction of CH2M Hill as of February 10, 1983 was as follows:

> With this total program implemented the state will have in place a thorough well designed constructed and conrolled facility.
>
> We wish to reaffirm CH2M Hill's position that with appropriate monitoring a contingency plan and full implementation of the site improvement program we see no technical reasons for not allow the reopening of the NIES site.
>
> Letter from CH2M Hill to the State of Kansas, February 10, 1983.

In summary, we find no evidence that Company personnel violated the law. However, it is clear that the activities of prior owners did lead to groundwater contamination.

2. Handling Of PCBs

In January 1981, the United States Environmental Protection Agency filed a civil administrative action against NIES for the following alleged violations of TSCA: (1) storage of one PCB transformer in a non-complying storage area; (2) storage of one PCB transformer and two large PCB capacitors without required marking; and (3) failure to develop and maintain an annual record of PCBs and PCB items handled at the facility.

In September of 1981, NIES entered into a consent agreement with USEPA in which NIES admitted the violations. Under the consent agreement all PCBs and PCB items on the site were properly marked and then shipped to Emelle. NIES further warranted that the required records had been prepared and would be maintained at the facility for a period of five years after the facility ceases to be used for the storage of PCBs and PCB items. Finally, NIES agreed to and did pay a civil penalty of $8,550 for the violations.

G. Lyncott, Pennsylvania

In November 1980, the Company acquired the Lyncott landfill in Susquahanna County, Pennsylvania, from Stabatrol Corporation. Stabatrol Corporation had no prior connection with the Company and was the owner of a 10-acre landfill. The Company acquired the site on or about November 14, 1980. Company officials stated that they checked with the Pennsylvania Department of Environmental Resources prior to acquiring the site and they were advised by State officials that the site was properly permitted and was operating in compliance with Pennsylvania laws.

On March 31, 1981, less than six months after the purchase of the site by the Company, the Pennsylvania Department of Environmental Resources ordered an immediate shutdown of the Lyncott site because of failures in the liners of two waste disposal vaults (Nos. 1 and 3) at the site.

An examination of Company records indicates that the Company was not aware at the time it purchased the sites of the construction defects in Vaults 1 and 3. However, an examination of Company records indicates that had a thorough technical and hydrogeologic investigation taken place prior to acquisition, these defects would have been discovered. The site has been permanently closed.

H. Seymour, Indiana

The news articles in March of 1983 reiterated a charge that the Company had violated its contract to clean-up a waste dump in Seymour, Indiana, by transporting wastes to two sites not specified in the cleanup agreement: Evergreen Landfill in Northwood, Ohio and Solvent Resource Recovery, Inc. in West Carrollton, Ohio.

The Seymour recycling site has never been owned or operated by the Company. It had been operated as a chemical reclamation, treatment and storage facility by other companies since 1969; and according to EPA, by 1982 there were approximately 60,000 55-gallon drums of solid and hazardous wastes at the site. Many of the drums were rusted, damaged and leaking.

In October of 1982, EPA, the State of Indiana and local authorities entered into an agreement with 24 generators whose industrial wastes were alleged to be among the hazardous wastes sent to the Seymour site. Under the agreement, which was entered as a Consent Decree in a federal District Court in Indiana, the 24 generators agreed to pay $7.7 million to undertake a surface cleanup of the site.

Chemical Waste Management, Inc., a corporate subsidiary of Waste Management, Inc., was selected as the prime contractor to carry out the cleanup, including drum removal,

tank removal, soil removal and final disposal of all materials from the site. Under the work plan for the job, all facilities that would be utilized for disposal were to be owned and operated by Chemical Waste Management, Inc. (page VI-3), and all wastes were to "...be treated in a manner that is both safe and in compliance with all existing regulations of applicable state and federal agencies" (page VI-4).

The work plan further identified six Company facilities that would be utilized for disposal. Shortly after the job commenced, however, unanticipated public resistance negated the use of three of these facilities (Monthly Status Report To The Federal District Court For January 1983, p. 5).

The Company interpreted the work plan to allow it to dispose of the Seymour wastes at any facility that was permitted to receive the wastes, provided that the facility was owned by the Company. Based on this interpretation, the Company began shipping wastes to two Company sites that were not identified in the work plan, but which were permitted to receive the wastes: Evergreen Landfill and Solvent Resource Recovery, Inc. According to Company personnel, EPA's on-scene coordinator verbally approved these actions (Monthly Status Report To The Federal District Court For January, 1983, pp. 5-6).

Later, USEPA's Region V personnel stated publicly that they had approved the shipments to these Company sites that

were not listed in the work plan but that such approval was given after the first shipment was made.

In spite of EPA's verbal approval, counsel for EPA wrote to the Company on March 15, 1983 disapproving the Company's action. According to EPA, shipment of wastes to any Company facility other than the six facilities listed in the work plan was unauthorized, even though such other facilities may have been permitted waste disposal facilities owned or operated by the Company. To use such facilities, the Company would be required to give prior written notification to EPA's counsel, the State of Indiana and the Seymour trustees, and to secure written approval from EPA's counsel.

On the basis of this interpretation that use of the unlisted sites was unauthorized, and on the basis of several other technical violations of the work plan, EPA requested, and the Company agreed, to pay a $3,000 stipulated penalty.

Additionally, as soon as EPA indicated its disapproval of the Company's use of the unlisted sites, the Company immediately stopped shipments to those sites. The Company also retrieved approximately 16,000 gallons of solvents that had been shipped to one of the sites and shipped it to the listed Emelle, Alabama site. Thereafter, the Company requested approval of the two unlisted Ohio facilities in accordance with the procedure outlined by EPA's counsel.

Again, Seymour is another example of conduct which was perfectly proper, had informal agency approval, but which did not have written documentation demonstrating such approval. There was nothing wrong with conduct; but the failure to have written approval exposed the Company to charges of non-compliance.

I. Liquids In Landfills

Much has been written on the allegations of political influence and malfeasance regarding EPA's decision to lift the ban on the deposit of "liquids in landfills" made on February 25, 1982 and revoked on March 18, 1982. This is a classic example of a misunderstanding by the press and the public regarding what the regulations do and do not call for and what events actually took place. It is important to understand the following.

EPA has never proposed banning all "liquids in landfills." Current regulations allow the deposit of bulk liquids directly into hazardous waste landfills. See, e.g., 40 C.F.R. Section 265.314(a)(1). EPA allows the direct disposal of bulk liquids on the assumption that the site's leachate collection system will prevent or retard the migration of liquids from the site. (We regard the practice of direct disposal of bulk liquids as a questionable practice that requires public discussion).

The furor over the deposit of "liquids in landfills" is thus a misnomer. The proposal in question was for the ban of "containerized" liquids, i.e., liquids in drums.

In the late summer of 1981, the Company, on behalf of National Solid Waste Management Association (NSWMA) made a proposal to EPA to allow a percentage of liquids -- not to exceed 25% of the total volume of the landfill -- to continue to be buried in containers because of the safety concerns over opening of drums. This proposal was made as part of settlement discussions in the Shell Oil v. EPA litigation. This litigation involved a challenge to the validity of EPA's RCRA regulations.

At a meeting on November 6, 1981 in Washington, D.C., an agreement was reached by EPA and the litigants in the Shell Oil v. EPA litigation to adopt the proposal and modify the ban. Company records show that persons present at the meeting on November 6, 1981 included representatives of the Justice Department, representatives of environmental groups such as the Environmental Defense Fund, as well as Company representatives and representatives of other private companies.

Because of the short time between the November 6, 1981 agreement and the impending November 19, 1981 compliance date, EPA agreed to extend the compliance date until the 25% proposal could be noticed in the Federal Register and acted upon. This agreement was widely known throughout the industrial and environmental communities -- as early as

December 1981 -- even though the formal proposal and extension of the compliance date was not published until February 25, 1982.

In short, from the evidence available, the "liquid in landfill" negotiations were conducted openly and with due regard for the rights of the public and particularly the rights of concerned environmental organizations. We found no evidence of undue political influence in EPA's proposal.

J. James Sanderson

The Company has used the law firm of Saunders, Snyder, Ross & Dickson in Denver, Colorado, to represent the Company in a variety of State court proceedings involving the Lowry Landfill project. The principal partner in that firm representing the Company was a Mr. Eugene Megyesey, who represented the Company throughout the litigation involving Arapahoe County and the issue of the certificate of designation. (See discussion above under Lowry). Mr. Megyesey represented the Company on Lowry matters from late 1980 through 1982, including matters with the regional office of U.S.E.P.A.

A variety of charges have been made that one of the partners in the Saunders firm, Mr. James Sanderson, had improperly influenced the Environmental Protection Agency on behalf of the Company relative to two matters: (1) the

suspension of the ban on containerized liquids in landfills and (2) permitting decisions with respect to the incinerator ship, Vulcanus.

We have carefully examined all of the Company records related to the liquids in landfill issue, including the development of the technical position espoused by the Company and the participants in the various litigation meetings leading to the decision to temporarily suspend the ban. We have found no evidence of participation by Mr. Sanderson. The merits and confusion about the liquids in landfill issue is discussed above.

Mr. Sanderson's activities on behalf of the Company with respect to the Vulcanus involved communications by Mr. Sanderson with the EPA Assistant Administrator relating to the processing of permit applications for the Vulcanus in September, 1982 and in January, 1983. The details of Mr. Sanderson's conduct are set forth in a Justice Department report dated August 11, 1983, which found no violation of applicable statutes and regulations. Because of the detail of that analysis, we see no purpose in duplicating a discussion of the relevant statutes and regulations as they apply to Mr. Sanderson's conduct.

II. ASSESSMENT AND RECOMMENDATIONS

Given the litany of charges and facts set forth above, it is easy to lose perspective on the significance of these events as they relate to the overall operations and credibility of the Company. This is particularly true when the whole focus of this report is directed toward investigating complaints against the Company and not toward describing any positive aspects of the Company's operations. It is incumbent on this firm, both as investigators and professionals working in the field of environmental protection, to give some assessment as to the significance of our findings, the probable causes for some of the events described above, and our recommendations for the future.

This assessment of necessity contains certain positive, and we believe, accurate statements concerning Company attitudes and operations. It also contains certain negative statements concerning the past conduct of some Company employees.

A. Summary Observations

1. Environmental Protection. Protection of the environment must be the overriding factor in the Company's hazardous waste treatment and disposal operations. The central question is not regulatory compliance or public perception -- but whether the Company's hazardous waste operations actually protect the environment. Based on our discussions with Company technical personnel, the Company's technical approach to hazardous waste management is highly consistent with sound environmental policies.

Contrary to historical perception, the Company does not advocate a major emphasis on landfilling hazardous wastes. The Company advocates a mix of treatment and disposal alternatives, including landfills, appropriate to the characteristics of the waste stream involved.

Indeed, the Company's current technical position closely parallels the recommendations of the Toxic Waste Assessment Group's report to then California Governor Edmund G. Brown, Jr., Alternatives To Land Disposal Of Hazardous Wastes (1981). However, instead of limiting these alternatives to California, Company representatives have emphasized the need for nationwide requirements which will prevent lowered standards of environmental protection in some states.

What does this mean to the goal of environmental protection? It means recycling, or chemical, biological or

physical destruction of organic hazardous wastes as preferred alternatives to landfilling. It means using landfills for hazardous wastes only where alternative disposal techniques are either unavailable or create an even greater environmental risk. (There appear to be some wastes for which alternative treatment or disposal methods may be either infeasible or create more environmental problems.) Finally, it means the siting and design of hazardous waste landfills consistent with a high level of groundwater protection.

2. **Credibility**. Credibility is a second essential factor in the Company's hazardous waste treatment and disposal operations. The public, the press, the regulatory agencies, the generators, and the financial community must all have confidence that the Company's operations do not threaten contamination of the air, surface water, or groundwater. The Company must protect the environment, and of almost equal importance, the public must perceive that the Company is protecting the environment.

Because of the press charges examined above, the Company's credibility has been severely damaged. We recommend below certain actions consistent with both the reality and perception of environmental protection.

3. **Compliance**. Regulatory compliance is the third essential factor. Regulatory compliance may in many cases be unrelated to or completely unnecessary for environmental protection. Conversely, regulatory compliance may not

provide adequate environmental protection. Nevertheless, rigid documented regulatory compliance is perceived by the public and the press as the equivalent of environmental protection; and non-compliance -- even for wholly justifiable reasons -- is perceived as harmful to the environment.

We have found that several of the charges of regulatory non-compliance made against the Company are without merit. Of those that do have merit, there is no evidence that any conduct of Company personnel involved in those charges has caused any contamination of the air, surface water, or groundwater.

As to the charges that do have merit, they can be divided into three principal categories:

a. technical violations which occurred, but which are not very significant. An example would be the failure to sample every truck that came in from the Aniston job at Emelle. The fingerprint analysis does not provide any significant information on a truck-by-truck basis regarding the wastes brought in from Aniston. Nevertheless, the Waste Analysis Plan did say that every load would be sampled.

b. violations or charges of violations which are caused by reliance on informal variations by regulatory authority. These informal variations are not formally authorized or documented. Clearly

the conduct of CID employees in accepting loads of a permitted waste stream after a permit had expired and while the permit renewal application was pending made common sense. However, Illinois does not have explicit authority to make such an informal variation, and the Company clearly lacked documented evidence that such a variation had been granted in the cases in question.

c. violations which may not harm the environment, but which are significant from the standpoint of regulatory compliance. Certainly the actions at O.L.D. as to PCBs fit into this category.

Since the events of March 1983, the Company has instituted a series of procedural safeguards designed to prevent a recurrence of any non-compliance situations. These include the creation of an Environmental Compliance Program, as well as an expanded audit program. We believe that these programs, when refined and if properly implemented, will provide for a high standard of regulatory compliance. Further, the Company has made use of its key management officials and highly qualified outside consultants to maximize compliance efforts at its hazardous waste sites.

B. Assessments As To Cause

We have attempted to identify the causes of the violations and the causes of the erroneous charges so that they can be prevented in the future. These causes include the following.

1. **Reliance On Informal, Undocumented Agency Variations**. The federal approach to environmental protection and that of some states is to write regulations attempting to cover all possible situations. The hundreds of pages of fine print regulations in the Code of Federal Regulations attempt to cover myriad situations.

Despite the mass of detail, the regulations often fail to foresee situations which need to be addressed, but are either outside of or inconsistent with the letter of the regulations. Moreover, in many instances, the regulations fail to openly authorize a variance system which will allow agency officials to address unforeseen or emergency situations and to approve necessary actions which will not harm the environment.

We emphasize that such a variance system, properly authorized and administered under measurable standards, is desirable and necessary from a perspective of environmental protection and is probably required under the Constitution. However, in the absence of explicit authorization for such variances, many agency officials have developed an informal variance mechanism by which the agency permits an action

which does not harm the environment, but which does not comply with the letter of the regulation. These informal variances have been called a variety of names, the most common of which is "enforcement discretion."

Again, such a variance mechanism is an essential element in any environmental regulatory program. However, the historical and current state of informal variance procedures -- without explicit authorization and documentation -- creates two severe problems. First, the agency -- though its actions in granting an informal variance may be perfectly proper and consistent with a high level of environmental protection -- runs the risk of being accused of making a "sweetheart deal" with the regulated industry. There is at least one example of such an unjustified charge in this report.

Second, without explicit authorization for such a procedure and without written documentation to support the Company's position, these informal variances leave the Company exposed to charges that it knowingly violated the law. When such charges are made by citizens, the press, or third party enforcement agencies, the Company has no written record to verify the existence of this informal variance procedure and its application to a particular case.

We emphasize this problem for several reasons. First, excessive reliance on undocumented informal variance procedures leads to major credibility problems for the Company. It does little good to talk about informal

approvals when the Company has been charged with a violation and where the Company cannot document its position. Second, reliance on informal practice and approvals with agency personnel can lull Company employees into taking actions unilaterally which may be environmentally sound, but which are inconsistent with regulatory requirements and which expose the Company to charges of violations.

2. **Public And Media Misunderstanding Of Regulatory Requirements.** One of the common themes that emerged from this investigation is that the public and the news media are often unaware of the requirements of the regulations and how the regulations actually relate to environmental protection. This misunderstanding cuts both ways. There have been accusations of wrongdoing when an analysis of the regulations and the facts discloses no violation. Conversely, there have been assumptions made by the press and the public that compliance with an environmental regulation will provide environmental protection when it will not.

3. **Insufficient Communication And Coordination Between Site Personnel And Headquarters.** A number of the allegations arose, and some violations of the regulatory requirements occurred, because there was insufficient communication and coordination within the Company.

First there has been a lack of communication between the sites and corporate headquarters. In particular, the sites have failed to advise corporate headquarters of

potential serious problems on-site before the problems blossom into crises. Two examples of this type of problem are the failure to file manifests at CID and the PCB problem at O.L.D. In either case, if appropriate corporate officials had gotten involved at the time the issues first arose, the current problems might have been avoided, and any remedial action would have been completed long ago.

Second, there has been a lack of communication between site management and the operations people who actually do the disposal work on site. At several of the sites, the site management was aware of the regulatory requirements and corporate policies, but had not effectively communicated these matters to the operations people or policed the operations people to ensure compliance.

C. Recommendations

Consistent with our assessment of the causes of the conduct and the allegations, we make the following recommendations. Many of these recommendations contain elements which have already been adopted by the Company.

As two central Company objectives, we recommend:

1. vigorous compliance with the letter of the law; and

2. the restoration and enhancement of the Company's credibility.

To achieve those objectives, we recommend the following.

1. Insuring Compliance

a. Employee Education. Employees at all levels of the Company expressed a need for better education as to regulatory requirements. There is no systematic and ongoing educational program as to regulatory compliance on a Company-wide basis at this time. We suggest the following for consideration:

(1) Establish a regulatory education program especially tailored to all levels of Company employees from top management to equipment operators. Do this with professional media and educational expertise to tailor the materials to the particular needs of a given group. Such a program must be kept simple and must be kept current.

(2) For key employees at both the operations level and in any compliance position, institute both initial and periodic testing as to regulatory requirements.

b. Handling Site Compliance Issues. Our investigation disclosed that technical compliance personnel at the sites were periodically overruled by the site business

manager. At times, technical personnel claimed that there was a violation when there was none. At other times, the business manager chose to ignore the violation.

There must be a mechanism where site compliance disputes can be brought to corporate attention and quickly resolved to assure compliance. While the Environmental Compliance Officer Program now underway addresses many of our concerns, we recommend the following:

(1) Establish compliance decision making teams at each site to be made up of the site manager, the site environmental compliance officer, and an attorney specially assigned to the site from corporate headquarters. (The attorney need not be physically located at the site). If the site manager and the environmental compliance officer cannot agree, the dispute would be resolved by the attorney. Any member of the site team dissatisfied with a decision could have the decision reviewed by a decision team at corporate headquarters. Any decision on regulatory compliance at any site should be recorded on a log and the log should contain key pertinent information as to the background of the decision. The log should then be periodically reviewed by corporate headquarters.

(2) Establish a rotating corporate level decision making team available at all times to the sites to

assist the site decision teams in the absence of disputes and to resolve disputes sent up from the site. This corporate level team should consist of an executive from operations, an executive from environmental engineering or compliance, and an attorney from the legal department.

(3) Establish a corporate hotline where any potential problems at a site would be brought to the immediate attention of the corporate level decision team.

(4) Establish formal procedures whereby any action not explicitly authorized by agency regulations is brought to the attention of the agency and written recorded approval is obtained from the agency prior to the action being taken. Examples of the need for such a procedure include: expired permits up for renewal, loads received over volume limits, and out of specification loads. The Company is seriously exposed by informal oral approval procedures which are not recorded.

(5) All relevant compliance information including representative sample testing, permits, renewal dates and renewal actions, manifest transmittals, receipt control information, special action on

individual loads (i.e., out of specification loads) should be placed on a Company-wide computerized data base management system. Much of the adverse publicity of past months resulted from top management's inability to respond rapidly to charges respecting loads coming into individual sites. This same data base management system should also contain all site level and headquarter level environmental decision summaries and chronologies.

(6) As a general operating principle regulatory authorities should be informed as soon as possible about any environmental or regulatory concerns at a site even if not required to do so by the letter of the regulation, and a record should be kept of the time of such notification. If there is a circumstance where a suggestion is made to withhold any information, such a decision should only be made by the headquarter level environmental decision team and should be explicitly approved by the chief executive officer.

(7) The Company should establish a separate office of corporate watchdog and troubleshooter. All employees should be encouraged (with guarantees of confidentiality and job protection) to report any

concerns regarding actual or potential violations if the employee is hesitant to report through normal channels.

(8) All proposed off-site clean-up operations should be reviewed from the concept stage through completion by the headquarter level environmental decision team as well as legal and engineering staff.

2. Credibility

The key needs here are restoring the Company's credibility with the regulatory agencies and the public. They must be assured that the Company's treatment and disposal operations are in complete compliance with regulatory requirements and are environmentally sound. Consistent with the goal of restored public and regulatory credibility we have the following recommendations.

a. Public Education And Dialogue. It is obvious that much of the public and media concern over hazardous waste comes from worry about environmental contamination coupled with a gross misunderstanding about the technical assumptions and requirements of the existing regulatory program. We suggest a comprehensive and forthright public education program which openly discusses each of these areas in logical progression.

The Company ought to respond to each of the technical concerns of critics of hazardous waste disposal and explain how the Company has addressed these issues. Examples of these issues include the question of liquids in hazardous waste landfills, organic wastes in hazardous waste landfills, the characteristics and ability of soil and or synthetic barriers to contain liquid wastes, the feasibility and drawbacks of alternative technologies such as incineration, and the assumptions involved in siting hazardous waste facilities.

This public education program must be professional but not glossy. It must not be perceived as a "dog and pony show." It must hit the issues head on and aggressively and honestly communicate with the Company's critics in the media and the public.

We suggest that this educational program incorporate such communication tools as periodic and carefully planned national conferences; video productions; governmental and citizen group briefings; and literature.

Also of critical importance is the need for extensive and continuing dialogue between local citizens near disposal and treatment facilities and Company management. There are some critics who are simply demagogues playing on people's fears. However, the great majority of citizens are legitimately concerned about health hazards and need communication with the Company to prevent unwarranted concern.

b. Hydrogeologic And Process Safety. Perhaps the greatest community concern about land disposal sites is the question of groundwater safety. We know that the Company has already subjected its sites to intensive environmental scrutiny as part of the RCRA permit process. However, we believe that even more is needed to maximize public confidence.

To insure a high level of public confidence we are recommending that a panel of nationally respected geologists, toxicologists, and related environmental experts be assembled by the Company to review and evaluate each of the Company's existing and future hazardous waste treatment and disposal sites for protection of the environment -- particularly as to groundwater but also as to air and surface water protection.

This concept is already being implemented by the Company. The Company is developing an Environmental Study Task Force made up of nationally known experts in the fields relating to the safety of hazardous waste management. This task force will involve multiple experts in such fields as hydrogeology, toxicology, water treatment and chemical processes.

If the task force is made up of experts who possess both skill and credibility as to their environmental concern -- and we believe it will be -- its scientific determination will go far in establishing a high level of public confidence.

Karaganis, Gail & White, Ltd.
Attorneys at Law

September 15, 1983

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RISK ASSESSMENT FOR THE OLD HAZARDOUS WASTE DISPOSAL SITE AT VICKERY, OHIO

Prepared by

Clement Associates, Inc.
1515 Wilson Boulevard
Arlington, Virginia 22209

Prepared for

Bergson, Borkland, Margolis and Adler
11 Dupont Circle
Washington, D.C. 20036

August 16, 1983

PREFACE

This report has been prepared for, and at the request of Bergson, Borkland, Margolis, and Adler (BBMA) as part of their internal investigation of operations and environmental contamination at the OLD hazardous waste disposal site operated by Chemical Waste Management, Inc. (CWM) in Vickery, Ohio. It is based on information supplied by BBMA, CWM and their technical contractors, including Environmental Testing and Certification Corporation (ETC), Environmental Research and Technology, Inc. (ERT), Golder Associates (Golder), and Weston, Inc. (Weston). As part of its standard practices, Clement Associates, Inc. (Clement) has attempted to verify the reliability of data supplied by BBMA, CWM and their contractors, including review of sampling designs, analytical procedures and quality assurance data included in the contractors' reports. In certain cases, Clement has suggested additional sampling or analytical work to fill gaps in data required for risk assessment. However, Clement did not take part in the design or execution of field studies, sample collection, or sample analyses. Thus, Clement makes no representation as to the completeness or accuracy of the data on which this report is based. Clement's responsibility is limited to the use of these data in preparing a reasonable scientific assessment of the risks that might arise during and after various remedial options.

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PREFACE

This report has been prepared for, and at the request of Bergson, Borkland, Margolis, and Adler (BBMA) as part of their internal investigation of operations and environmental contamination at the OLD hazardous waste disposal site operated by Chemical Waste Management, Inc. (CWM) in Vickery, Ohio. It is based on information supplied by BBMA, CWM and their technical contractors, including Environmental Testing and Certification Corporation (ETC), Environmental Research and Technology, Inc. (ERT), Golder Associates (Golder), and Weston, Inc. (Weston). As part of its standard practices, Clement Associates, Inc. (Clement) has attempted to verify the reliability of data supplied by BBMA, CWM and their contractors, including review of sampling designs, analytical procedures and quality assurance data included in the contractors' reports. In certain cases, Clement has suggested additional sampling or analytical work to fill gaps in data required for risk assessment. However, Clement did not take part in the design or execution of field studies, sample collection, or sample analyses. Thus, Clement makes no representation as to the completeness or accuracy of the data on which this report is based. Clement's responsibility is limited to the use of these data in preparing a reasonable scientific assessment of the risks that might arise during and after various remedial options.

Clement has specialized in the preparation of written assessments for toxic chemicals, and has conducted a number of risk assessments for permitted uncontrolled hazardous waste sites. For this purpose Clement has developed special techniques of risk assessment to deal with specific problems that arise at hazardous waste sites. These techniques are described briefly in Section II of this report.

SUMMARY

This report presents an assessment of possible risks that might result from the presence of PCBs and other chemicals at the OLD waste disposal site operated by Chemical Waste Management, Inc. (CWM) at Vickery, Ohio. It is based on chemical, hydrogeological, and other environmental data supplied by CWM and its technical consultants (see Appendix A), and upon toxicological data available to Clement Associates, Inc. (Clement). Assessment of risks is presented both for the present state of the site and for the conditions that would prevail under each of nine remedial options outlined by CWM in its presentation of July 28, 1983, to the Ohio EPA. Both long-term risks resulting from chemical exposure and short-term risks arising during remedial work are considered.

Section II of this report summarizes and discusses procedures used for risk assessment at hazardous waste sites. Risk assessment for toxic chemicals involves three separate steps: exposure assessment, toxicity assessment, and risk assessment. Each of these steps introduces a number of scientific uncertainties, even when extensive data on exposure and toxicity are available. In the case of hazardous waste sites, additional uncertainties are usually introduced by the multiplicity of chemicals present, multiple pathways of environmental transport and exposure, incomplete information about the nature and extent of chemical contamination, and the long time-scales for chemical

migration. For these reasons, risk assessments for hazardous waste sites are rarely accurate to better than an order of magnitude, and semiquantitative or verbal characterizations of the extent and magnitude of risk are often appropriate An approach is described which involves the identification of a limited number of chemicals of primary concern at each site and the exploration of a limited number of exposure pathways, using a "worst-case scenario" approach.

Section III of this report summarizes the toxicity of the chemicals of primary concern at the Vickery site. Primary attention is devoted to PCBs because of their presence at the site and their special regulatory status (Section IIIA). The toxicity of 14 other chemicals present in substantial quantities is summarized briefly, based on USEPA's Ambient Water Quality Criteria documents (Section IIIB). For each chemical, daily intakes are identified that correspond to very low carcinogenic risks and/or ample margins of safety for other types of risk (Figure 1 and Table 2). These risks are placed in the context of upper low-level risks experienced in the general population (Table 3).

Section IV of this report explores eight exposure scenarios at the Vickery site and assesses in semiquantitative terms the risks associated with each. With the probable exception of exposure to volatile organic compounds (other than PCBs) volatilizing from the lagoons, risks resulting from long-term exposure to materials migrating from the site are judged to

be negligible or very low for all remedial options, including the no-action option. The most important risks under most options are short-term risks arising during the remedial work itself. This report explores several of these risks, including chemical exposures and operational accidents to remedial personnel, on-site and off-site exposures to materials volatilizing during remedial excavation, and off-site traffic accidents. For all options involving substantial off-site transportation, traffic accidents are judged to be the most important single source of risk arising from the site.

Table A presents a summary characterization of the risks judged likely to arise under each of the remedial options. Risks resulting from chemical exposures and accidents arising during remedial work can probably be kept low by an effective safety plan, but cannot be eliminated altogether. However, these risks are similar under all remedial options and the bottom line of table A reflects only incremental risks associated with each option. Under option 1, 1A, 1B, and 5, these incremental risks are judged to be <u>negligible</u> or <u>very low</u> (i.e., there would be an adequate or greater margin-of-safety for all chemical exposures, and there would be no substantial off-site transportation). These options represent an improvement over the no-action options, for which there would probably be a less-than-adequate margin-of-safety resulting from exposure to organic chemicals (other than PCBs) volatilizing from the lagoon. Options 2, 3, 4B, 4A, and 6 would involve large-scale

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TABLE A

CHARACTERIZATION[1] OF RISKS ARISING UNDER VARIOUS REMEDIAL OPTIONS AT THE VICKERY, OHIO, SITE

Type of Risk	No Action	Remedial Option								
		1	1A	1B	2	3	4A	4B	5	6
Volatilization of PCBs from ponds	-	-	-	-	-	-	-	-	-	-
Surface water runoff of PCBs	-	-	-	-	-	-	-	-	-	-
Infiltration of PCBs into ground-water and transport off-site	0	0	-	-	-	-	-	-	-	-
Volatilization of other VOCs from ponds; on-site or off-site exposure	XX	0	-	-	-	-	-	-	-	-
Exposure of remedial workers to PCBs*	-	0	0	0	0	0	0	0	0	0
Release of other VOCs during remedial work; on-site or off-site exposure*	-	X	X	X	X	X	X	X	X	X
On-site accidents*	-	X	X	X	X	X	X	X	X	X
Transportation accidents	-	-	-	-	X	XX	XXX	XX	-	XXXX
Overall characterization	XX	0	-	-	X	XX	XXX	XX	-	XXXX

[1]-, negligible (at least ample margin of safety);
0, very low (adequate margin of safety);
X, low (marginal margin of safety; 2-3 accidents expected);
XX, low-to-moderate (marginal to inadequate margin of safety; 6-7 accidents expected);
XXX, moderate (10-12 accidents expected; death possible);
XXXX, moderate-to-high (20-25 accidents expected; death likely).

*These risks are common to all remedial options and are expected to be minimized by a safety plan (see text); they are not included in the overall characterization, which classifies incremental risks associated with each option.

transportation of materials from the site for off-site disposal and would result in progressively increasing risk of injury, death, and chemical spills from off-site traffic accidents. At the extreme, option 6 would involve nearly 5 million miles of off-site transportation by heavy trucks and would statistically be expected to result in 20-25 traffic accidents, a number of injuries, and probably at least one death; this option is categorized as giving rise to <u>moderate-to-high</u> risks.

I. INTRODUCTION

This report presents a summary of the possible risks that might arise from the storage, treatment and disposal of certain chemicals at the OLD hazardous waste site operated by Chemical Waste Management, Inc. (CWM), at Vickery, Ohio. Primary attention is devoted to risks that might be posed by polychlorinated biphenyls (PCBs), which have recently been found as contaminants of oils, sludges, and other substances at the site. Emphasis is placed on PCBs because of their special regulatory status under the Toxic Substances Control Act, which has led to the design of specific remedial measures to contain, reduce, or eliminate the contamination of the environment with these materials. Some attention is devoted to PCDD which has recently been found in trace quantities at the site (see Appendix D). Limited attention is paid to risks that might be posed by other materials identified at the site, particularly volatile organic compounds that are found in association with PCBs and that would be affected by the remedial measures applied to PCBs. To the extent possible, this report assesses the risks associated with each of the nine remedial options proposed by CWM in its submission to the Ohio EPA dated 28 July, 1983, as well as with the situation that would arise if no further remedial actions were applied to the present contamination. The results of this risk assessment have already been presented in schematic summary form in Attachment B, Table 1, of CWM's submission

of 28 July 1983. This report provides documentation and background information for those summary characterizations of risk.

This report is in three main parts. The first is a brief description of scientific procedures available for conducting risk assessments at hazardous waste sites, and explains the limited precision attainable by such assessments. The second is a summary of toxicity data on PCBs and other contaminants identified at the OLD site. The third includes analyses of a number of scenarios for human exposure, and assesses the potential for exposure and risk arising under each scenario. This section utilizes technical information supplied by other contractors, including hydrogeological information developed by Golder Associates, chemical analyses of sludges and other materials by Environmental Testing and Certification Corporation, characterization of the site by CWM, and air monitoring by Environmental Resources and Technology, Inc. (see Appendix A for a list of primary information used). The report concludes with a summary and tabulation of results. Certain technical parts of the risk assessments are presented in Appendices B and C to this report.

II. METHODS FOR RISK ASSESSMENT AT HAZARDOUS WASTE SITES

A. General Methodology for Risk Assessment

Risk assessment for toxic chemicals follows a methodology which has now become fairly standardized. It involves three distinct steps: exposure assessment, hazard assessment, and risk assessment. In exposure assessment, data on the distribution of the chemical in the environment are assembled, and pathways leading to human exposure are identified. The human population at risk of exposure is enumerated, and the distribution and magnitude of exposures are calculated. The data are synthesized to yield a summary of the number and distribution of persons exposed to the chemical at different levels and frequencies. If sufficient data are available, the distribution of exposures may be formulated in statistical terms; more frequently, a limited number of high exposure groups may be identified.

In hazard assessment, information on the toxicity of the chemical is assessed by means of critical review of toxicological and epidemiological studies. The toxic effects of most concern at low exposure levels are identified, and numerical dose-response data are extracted from the studies under review. For toxic effects other than carcinogenesis, the lowest dose levels that cause adverse effects ("LOAELs") and the highest dose levels that cause no adverse effects ("NOAELs") are identified. For carcinogenesis, it is customary to assume that no absolute

thresholds (NOAELS) may exist, and the data are fitted to mathematical models of dose-response relationships to estimate the probability of response per unit dose ("unit risk") at low-dose levels.

In risk assessment, the exposure and hazard data are synthesized to estimate the extent and magnitude of risks to the human population. For effects other than carcinogenesis, "margins of safety" between expected exposure levels and NOAELs or LOAELs are calculated for different segments of the population. For carcinogenic effects, data on the distribution of exposures are combined with estimates of unit risk to yield estimates of the distribution of risk. A scientific risk assessment should include not only a description of the risks to the population but also a statement of the scientific uncertainties in this description.

Interpretation of the results of a risk assessment involves not only scientific judgments about the probability of adverse effects but policy judgments about the acceptability of low risks. As a scientific matter, estimates of risk at low exposure levels are subject to considerable uncertainty. For effects other than carcinogenesis, fairly large margins of safety are required before it can be concluded that population risks are low. This requirement for large margins of safety arises both because humans may be more sensitive to low doses of a chemical than the animal species used in toxicity studies, and because the human population is variable, so that some individuals

may be much more sensitive than others. However, the magnitude of the margin of safety required in any specific case is a matter for scientific judgment. Toxicologists usually require at least a 100-fold margin of safety between a NOAEL established in an animal species and human exposure levels, and in some circumstances a 1000-fold margin of safety may be required before it can be stated with scientific confidence that risks are very low. For carcinogenic effects, extrapolation of dose-response data to predict risk levels smaller than 10^{-3} (1 in 1,000) or 10^{-4} (1 in 10,000) is scientifically tenuous. However, individual risk levels of 10^{-5} (1 in 100,000) or even 10^{-6} (1 in 1,000,000) are usually of concern to the public and to the policymaker, especially when substantial numbers of people are exposed. To overcome this policy dilemma, scientists usually extend their risk models to predict risk levels as low as 10^{-5} or 10^{-6}, incorporating "conservative" assumptions to avoid underestimating risks. However, the consequence of this conservatism is that standard procedures overestimate risk by an unknown (but potentially large) factor. The uncertainties in hazard assessment are usually compounded by uncertainties in exposure assessment, and by variability in exposure among different segments of the population.

B. Specific Problems Arising at Hazardous Waste Sites

Risk assessments for exposure to chemicals at hazardous waste sites are subject to a number of additional uncertainties, primarily arising from complexities in exposure assessment.

In most cases, a number of different chemicals are present at the site. Their quantities, distribution, and even their identities are usually unknown at the outset and have to be estimated from a limited number of sample measurements. It is now recognized that no hazardous waste site is totally secure, and a large number of environmental pathways by which chemicals may migrate from the site may have to be considered. However, since migration is often very slow, it is rarely possible to measure the exposure of off-site populations directly, and it is necessary to rely on models of chemical migration. Constructing such models requires knowledge of the characteristics of the chemicals and of the local environment (soils, groundwater, surface water, etc.) that is rarely available in sufficient detail for precise modelling. Although models sometimes can pinpoint the need for additional monitoring data (e.g., when calculations of volatilization rates suggest that concentrations of chemicals in air may be high enough to be of concern), the long time-scale of many hydrogeological processes means that models of transport in groundwater are often practically unverifiable. For these reasons, <u>assessments of exposure to chemicals migrating from hazardous waste sites are rarely accurate to better than order of magnitude</u>. Unless precise monitoring data are available in a specific case, it is usually a waste of resources to develop elaborate models of exposure and risk, and it is scientifically misleading to present the

results as though they were precise and accurate predictions of exposure and risk.

C. Procedures Used in the Report

The general procedures for risk assessment used in this report have been developed by scientists and engineers at Clement from experience at a number of hazardous waste sites. First, we review the information available on the chemicals present at the site and develop a short list of those giving rise to the greatest concern, on the basis of quantities present, toxicity, and propensity for migration leading to significant exposure. (In the case of Vickery, PCBs were prespecified for primary attention because of their special regulatory status under the Toxic Substances Control Act, but we identified 14 other chemicals for attention based on their presence at the site in substantial quantities and their toxicity (Table 2).) Second, we review information on the disposition of the chemicals at the site, and on engineering, hydrogeological, and other factors that determine the potential for these chemicals to migrate through or away from the site. Instead of attempting to construct detailed models of the transport of all chemicals by all possible pathways, we identify a limited number of pathways for specific attention. (In the case of Vickery, we identified volatilization and groundwater infiltration as the pathways of primary concern, but also recognized that the potential for surface water runoff had not been fully investigated and recommended additional sampling to verify its lack of importance.)

Third, for each transport pathway so identified, we develop scenarios under which the greatest exposure to human populations might result, and construct simplified models of transport and exposure for each. (In the case of Vickery, we constructed four scenarios for exposure, excluded two of them as unimportant on the basis of monitoring data, and developed simplified models for the other two.) Fourth, we combine exposure predictions from the simplified models with information on the size and distribution of populations at risk. (In the case of Vickery, we consider the workers on-site and the scattered population residing within 5 km of the site to be the primary groups at risk from exposure to airborne emissions.) Fifth, we review the remedial options under consideration for the site and evaluate the degree to which risks calculated for each scenario would be reduced (or increased) under each remedial option. Finally, we consider short-term risks that arise during, and as a result of, the remedial work.

Each of the steps listed above is highly site-specific and is usually limited more or less severely by the nature of the data available. The risks identified and estimated in each section of the assessment are not only subject to substantial scientific uncertainty, but also vary widely in nature and extent. For example, some risks may be of acute chemical exposure or mechanical accident to remedial workers; others may be expressed as a less-than-adequate margin of safety for a limited group of on-site workers or off-site residents; and

others may be expressed as a possible cancer risk of 10^{-6} or 10^{-5} to another group of persons. Overall characterization of the risks posed by the site under various remedial options involves weighing short-term risks against long-term risks, very uncertain risks against less uncertain risks, and risks to occupationally exposed workers against risks to third parties. We regard it as impossible to derive a single numerical characterization of the nature and magnitude of the risks posed by a site. Instead, we give a verbal characterization of the risks arising under each exposure scenario ("negligible," "low," "moderate-to-high," etc.) and an overall characterization of the risks posed by the site in the same terms. Since these characterizations involve some subjective judgment, we present them separately for each type of exposure, so that policymakers who are inclined to assign different relative weights to them can do so. For example, at the Vickery site, it is our judgment that long-term risks resulting from chemical exposures are small and uncertain, whereas short-term risks arising from remedial work under some remedial options are both larger and more certain to occur. However, for those who may disagree with either of these judgments, our assessment of risks of different types is disaggregated in Table 5, and its basis is explained in the text of Sections III and IV of this report.

III. TOXICITY OF PCBs AND OTHER CHEMICALS IDENTIFIED AT THE OLD SITE

A. Toxicity Assessment for PCBs

The toxicity of PCBs is evaluated in this section, which includes a survey of the literature, consideration of the difficulties of such evaluations, a review of key studies, and a discussion of limitations to such studies. Margins of safety are considered in the final segment of this section.

1. Literature Survey

Scientific data on the toxicity of PCBs and of their contaminants and related compounds have been reviewed in many papers, books, and scientific reports. The reference list includes 25 of these scientific reviews published between 1972 and 1983. We have reviewed most of the available scientific information summarized in these reviews and published in recent scientific journals. The scientific literature on the toxicity of PCBs is voluminous and complex, and a wide variety of toxic effects has been documented in studies of varying quality and conclusiveness. Appendix B to this report summarizes the toxicity studies which we judge to be the most relevant to assessing the possible hazards posed by the current contamination of the OLD site with PCBS.

Data on effects of PCBs in humans are derived from three main sources.

- In studies of workers exposed to relatively high levels[1] of PCBs in the workplace, the most consistent effect reported is a skin disease known as chloracne. Other effects reported less consistently or less frequently include induction of hepatic microsomal enzymes, other changes in liver function, neurological and behavioral symptoms, digestive disturbances, eye irritation, and respiratory impairment (NIOSH 1977, Warshaw et al. 1979). Three studies have suggested possible excess frequencies of cancer in exposed workers (Bahn et al. 1976, Brown and Jones 1981, Bertazzi et al. 1981), but these studies were limited by small sample sizes, were mutually inconsistent, and are not generally regarded as conclusive.

- Two incidents have been reported in which large numbers of people were poisoned by consumption of cooking oil contaminated with PCBs and with their thermal decomposition products. These incidents took place in Japan, where the disease is known as "Yusho" (Kuratsune et al. 1972, 1976), and in Taiwan (Chang et al. 1980). The symptoms included long-lasting skin lesions similar to those observed in chloracne, but also included abnormal pigmentation of the skin, menstrual disorders, liver damage, neurobehavioral impairment, minor birth abnormalities, respiratory symptoms, and immunological impairment.

- In the general population, exposure to PCBs (as measured indirectly by residues of PCBs in the blood or body fat) has been statistically correlated with elevated blood pressure (Kreiss et al. 1981), elevated levels of liver enzymes and serum triglycerides (Baker et al. 1980), premature births (Wassermann et al. 1982), missed abortions (Bercovici et al. 1980), and various types of cancer (Unger and Olsen 1980). However, these effects were also associated with exposure to DDE and other chemicals, and the results are ambiguous.

Experimental studies in animals have revealed a wide spectrum of adverse effects of PCBs when administered under appropriate conditions. Some of these effects are closely parallel to effects observed in humans. For example, PCBs induce hepatic microsomal enzymes in a number of animal species, and cause

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[1] "High" occupational levels are 200-2000 $\mu g/m^3$ plus skin contact.

skin lesions in rhesus monkeys that closely resemble those observed in human chloracne. Some effects observed in animals, such as immunosuppression and gastric lesions, have been reported only infrequently or equivocally in humans. Other effects have not been observed in humans, such as the induction of birth defects in dogs and swine. Several studies have indicated that PCBs can cause or enhance the induction of liver cancer in rats and mice.

2. Problems in Hazard Assessment

Assessment of the hazards posed by PCBs is made very complex by a number of factors.

- PCBs are complex mixtures and a number of commercial products have been sold and used which varied substantially in composition. It has long been known that these products differ in toxicity to at least a moderate degree. Some of the most serious toxic effects in animals (e.g., reproductive impairment in rhesus monkeys and liver cancer in rats) have been demonstrated only in experiments with mixtures (Aroclors 1248 and 1260) that were never used commercially in large quantities.

- PCBs are subject to contamination by highly toxic impurities, of which the most important are polychlorinated dibenzofurans (CDFs). These impurities were present at only trace quantities (1-5 ppm) in the commercially pure PCB mixtures, but can be formed in service under certain conditions involving high temperature and the presence of oxygen. There is little doubt that the high toxicity of the PCB mixtures in the "Yusho" incidents in Japan and Taiwan was due primarily to CDFs formed in service in this way.

- The results of studies with PCBs, especially in exposed human populations, have often been inconsistent, and some positive results have not been confirmed when the studies were repeated under similar conditions.

- Some studies have been of poor quality and can be accorded little weight in hazard assessment.

- The effects of PCBs often appear widely different in different species of animals. For example, species such as the mink and the rhesus monkey appear to be extremely sensitive to certain PCB mixtures, whereas the more conventional test species such as rats, mice, and dogs appear much less sensitive.

- The human studies have been limited in scope and duration, and they have not yielded conclusive evidence about the potential of PCBs to cause reproductive impairments or cancer in exposed populations.

For these reasons, selection of scientific studies to serve as the basis for risk assessment for PCBs and CDFs is unusually difficult. On the one hand, it can be argued that studies in animals provide evidence for serious toxic effects at very low exposure levels. In particular, the toxic effects observed in rhesus monkeys are parallel to those in humans exposed to PCBs either in the workplace (chloracne) or via contaminated food (Yusho). Studies in rhesus monkeys have revealed serious effects on reproduction and neurobehavioral development at low exposure levels. On the other hand, it can be argued that chloracne and Yusho are probably caused primarily by CDFs, that the monkeys were exposed to a mixture (Aroclor 1248) to which there has been very little human exposure, that reproductive and neurobehavioral effects were not reported in Yusho victims, and that more conventional test animal species have not shown significant effects at low exposure levels. With reference to human studies, it can be argued that studies of workers exposed to PCB mixtures made in the United States have not unequivocally shown significant effects,

except for chloracne at high exposure levels and inconsistent effects on liver function.

These arguments have been used by Ecology and Environment (1981) and Drill et al. (1982) to support the conclusion that risks posed by PCBs at low levels in the environment are insignificant. However, this conclusion has not yet been adopted as a consensus view by other scientific reviewers or by regulatory agencies such as the U.S. Environmental Protection Agency (USEPA 1980). Pending resolution of this scientific debate, for the purposes of this risk assessment we place weight on the scientific studies that suggest that PCBs may be toxic at low exposure levels. However, we recognize that the relevance of these studies has been questioned and that our assessment may be unduly conservative.

To serve as the basis of our risk assessment, we have selected three types of toxic effect of PCBs that are judged most likely to be relevant at low exposure levels. (Appendix C explains why other types of toxic effect are considered less relevant). The following section summarizes data on these toxic effects, and assesses their importance at low dose levels.

3. Assessment of Key Studies

a. Chloracne

Chloracne is a disfiguring skin disease that has been associated with exposure to PCBs, both in the workplace (NIOSH 1977) and through accidental contamination of food (Kuratsune 1972, 1975; Chung et al. 1980). The incidents of food contamina-

tion are complicated by the presence of high levels of CDFs and other contaminants, so the following assessment is based on dose-response data obtained through studies of workplace exposure to relatively uncontaminated PCBs.

NIOSH (1977) reviewed the data on the occurrence of chloracne in workers exposed to PCBs, and concluded that chloracne was generally associated with PCB concentrations in the blood of 200 ppb or greater. Fischbein et al. (1979) reported a high incidence (45-55%) of skin lesions (not limited to chloracne) in workers in a capacitor manufacturing plant whose average plasma concentration of PCBs was 172 ppb. Because of wide variability in blood concentrations and uncertainty in diagnosis, these and other reports on occupational exposure do not clearly specify a no-observed-adverse-effect-level (NOAEL) for chloracne. However, Humphrey (1977) reported no significant increase in skin disorders in groups of people exposed to PCBs via fish, with mean blood levels of PCBs ranging from 46 to 82 ppb, and individual levels ranging up to 366 ppb. Recognizing the possibility that chloracne may be caused primarily by CDFs, we will use these data as the basis for the assumption that 80 ppb in the blood is a NOAEL for skin effects of PCBs in healthy adults exposed to environmental residues of PCBs. This figure is selected as the highest average level for a group of people with no overtly detectable effects.

This blood concentration can be converted to equivalent PCB intake, using the results of the study by Humphrey (1977),

which indicated that a blood concentration of 58 μg/liter corresponded to an average daily intake of about 130 μg/day. Assuming that the relationship between intake and blood PCB level is linear, an average daily intake of PCBs of about 180 μg (80 x 130/58) would be a NOAEL.

b. Reproductive and Neurobehavioral Effects

Allen and his coworkers have reported a series of studies of the effects of PCBs (Aroclor 1248) on the health and reproductive performance of rhesus monkeys (Allen et al. 1975, 1979; Bowman et al. 1978, 1981). At relatively high concentrations in the diet (10 and 5 ppm), PCBs severely impaired reproduction, and the few infants who were born alive showed signs of poisoning, some of which closely resembled the signs of chloracne in man. Similar (but less severe) effects were observed in monkeys exposed to PCBs at 1 and 0.5 ppm on the diet. In the most recent study (Bowman et al. 1981), monkeys exposed to PCBs at 0.5 ppm in the diet for 3 days per week throughout pregnancy and nursing bred more or less normally, but the infants were underweight at birth, developed minor signs of poisoning (hyperpigmentation of skin) during the nursing period, were hyperactive and showed impaired learning ability when tested at 6 months of age. This average dietary concentration of 0.21 ppm is the lowest dose level at which significant adverse effects of PCBs have been reported in experimental animals. This dietary concentration is equivalent to a daily dose of

0.011 mg/kg body weight/day in the monkeys, which would correspond to a daily intake of about 700 μg/day in adult humans.

c. Carcinogenic Effects in Animals

Several studies have shown that PCBs are carcinogenic in rats and mice, causing increased incidence of liver tumors when administered to the animals at high levels in the diet for most or all of their lifetimes. However, only two of the studies were conducted systematically enough to serve as the basis for risk assessment. In a study by Kimbrough et al. (1975), lifetime exposure of rats to a diet containing 100 ppm Aroclor 1260 led to a high incidence (26/184 or 14.3%) of carcinomas of the liver, and a very high incidence (144/184 or 78.3%) of neoplastic nodules. In a smaller study by the National Cancer Institute (1978), lifetime exposure of rats to a dietary concentration of 100 ppm Aroclor 1254 led to a much smaller incidence of liver tumors (2/48 carcinomas and 3/48 neoplastic nodules or adenomas, pooling data for males and females). Although the differences in tumor frequency between the two experiments are large, the biological difference is less important, because the rats in the NCI study also had a high incidence of "hyperplastic nodules," a condition regarded by many pathologists as an earlier stage in the development of liver tumors. Thus, the main difference appears to have been that tumors developed more rapidly in the Kimbrough experiment than in the NCI experiment.

Several writers have used the data of Kimbrough et al. (1975) as the basis for low dose risk assessment. The most comprehensive assessment was that of Crump and Masterman (1979), who calculated that a dietary concentration of 6.9 ppb would correspond to a lifetime excess risk of 10^{-5} (1 in 100,000) for hepatocellular carcinomas, and that a dietary concentration of 0.63 ppb would correspond to a lifetime excess risk of 10^{-5} for neoplastic nodules. If it is assumed that humans would respond similarly at the same dietary concentrations, then a lifetime excess risk of 10^{-5} would correspond to daily intakes of about 10 ug and 1 ug, respectively.[1]

It should be emphasized that these estimates of possible carcinogenic risk are tenuous. They involve extrapolation from an effect observed in rats at a very high dose level to predict effects in humans at doses 100,000 times smaller. Although this extrapolation follows EPA's current procedures for carcinogenic risk assessment, these procedures are intended to be conservative, and are currently under review. PCBs are known to act by "promoting" the effects of other carcinogens (Nishizumi 1976, 1979, Preston et al. 1981). However, these effects have been studied only at high doses, and there are no accepted procedures for risk assessment in these circumstances. Some recent writers have proposed that thresholds

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[1]Similar results were presented by NAS (1977) and EPA (1980). The results are sensitive to the assumption that is made about the way in which doses should be scaled between species (Nisbet 1981), but the assumption made in the text conforms to EPA's current practice.

exist for the action of cancer promoters and that safe levels of exposure can be established by applying a margin of safety to a no-observed-effect-level. However, this approach cannot yet be applied to PCBs because no experiment has been conducted to establish a NOAEL for cancer promotion.

4. Limitations of the Studies

Table 1 summarizes the three types of toxic effects that are considered in our risk assessment. The column headed "Comments" indicates that each of the three sets of data has substantial limitations and that there are several reasons to question their direct applicability to prediction of human risks. Nevertheless, they include the best-documented subchronic effect in humans and the two effects of greatest concern that have been reported in experimental animals. For these reasons we use them as the basis for risk assessment, while emphasizing that the limitations pointed out in Table 1 may lead to overestimation of risks.

5. Margins of Safety

For each of the three types of toxic effect considered in this risk assessment, some information is available on dose-response relationships. That is, for at least one level of dosage, effects have been measured in animals or humans under conditions of prolonged exposure. Accordingly, for any hypothetical situation in which humans would be exposed for long periods to lower levels of PCBs, "margins of safety" can be calculated.

TABLE 1

TOXIC EFFECTS CONSIDERED IN RISK ASSESSMENT

Effect	Dose-Response Data	Comments
Choracne		
Occupational skin disease, liver and neurobehavioral symptoms in some cases	Associated with blood levels over 200 ppb; no effects in groups with 46-82 ppb	Reported effects variable; may reflect misdiagnosis and effects of CDFs; not necessarily the most sensitive indicator of long-term exposure to PCBs
Reproductive Impairment		
Failure to conceive, skin lesions, retarded development, learning deficits	Minor effects at lowest dose tested, about 11 µg/kg/day to mothers	Demonstrated only in rhesus monkeys; other species less sensitive Demonstrated only with Aroclor 1248; possible role of CDFs; small sample
Cancer Induction		
Liver cancer in rats in one good and several unsatisfactory experiments; negative or marginal effects in others	Tested only at very high dose, 100 ppm in diet or about 8 mg/kg/day	Demonstrated only with Aroclor 1260; weak or equivocal effects with Aroclor 1254; primarily cancer promoter

Figure 1 presents a graphic description of the relationship between levels of intake and margins of safety. The left-hand column indicates (on a logarithmic scale) daily intakes of PCBs in μg/day and indicates the equivalent long-term average intake levels at which toxic effects have been observed. The middle column characterizes the margin of safety at various lower dose levels. For example, an average daily intake of about 100 μg/day would be slightly greater than half the no-observed-effect level (NOAEL) for chloracne, and about one-seventh that caused adverse effects in monkeys. These margins of safety would normally be considered inadequate, because they would not allow sufficiently for variations in sensitivity within the human population, and for differences in sensitivity between human and animal species. On the other hand, an average daily intake of about 1 μg/day would be about 1/180 times the NOAEL for chloracne, and about 1/700 times the lowest observed effect level in monkeys. These margins of safety would ordinarily be considered adequate to ensure safety to exposed populations, even under conditions of long-term exposure. If average daily intakes were kept below 1 μg/day, the margins of safety for these effects would ordinarily be considered at least ample.

The right hand column in Figure 1 shows conservative estimates of the possible cancer risks that might result from long-term (lifetime) intake of PCBs at the indicated rate. For example, continuous ingestion of 1 μg/day of PCBs throughout

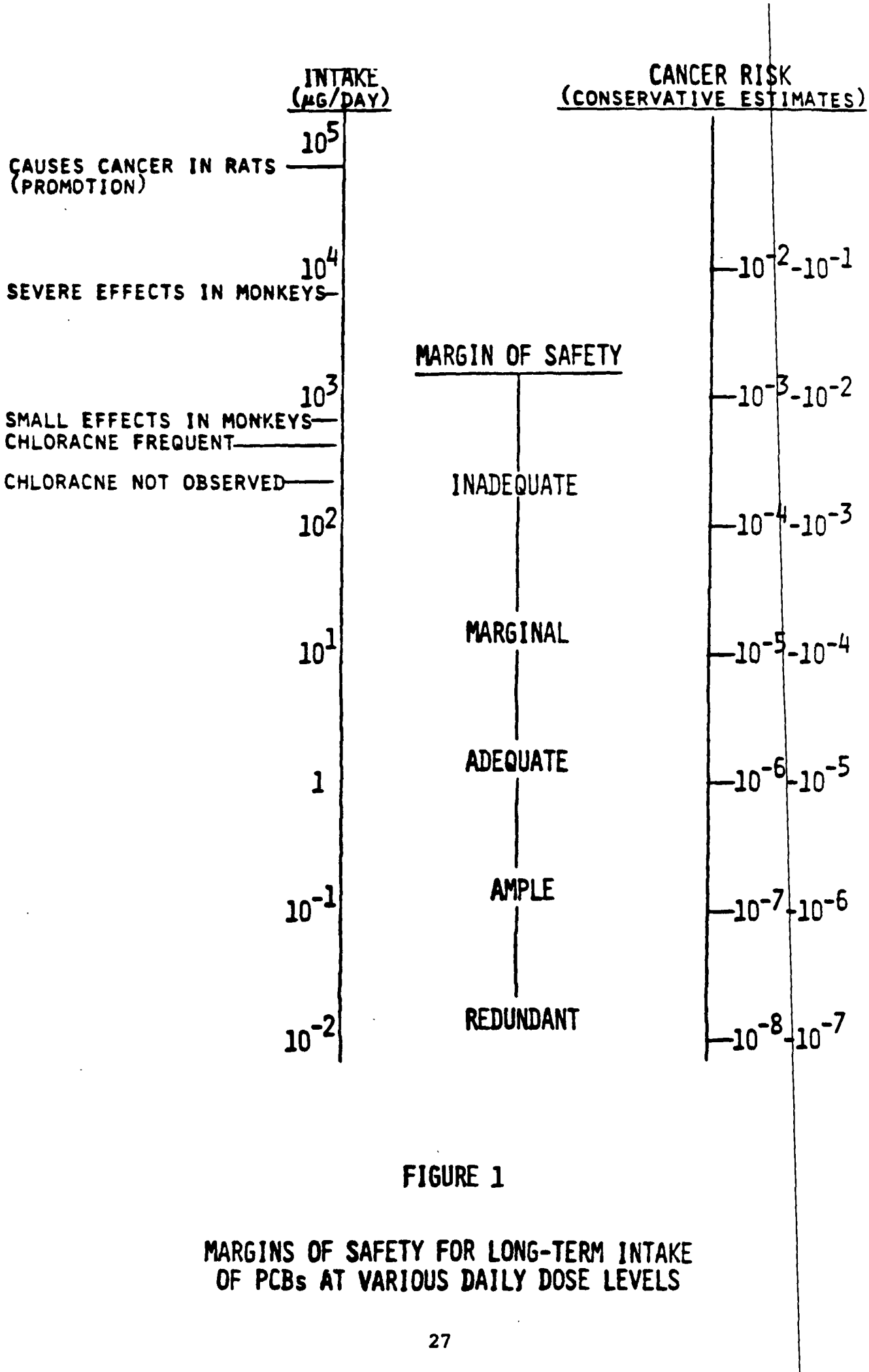


FIGURE 1

MARGINS OF SAFETY FOR LONG-TERM INTAKE OF PCBs AT VARIOUS DAILY DOSE LEVELS

life might, under the assumptions of the calculations, lead to cancer risks in the range of 10^{-6} and 10^{-5} (1-10 per million). For the reasons explained above, these estimates are tenuous and are designed to be conservative.

The risk assessments illustrated in Figure 1 are made specifically for continuous intake of PCBs for long periods (lifetime intake for cancer risks, exposure for months or years for other types of effect). If exposure is for short periods or is intermittent, margins of safety would be correspondingly higher.

B. Toxicity of Other Contaminants

In addition to PCBs, several other priority pollutants have been detected in the sludges and aqueous layers of the ponds at the OLD site. Since these chemicals are found in association with PCBs and will be subjected to the same remedial actions, we have considered briefly the potential for human exposure and health risks that may arise from their presence (see Sections IV D and IV F below). However, since these chemicals are not the primary subject of this risk assessment, we have relied on secondary sources for toxicity assessment. Specifically, we have utilized the Water Quality Criteria Documents for these pollutants as issued by EPA in 1980. These documents included detailed reviews of toxicity information available at that time and risk assessments for both carcinogenic and noncarcinogenic effects.

The pollutants identified in substantial quantities at the site are the following:

Toluene

Ethylbenzene

Chloromethane

Dichloromethane

Chloroform

Carbon tetrachloride

1,2-Dichloroethane

1,1,1-Trichloroethane

Trichloroethylene

Tetrachloroethylene

Chlorobenzene

o-Dichlorobenzene

m-Dichlorobenzene

p-Dichlorobenzene

Table 2 lists for each of these chemicals the water quality criteria numbers calculated by EPA, and the corresponding daily intakes by an average person. For carcinogenic chemicals, these intakes are intended to represent an exposure level that, under conservative assumptions, would not lead to a lifetime risk of cancer greater than 10^{-5} (1 in 100,000). To place this risk level in perspective, the workforce at the OLD site incudes 55 workers, and about 850 other persons who live within about 5 km of the site. Assuming long-term exposure for all these persons, a life-time risk of 10^{-5} for each person would

TABLE 2

CRITERIA NUMBERS AND DAILY INTAKES FOR 13 CHEMICALS FOUND AT THE OLD SITE[a]

Chemical	Carcinogenic Effects		Noncarcinogenic Effects	
	Water Quality Criterion (10^{-5} Risk) (μg/liter)	Corresponding Daily Intake (μg/day)	Water Quality Criterion (μg/liter)	Corresponding Daily Intake (μg/day)
Ethylbenzene			1,400-8,500	1,600-9,500
Chloromethane			7,500	7,500
Dichloromethane			12,400	24,800
Chloroform	1.90	3.85		
Carbon tetrachloride	4.0	8.5		
1,2-Dichloroethane	9.4	18.9		
1,1,1-Trichloroethane			18,400	37,500
Trichloroethylene[b]	27	55.9	18,300	38,000
Tetrachloroethylene	8.0	17.6		
Chlorobenzene			20	41.3
o-Dichlorobenzene			400	945
m-Dichlorobenzene			400	945
p-Dichlorobenzene			400	945

[a]An Ambient Water Criterion was not formulated by EPA for toluene, but the toxicity of this chemical is low and comparable to that of ethylbenzene (NAS 1980).

[b]A criterion for noncarcinogenic effects is also given because the study used as a basis for the criterion for carcinogenic effects had several major technical problems which make the results subject to question. This latter criterion, however, was the one recommended by EPA in 1980.

correspond to a probability of about 9 x 10^{-3} (less than 1 in 100) that one excess cancer would occur in this population over a 70-year period. For the average person in the U.S. population, the probability of dying of cancer is about 0.24 (1 in 4); an excess lifetime risk of 10^{-5} would increase this by a factor of 1/24,000 (0.004%). Table 3 lists the lifetime risk of death from a number of causes. The lifetime risk of 10^{-5} is about one-third of that of being killed by lightning, and is similar to the excess risk imposed by driving a car for about 20 minutes, or by smoking one cigarette every 3 years. For noncarcinogenic chemicals, the intakes listed in Table 2 are intended to provide an adequate margin of safety below the lowest levels reported to cause toxic effects in humans or animals. For the purposes of this report, we assume that the rates of intake tabulated in Table 2 would correspond to an adequate margin of safety for long-term exposure to these chemicals. For PCBs, an adequate margin of safety for noncarcinogenic effects corresponds to a lifetime risk of 10^{-5} or less for carcinogenic effects (Figure 1). For other chemicals, Gaylor (1983) has shown that the procedures used to establish an adequate margin of safety would generally ensure that cancer risks would be less than 10^{-4}. Thus, although there is no exact correspondence between the numbers obtained by the two procedures, the intakes listed in Table 2 may be somewhat more protective for carcinogenic effects than for noncarcinogenic effects.

TABLE 3

LIFETIME RISKS OF DEATH FROM VARIOUS CAUSES IN THE GENERAL U.S. POPULATION

Cause of Death	Risk Over Lifetime of 70 Years
Vaccination for small pox (once in a lifetime)	3.0×10^{-6}
Lightning	2.8×10^{-5}
Nuclear power	3.2×10^{-5}
Home appliance	3.5×10^{-5}
Natural disaster	7.0×10^{-5}
Airplane accident (1 transcontinental flight/year)	2.1×10^{-4}
Electrocution	3.5×10^{-4}
Medical X-rays	7.0×10^{-4}[a]
Accidental poisoning	9.1×10^{-4}

[a]Risk of cancer, not necessarily of death

SOURCES: Fischhoff et al. 1982 and Wilson 1978

IV. EXPOSURE SCENARIOS AND RISK ASSESSMENT

A. Transport of PCBs in Air

The first exposure scenario to be explored is the volatilization of PCBs from the ponds or other contaminated areas at the site, leading to exposure via inhalation of workers on-site or of persons in the general population resident downwind. The potential for such exposure has been investigated directly by ERT, who collected three series of ambient air samples for analysis for PCBs. The first series of samples was collected at five sites around the perimeter of the OLD facility and utilized polyurethane foam adsorbents (USEPA's recommended method). Five or six samples were collected at each site. PCBs were not detected in any sample at detection limits between 0.05 and 0.1 $\mu g/m^3$ (ERT draft report of April 22, 1983). The second series of samples utilized personal monitors carried by workers at the facility with Florisil and polyurethane foam adsorbents (NIOSH method P&CAM 253). Prior to the initiation of remedial work, two personal monitor samples and three area samples were collected from the skimming and oil recovery areas. PCBs were not detected in any sample at detection limits of about 0.15 $\mu g/m^3$ (ERT letter of May 26, 1983). The third series of area samples was collected at six sites around and downwind of the facility and also utilized NIOSH method P&CAM 253. PCBs were not detected in any sample at detection limits of about 0.5 $\mu g/m^3$ (ERT report of July 1983).

Assuming typical breathing rates (not exceeding 10 m^3/person during an 8-hour workday, or 20 m^3/person during a 24-hour period), these data suggest upper limits of 1.5-5 μg/day for intake of PCBs by inhalation for workers on site, 1-2 μg/day for persons at the fenceline, and progressively less for persons at increasing distances from the facility. Since PCBs were not detected in any sample, it is unlikely that actual intakes would approach these figures, which are based on the detection limits for the analytical methods. Accordingly, we conclude that risks resulting from exposure by inhalation under present conditions would be negligible. Under all remedial options, the potential for volatilization losses would be reduced, probably by several orders of magnitude, since PCBs would be removed from surface layers, fixed in a solid matrix, and/or removed from the site. (Transitorv exposures by inhalation during remedial work will be considered in Scenario E).

B. Transport of PCBs in Surface Water

The second exposure scenario to be explored is the transport of PCBs off-site in surface water runoff, with subsequent exposure to consumers of fish downstream. PCBs were detected at trace levels (22 ppb) in one water sample from a stormwater retention ditch on the site in ETC's Phase III sampling. However, this ditch does not drain off-site, and all surface water runoff from potentially contaminated areas of the site either will be analyzed for PCBs prior to discharge or will be collected and pumped into the lagoons. To investigate the possibility

that PCBs from the site might nevertheless have migrated into off-site surface water, samples were collected from the the two principal surface water channels drying the vicinity of the site, Raccoon Creek and Little Raccoon Creek. PCBs were not detected (detection limit, 10 ppb) in water samples taken downstream from the site in either creek (ETC's Phase VI). To improve the sensitivity of this result, samples of water and sediment were taken in water and sediment in Raccoon Creek in July 1983; again PCBs were not detected in any sample at a detection limit of 10 ppb (ETC's Phase VIII). The most significant of these negative findings was in sediment immediately downstream from the site. Since PCBs are usually partitioned between sediments and water in a ratio of 10,000:1 or more, this indicates that PCB levels in the water of Raccoon Creek are unlikely to exceed about 1 ppt (parts per trillion). Even if present at this level, PCBs would be diluted downstream as the creek flowed into larger bodies of water and would pose a negligible risk to downstream consumers of fish.

C. Transport of PCBs in Groundwater

The third scenario for human exposure to PCBs migrating from the site is the possibility that PCBs might move through the soil in percolating groundwater, leading to human exposure either to water pumped from subsurface aquifers, or to surface waters downstream. Although the site is favorably situated on top of a 38-foot layer of relatively impervious clay, there is a theoretical possibility that PCBs will slowly migrate

downwards to the underlying aquifer, or horizontally though surficial soil layers to contaminate surface waters downgradient. These possibilities will be explored semiquantitatively in this section.

We note, first, that PCBs in the existing lagoons are found primarily in oily sludges. Although the partition coefficient for PCBs between these sludges and the aqueous phase in the lagoons has not been measured, it is likely to be at least 10^6 (reflecting the low solubility of PCBs in water, of the order of 50 ppb). Thus, with high concentrations of PCBs in the sludges of the order of 50-200 ppm, it is unlikely that the initial concentrations of PCBs in water percolating into the clay would exceed 0.1 ppb (100 parts per trillion). Even if undiluted, such a concentration would pose negligible risk to human health, since a person drinking 2 liters of water containing 0.1 ppb of PCBs per day would ingest only 0.2 μg/day. PCBs at such a concentration would only be of concern if they migrated into surface water and were reconcentrated in fish.

We note, second, that there is evidence that sulfuric acid in the lagoons has reacted with materials in the clay lining to form a highly impervious layer of calcium sulfate (gypsum). Although this layer is expected to retard percolation from the lagoons into the unaltered clays, we have no information on its characteristics and therefore have not considered it in our models. This is appropriate for the situation arising under some of the remedial options, in which the gypsum layer

would be at least partly broken up. However, for the unremedied situation, the omission of the impervious layer from our models will lead to substantial overestimation of the potential for migration.

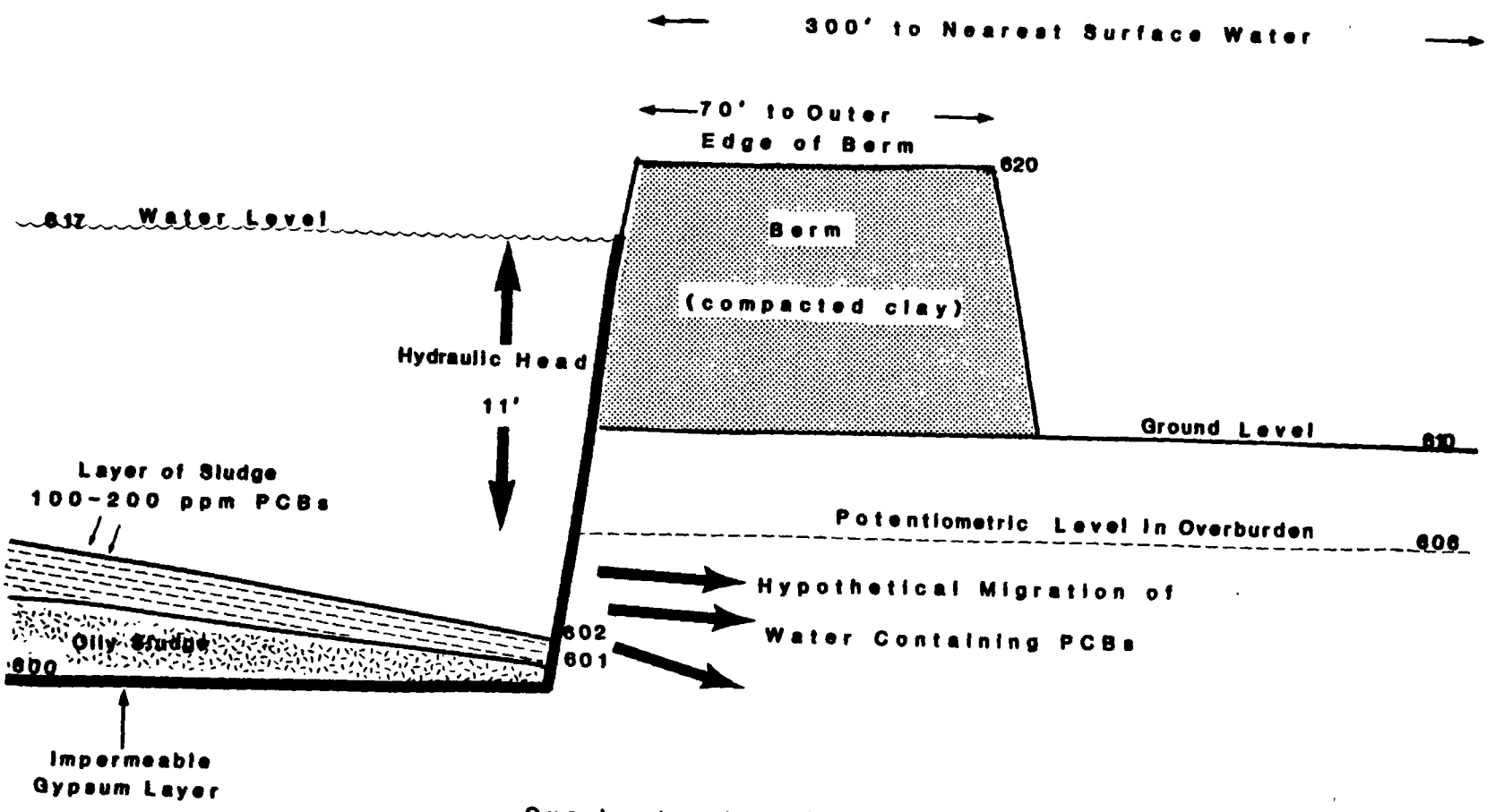
The potential for downward migration of aqueous-phase materials from the site has already been calculated by Golder Associates (Exhibit III to CWM's presentation of July 28, 1983). Using the measured vertical hydraulic gradient of 0.33 (12'/36'), the vertical permeability of the clay of $2x10^{-8}$ cm/s (average of laboratory measurements), and an assumed porosity of 0.1, they estimated the average rate of downward percolation though the overburden as about 0.02 m/yr. (0.07 ft/yr). Neglecting retardation in the gypsum layer, it would than take about 400 years for aqueous phase materials from the lagoons to reach the underlying aquifer. However, PCBs are strongly adsorbed to the surfaces of clay particles, and PCBs would not reach the underlying aquifer until the overburden were saturated with them. Under the conditions assumed in Golder's model, the volume flow of water through a 1 m^2 horizontal cross-section would be about 0.002 m^3/year, and the mass flux of PCBs (at an initial concentration of 0.1 ppb) would be about 0.2 µg/year. Assuming a typical partition coefficient of 10^4 between clay and aqueous phase, the equilibrium concentration in the clay would be of the order of 1 ppm. The time required for PCBs to saturate the overburden to this level and to reach the aquifer would then be of the order of 100 million years. Even after this

time, the aqueous concentration of PCBs reaching the aquifer would still be of the order of 0.1 ppb and would be further diluted by the water flowing through the aquifer.

A somewhat higher potential for exposure may arise from horizontal percolation though the surficial layers, since the horizontal permeability of the clay is much higher than its vertical permeability--of the order of 10^{-7} cm/s and perhaps locally as high as 10^{-6} cm/s (Golder Associates, report of June 1983). In our judgment, the greatest potential for such movement is at the north end of lagoons 4 and 5, where a layer of sludge containing PCBs is present in the lagoons between 0 and 8 feet below the level of the surrounding terrain, and is under a hydraulic head about 11' greater than that in the surrounding overburden. Accordingly, we have constructed a simple model of a scenario in which aqueous-phase materials containing PCBs would migrate horizontally though the soil under the berm at the north end of the lagoons, eventually emerging near the surface of the soil 20 m to the north (on-site) or into surface waters 100 m to the north (off-site). This scenario is illustrated diagramatically in Figure 2. Using a simplified one-dimensional model and assuming a linear hydraulic gradient, the calculation presented above for vertical migration can be adapted simply to cover horizontal migration. For transport 20 m though the berm, the hydraulic gradient would be 0.16, so that the average velocity of flow would be 0.05 m/yr for a permeability of 10^{-7}cm/s and 0.5 m/yr for local

FIGURE 2

Schematic Model of North End of Lagoon 5 to Illustrate Hypothetical Horizontal Migration of Water Containing PCBs



Overburden (clay)

Vertical Permeability 2×10^{-8} cm/s

Horizontal Permeability 10^{-7} - 10^{-6} cm/s

Heights in Feet Above Sea Level

zones with permeability 10^{-6} cm/s. For transport 100 m to off-site drainage channels, the average velocity of flow would be 0.01 m/yr for a permeability of 10^{-7} cm/s and 0.1 m/yr for local zones with permeability 10^{-6} cm/s. Even under the last scenario, the worst case for human exposure off-site, it would take a period of the order of 100 million years for the PCBs to saturate the subsurface clays and to reach the off-site surface water channel. Even after this period, the aqueous concentration of PCBs reaching the surface channel would still be of the order of 0.1 ppb and would be further diluted as they mixed with the water in the channel and moved downstream.

Based on the above simple calculations, we judge the risks posed by migration of PCBs in groundwater from the lagoons as they exist at present to be negligible. Hypothetically, PCBs might also migrate through the overburden in an organic phase separate from the aqueous phase. If so, the initial concentration of PCBs would be higher and the time required to saturate the overburden would be lower. In our judgment, the nature of the sludge is such as to make the likelihood of non-aqueous phase migration unlikely, and this is supported by observational evidence, which revealed very slow percolation of aqueous-phase materials and no oily materials in a boring into a berm between the lagoons (Golder Associates, personal communication from G. Collison, July 1983). However, on the information available, the possibility of non-aqueous phase migration cannot be altogether excluded. For this reason,

we classify the risk of exposure resulting from groundwater contamination under present (unremedied) conditions as very low.

Under remedial option 1, sludges would be fixed in a solid matrix and reinterred in situ in lagoons 4 and 5. Although this may reduce the potential for leaching into aqueous-phase liquids, it is not certain that it would do so, since the partition coefficient of PCBs between oily sludges and water is already extremely high and that between the fixed sludges and water may not be higher. Also, option 1 will at least partly remove the protective gypsum lining of the lagoons. In the absence of a leachate collection system, the filled pond will eventually fill with water percolating through the clay cap (the "bathtub effect") and an outward hydraulic gradient will be re-established. Thus, in our judgment, remedial option 1 will probably not yield a net reduction in the potential for migration into groundwater.

Remedial options 2, 3, and 4 are intended to remove a large fraction of the PCBs off-site. However, they would also remove most of the other organic materials that are responsible for the partitioning of PCBs out of the aqueous phase. Hence it is not clear that the possibility for migration of PCBs into groundwater would be reduced.

Remedial options 1A, 1B, and 5 all involve fixing of the PCBs in a solid matrix and reinterring them in a secure cell with a leachate collection system. Under these options, the operation of the leachate collection system will suffice to

reverse the hydraulic gradient. Hence, any movement of PCBs in groundwater would be inwards rather than outwards, and the possibility for human exposure via groundwater movement will be negligible or zero.

Remedial option 6 would involve the transport of all contaminated sludges offsite, so the possibility for significant migration would be negligible or zero. (We assume that they would be disposed of at another site where environmental conditions are equally favorable).

D. Transport of Other Volatile Organics in Air

In addition to PCBs, a number of other volatile organic compounds (VOCs) have been detected in the sludges and aqueous layers of the lagoons at the OLD site. Some of these chemicals are present in larger concentrations then PCBs, are more volatile, and are less prone to be trapped in the oily surface layer of the lagoons. Accordingly, we have calculated the potential for exposure to these materials by inhalation, both on-site and off-site.

Preliminary engineering estimates of volatilization of VOCs from the lagoons at the OLD site were presented by ERT (Report of June, 1983), based on measurements of their concentrations in aqueous-phase samples collected and analyzed by Allied Analytical and Research Laboratories (Report of 28 June 1982). Subsequently, ETC performed analyses of samples collected from the lagoons in July 1983 (ETC, Phase VIII Report), and ERT revised its calculations of emission rates to reflect these

more current analyses (ERT, letter of July 12, 1983). Our calculations of potential exposure are based on these last estimates.

ERT's estimates of emission rates are dominated by those from lagoon 11, which accounted for about 80 percent of all the calculated emissions because of its large size and relatively high concentrations of certain VOCs. Table 4 shows the concentrations of VOCs in lagoon 11 in July 1983, and the corresponding estimates of emission rates under a typical set of summer weather conditions (wind speed 9.5 mph, the average speed for the year at Toledo, and temperature 22°C). Based on these calculations of emission rates, we have used a standard atmospheric diffusion model (neglecting degradation) to estimate the likely concentrations of these chemicals at various distances downwind under these weather conditions. For distances of 1, 2, and 5 km downstream, the model yields concentration estimates for total VOCs of 230, 190, and 69 $\mu g/m^3$, respectively. Of these concentrations, about 38% would consist of dichloromethane, 28% of chloromethane, 27% of chlorobenzene, and 4.4% of chloroform. Comparison with Table 2 indicates that these concentrations would be of concern primarily for chlorobenzene and chloroform. For both these chemicals, a person resident downwind and breathing 20 m^3/d of air might be subject to intakes in the range characterized as providing only a marginal to inadequate margin of safety (see Table 2 and Figure 1). Although these calculated intakes are not clearly hazardous (the calculated intake of

chloroform, for example, is similar to intakes by ingestion of drinking water from some chlorinated supplies), these estimates show at least the need for direct measurements of ambient concentrations, to verify or refute the predictions of the model.

We also considered exposure of on-site personnel to airborne emissions of VOCs from the lagoons. The worst case is probably for outdoor workers immediately downwind (east) of lagoon 11 under warm conditions (22°C) with a moderate wind (9.5 mph). Under these circumstances, we calculate that the effective mixing height for materials volatilizing from the lagoon is 9 m. Hence, if it is assumed that the materials are well-mixed, the average concentration would be about 520 $\mu g/m^3$. (This is only about twice the concentration calculated for 1 km downwind, because of the limited opportunity for hozizontal mixing close to an extended source.) For a worker working outdoors for an 8-hour workday, intakes would be similar to those calculated above for 24-hour residents farther downwind, and the same comments about margins of safety are applicable.

Under all remedial options, the potential for volatilization will be reduced, usually by several orders of magnitude. The options that provide for off-site removal of PCBs, or treatment of the contaminated sludges and off-site removal of the extracted materials, would also effect off-site removal of most of the other VOCs listed in Table 4. Other options that provide for

TABLE 4

CALCULATED EMISSION RATES OF VOLATILE

ORGANIC COMPOUNDS FROM LAGOON 11 AT VICKERY, OHIO

Chemical[a]	Concentration (μg/liter)	C/ MW[b]	Emission Rate[c] (g/s)
Chlorobenzene	14,400	1,352	1.43
Chloroform	2,620	243	0.26
Chloromethane	8,900	1,398	1.48
Dichloromethane	17,700	1,931	2.04
Toluene	1,210	126	0.13
1,1,1-Trichloroethane	1,050	102	0.11
Trichloroethylene	728	64	0.07

[a]Benzene, ethylbenzene, 1,2-dichloroethane and 1,1,2,2-tetrachloroethane were detected at small concentrations in the 1982 samples, but were below detection limits in the 1983 samples. Dichlorobenzenes (o-,m-, and p-) have been reported in the sludges, but not in aqueous samples.

[b]Concentration in μg/l divided by (molecular weight)$^{0.5}$. Volatilization rates of different compounds are expected to be in proportion to this quantity.

[c]Calculated using two-resistance theory for wind speed of 9.5 mph and air temperature of 22°C.

fixing of the sludges in a solid matrix and interring them in a secure cell will also greatly retard any losses of other VOCs, except perhaps option 1, in which water levels in the cells may be high and some VOCs may be able to migrate upwards to the surface. Thus, under all remedial options, we characterize the potential for volatilization of VOCs leading to significant exposure downwind as very low or negligible. However, it should be noted that most of the reductions in risk will not be effected until lagoon 11 is drained, unless emissions are reduced in the interim by reductions in inputs and hence in the pond inventory of these chemicals.

Conclusions on Long-Term Off-site Migration

Under all options for remedial action, the possibility for long-term movement of PCBs (and other volatile organic compounds) off-site and for significant long-term human or environmental exposure arising therefrom is very low or negligible. Under all options, therefore, potential risks are dominated by short-term exposures arising during the remedial work. These short-term risks are considered in the rest of Section IV.

E. Exposure of Remedial Workers to PCBs

During the remedial work, workers will be operating machinery and equipment that is handling substantial quantities of PCBs, and the workers may be exposed to PCBs both by inhalation and by dermal contact. This situation arises in all remedial work

at hazardous waste sites, and risks to workers are minimized as a matter of routine by the implementation of safety plans. A typical safety plan involves the specification and rigorous enforcement of safe operating procedures, use of protective clothing, monitoring of ambient concentrations and/or personal monitoring[1], medical surveillance of workers, and a contingency plan for accidents or emergencies. In our experience and in the experience of our consultants in occupational medicine, an adequate safety plan can reduce the possibility that workers will be exposed to hazardous levels of PCBs at a very low level. In any case, these risks are common to all remedial options and cannot be used to discriminate among them. The only exception to this generalization is that options 2 and 3 involve more handling of PCB-contaminated sludges and a solvent-treatment step, so that the possibilities for worker exposure are probably somewhat higher.

F. Exposure of Workers and Persons Off-Site to Volatile Organic Compounds Released During Remedial Work

Another possible route of exposure during remedial work is the release of other VOCs from sludges exposed to the air during excavation, transportation or other treatment. Some volatilization is to be expected, since the sludges contain

[1]At the Vickery site, personal air monitors were used to collect 15 samples from workers sampling oil and skimming oil from the surface of the lagoons during remedial work in May-June, 1983. PCBs were not detected in any sample at a detection limit of 1 $\mu g/m^3$ (CWM data collected in May-June 1983). Dermal exposure is more difficult to measure, however.

substantial quantities of some of the materials listed in Tables 2 and 4, and the sludges are known to be highly odorous when first exposed to the air. The factors governing these transitory volatilization losses are so complex that it is impossible to calculate them a priori. Instead, we have recommended that airborne concentrations of VOCs should be measured in a pilot operation or in the first stages of a remedial program, and that these measurements should be used as the basis for designing a safety plan. At this stage in the risk assessment, it is our judgment that such exposures are of potential concern, because existing exposures to VOCs emitted from the surface of the lagoons may not provide an adequate margin of safety for long-term exposure (see above) and because such exposures are likely to increase, at least transitorily, during remedial work. Accordingly, we have recommended that design and execution of the remedial program and safety plan should take these exposures into account. This should include minimizing exposure of newly-excavated sludges to the air, minimizing worker exposure to vapors, avoiding work during hot periods of the year, monitoring ambient concentrations in the work area and at the fenceline, and operating a contingency plan to interrupt work if hazardous levels are approached. For the purposes of this risk assessment, we note that if these precautions are adopted, any risk arising from this source will be the same under any remedial option, and indeed would have arisen under any plan to close the lagoons at some time in the future.

G. On-Site Accidents

As in any operation involving the construction and use of heavy equipment, there is some risk of on-site accidents leading to injury or death of workers. We asume that these risks will be minimized by an effective safety plan, and will be the same under all remedial options (except options 2 and 3, which involve somewhat more on-site activity).

H. Transportation Accidents

The last category of risks to be considered is that arising from traffic accidents during the transportation of materials for off-site disposal. Some of the options would involve large-scale highway transportation in heavy vehicles. For example, option 6 would involve about 2,950 round trips to Emelle, Alabama, or about 4.8 million miles travel by heavy trucks. (This assumes transport of liquid sludges; if the materials were solidified before transport, total mileage would double to about 9.6 million miles). Option 4A (liquid sludges >50 ppm PCBs to Emelle) would involve about 2.3 million miles. Options 4B (semisolid sludges to Niagara Falls and Cincinnati) or 3 (solvent extracts to Chickasaw, Alabama) would each involve about 1.4 million miles. Option 2 (solvent extracts to Chickasaw, Alabama) wuld involve about 0.6 million miles. All options, including 1, 1A, and 1B, would involve some further transport of skimmed oils to Chickasaw, but this would involve less than 0.1 million miles in each case.

Large-scale highway transport on this scale involves substan-

tial and predictable risks resulting from highway accidents. According to statistics compiled and published by the U.S. Department of Transportation,[1] large trucks are involved in about 451 accidents for every 100 million vehicle miles traveled, and these cause about 54 injuries and 5.3 deaths. In 1981, vehicles carrying hazardous materials were involved in 1,868 accidents in the United States, which caused 1,604 injuries, 202 deaths, and $31 million in property damage. Although specific data are not available on accidents involving hazardous materials per 100 million vehicle miles, it is noteworthy that the death and injury rates per accident are 9 and 7 times higher, respectively, than those for accidents involving all heavy trucks. Information on the frequency of chemical spills resulting from highway traffic accidents is collected by EPA's Office of Emergency Response, but even summary statistics are not released to the public.

Applying these statistics to the projected transportation needs for the proposed remedial options, option 6 would statistically be expected to result in about 22 accidents. Using statistics on all heavy truck accidents, these would be expected to result in 2 or 3 injuries and 0.25 deaths (i.e., 1 chance in 4 of a fatal accident). Using statistics on truck accidents involving hazardous materials, they would be expected to result

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[1] U.S. Department of Transportation, Bureau of Motor Carrier Safety, Accidents of Motor Carriers of Property, 1980-81 (August 27, 1982)), pp. 35-40, 51-52; National Highway Traffic Safety Administration, Large-Truck Accident Causation (July 1982), pp. III-4 and III-5

in about 18 injuries and 2 or 3 deaths. Although specific statistics are not available to serve as the basis for prediction, we assume that at least some of these accidents would lead to spills of cargo containing PCBs. In our judgment, these relatively tangible risks of death, injury, and chemical spills are much greater than the theoretical and conjectural risks of chemical exposure and health impairment discussed in previous scenarios. Accordingly, we classify option 6 as one which gives rise to moderate-to-high risks of injury and death. Since risks are more or less in proportion to vehicle miles traveled, we classify option 4A as of moderate risk, options 3 and 4B as of low-to-moderate risk and option 2 as of low risk associated with transportation.

V. CONCLUSIONS

Table 5 provides a summary characterization of the risks judged likely to arise under each of the remedial options, including the no-action option. In our judgment, the predominant risks are those due to transportation accidents, whose magnitude rises in proportion to the extent of off-site transportation. Risks due to exposure to volatile organic compounds other than PCBs (primarily chlorobenzene and chloroform) may be of some concern, especially during the remedial action, and it is recommended that these risks be carefully managed by means of a safety plan. Other risks, including all health risks due to exposure to PCBs, are judged to be either negligible or very low, provided that an adequate safety plan is implemented during remedial action.

TABLE 5

CHARACTERIZATION[1] OF RISKS ARISING UNDER VARIOUS REMEDIAL OPTIONS AT THE VICKERY, OHIO, SITE

Type of Risk	No Action	Remedial Option								
		1	1A	1B	2	3	4A	4B	5	6
Volatilization of PCBs from ponds	-	-	-	-	-	-	-	-	-	-
Surface water runoff of PCBs	-	-	-	-	-	-	-	-	-	-
Infiltration of PCBs into ground-water and transport off-site	0	0	-	-	-	-	-	-	-	-
Volatilization of other VOCs from ponds; on-site or off-site exposure	XX	0	-	-	-	-	-	-	-	-
Exposure of remedial workers to PCBs*	-	0	0	0	0	0	0	0	0	0
Release of other VOCs during remedial work; on-site or off-site exposure*	-	X	X	X	X	X	X	X	X	X
On-site accidents*	-	X	X	X	X	X	X	X	X	X
Transportation accidents	-	-	-	-	X	XX	XXX	XX	-	XXXX
Overall characterization	XX	0	-	-	X	XX	XXX	XX	-	XXXX

[1]-, negligible (at least ample margin of safety);
0, very low (adequate margin of safety);
X, low (marginal margin of safety; 2-3 accidents expected);
XX, low-to-moderate (marginal to inadequate margin of safety; 6-7 accidents expected);
XXX, moderate (10-12 accidents expected; death possible);
XXXX, moderate-to-high (20-25 accidents expected; death likely).

*These risks are common to all remedial options and are expected to be minimized by a safety plan (see text); they are not included in the overall characterization, which classifies incremental risks associated with each option.

APPENDIX A
MATERIALS REVIEWED FOR THIS REPORT

Final Analytical Reports completed by Environmental Testing and Certification Corporation of Edison, New Jersey

Final Summary Report of Phase I
(Initial Audit for PCBs)
March 23-25, 1983
Addendum--Special Sampling Split with USEPA for Skim Oil Tank and Tank W-2

Final Summary Report of Phase II
(USEPA Split)
March 29-30, 1983

Final Summary Report of Phase III
(On-site Soil and Surface Water Monitoring for PCBs)
April 7-8, 1983

Final Summary Report of Phase IV
(On-site Ground Water Monitoring for PCBs)
April 18-21, 1983

Final Summary Report of Phase VI
(Off-site Surface Water Monitoring, Racoon Creek, for PCBs)
April 29, 1983

Final Summary Report of Phase VIII
(Additional Surface Water Monitoring for PCBs and Volatiles of Open Ponds 12, 11, 7, 5 and 4)

Draft Summary Reports completed by Environmental Testing and Certification Corporation of Edison, New Jersey

Draft Summary Report Phase Va
(Open Pond Sludge Characterization for PCB, Dioxin, and E.P. Toxicity on Ponds 12, 11, 7, 5, and 4)
April 25--May 6, 1983

Chemical Waste Management, Inc.

Air Sampling Results (personal air samples for PCBs taken during remedial work, May-June 1983)

Presentation to Ohio EPA on July 28, 1983,
Attachment B:

A. CWM Proposal for Remedial Action and Environmental Control Upgrading.

B. Exhibit I--Analytical data from ETC re: Sludge PCB Analysis.

C. Exhibit II--Sludge Remedial Operations.

D. Exhibit III--Site Integrity.

E. Exhibit IV--RCRA Landfill.

F. Exhibit V--Draft Consent Decree.

Reports and Letters from Environmental Research and Technology, Inc.

Draft Report: ERT Document No. B884-100
(Ambient PCB Testing at the CWM Facility in Vickery, Ohio)
April 1983

Letter from ERT to G.R.O.W.S., Inc., Reclamation
(Results of Limited Personal Monitoring for PCBs at Vickery; with Accompanying Table)
May 26, 1983

Draft Report: ERT Document B891-100(A)
(Preliminary Engineering Estimates of Volatile Organic Compounds and Inorganic Acids from Active Ponds, Vickery, Ohio)
June 1983

ERT Document No. B959-400-B
(Air Monitoring for PCBs and Inorganic Acids at CWM, Vickery, Ohio)
July 1983

Letter from ERT to CWM
(Impact of Revised Priority Pollutant Concentrations on Engineering Estimates of Pond Emissions; with Accompanying Table)
July 12, 1983

Letter from ERT to Clement Associates, Inc.
(Meteorological data for Toledo, Ohio)
July 22, 1983

Allied Analytical and Research Laboratories

Analytical Report No. 59513, "Pond 5"
Priority Pollutant Sampling Report
July 23, 1982

Analytical Report No. 59513, "Pond 7"
Priority Pollutant Sampling Report
July 23, 1982

Analytical Report No. 59780, "Pond 12"
Priority Pollutant Sampling Report
August 11, 1982

Golder Associates

Report on Geotechnical Data Review, Vickery, Ohio
Chemical Waste Management Facility
June 30, 1983

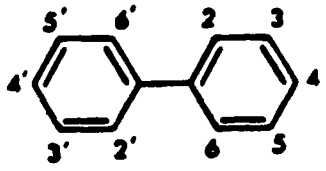
APPENDIX B

SUMMARY OF THE TOXICITY OF POLYCHLORINATED BIPHENYLS

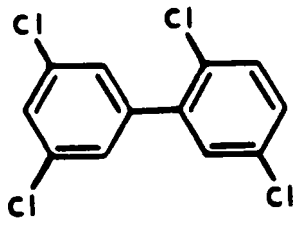
This APPENDIX summarizes the scientific information that is most relevant to the assessment of the possible risks posed by exposure to low levels of PCBs in the environment. It is divided into three parts. The first summarizes the chemistry of PCBs and described the nature of the commercial mixtures, including the presence of highly toxic trace contaminants. The second summarizes the most relevant information on the toxicity of PCBs, using information both from epidemiological studies and from experimental studies in laboratory animals. The third summarizes the available information on the toxicity of the toxic contaminants. Together these sections summarize the most important information on the known effects of PCBs, illustrate the complexity of the problem of risk assessment, and document the statements made in the text and in Appendix D.

I. Nature and Composition of PCB Mixtures

Commercial polychlorinated biphenyls (PCBs) are complex mixtures of chlorobiphenyls with varying degrees of chlorination. As indicated below, the parent biphenyl molecule has ten positions at which chlorine substitution can occur.



When the number but not the location of chlorine substitutions in a particular chlorobiphenyl is known, the chlorobiphenyl is referred to as a "congener" or "homolog" and is designated by a numerical prefix, e.g., tetrachlorobiphenyl. When the exact location of the chlorine substituents is known, the substance is referred to as an "isomer" and is identified by means of the numbering system indicated in the figure above. For example



is 2,3',5,5'-tetrachlorobiphenyl, one of 42 possible specific isomers of tetrachlorobiphenyl. Altogether there are 209 possible chlorobiphenyl isomers, at least 70 of which have been identified in commercial PCB mixtures.

Commercial production of PCBs involved chlorination of biphenyl with anhydrous chlorine in the presence of a catalyst which may be iron filings or ferric chloride, followed by treatment with alkali and distillation to purify the product. Depending on the process conditions, the product was a more or less complex mixture of chlorobiphenyls which was generally identified by the approximate percentage of chlorine it contained. In the case of the Aroclors formerly produced by Monsanto, the last two digits of the numerical designation (except for Aroclor 1016) indicated the approximate chlorine content; for example

Aroclor 1254 contained about 54% chlorine and Aroclor 1242 contained about 42% chlorine. Other PCB manufacturers used different designations; for example the French Phenoclor DP6, and the German Clophen A60, like Aroclor 1260, contained about 60% chlorine. Other commercial PCB mixtures included the Kanechlors formerly produced in Japan and the Fenclors formerly produced in Italy.

The molecular composition of several different PCB mixtures has been investigated in several studies (see IARC 1978). In one such study by Webb and McCall (1973), the approximate composition of several Aroclors was determined as indicated in Table B.1. There is evidently considerable overlap in composition between different Aroclor mixtures.

In addition to chlorobiphenyls, commercial PCBs may contain small quantities of impurities. Of particular importance are the highly toxic chlorinated dibenzofurans (CDFs) first identified as impurities in PCBs by Vos et al. (1970). CDFs have been detected at levels of 1-2 ppm in several Aroclors (Bowes et al. 1975a), at up to 13.6 ppm in Phenoclor DP-6 (Bowes et al. 1975a), and at up to 18 ppm in Kanechlor 400 (Nagayama et al. 1976). In a more recent study by Morita et al. (1977), 16 different Japanese and European PCB mixtures were analyzed and found to contain 1-16 ppm of CDFs (Table B.2). Of particular interest was the finding that a sample of a Japanese PCB mixture (Aroclor T1248) contained 2.8 ppm CDFs while Aroclor T1248 which had been used for 2 years in a heat exchange unit had

TABLE B.1

PERCENTAGE OF EACH CONGENER IN SEVERAL AROCLORS

Number of Chlorines	Aroclor					
	1221	1232	1242	1248	1254	1260
0	7	6				
1	51	26	1			
2	38	29	17	1		
3	3	24	40	23		
4		15	32	50	16	
5		0.5	10	20	60	12
6			0.5	1	23	46
7					1	35
8						6
9						
10						

TABLE B.2

CONCENTRATIONS (ppm) OF CDFs
OF DIFFERENT DEGREES OF CHLORINATION
IN PCB SAMPLES AND "YUSHO OIL"

PCB	3-Cl	4-Cl	5-Cl	6-Cl	Total	Reference
Aroclor 1248	--	0.5	1.2	0.3	2.0	1
Aroclor 1254[a]	--	0.1	0.2	1.4	1.7	1
Aroclor 1254[b]	--	0.2	0.4	0.9	1.5	1
Aroclor 1260[a]	--	0.1	0.4	0.5	1.0	1
Aroclor 1260[b]	--	0.2	0.3	0.3	0.8	1
Aroclor 1016	--	<0.001	<0.001	<0.001	--	1
Aroclor T64	--	4.8	9.4	2.0	16.2	2
Aroclor T241	--	2.4	2.7	0.8	5.9	2
Aroclor T1242	--	2.3	2.2	--	4.5	2
Aroclor T1248	--	0.5	2.3	--	2.8	2
Aroclor T1248[c]	0.3	5.8	5.6	0.7	12.4	2
Aroclor T1254	--	0.1	3.6	1.9	5.6	2
Aroclor T1260	--	0.8	0.9	0.5	2.2	2
Kanechlor KC300	--	6.7	1.6	--	8.3	2
Kanechlor KC400	0.3	12.2	10.4	0.9	23.8	2
Kanechlor KC500	0.2	1.7	1.1	3.1	6.1	2
Kanechlor KC600	--	0.2	0.5	0.4	1.1	2

TABLE B.2, (continued)

PCB	3-Cl	4-Cl	5-Cl	6-Cl	Total	Reference
Clophen A-30	1.6	2.3	1.0	--	4.9	2
Clophen A-40	1.5	5.4	6.9	--	13.8	2
Clophen A-50	0.7	8.3	4.1	1.8	14.9	2
Phenoclor DP-4	--	1.7	1.6	0.5	3.8	2
Phenoclor DP-5	--	4.6	2.7	2.6	9.9	2
Phenoclor DP-6[a]	0.2	2.1	2.6	5.6	10.5	2
Phenoclor DP-6[b]	--	0.7	10.0	2.9	13.6	1
Yusho oil	0.02	0.5	1.3	0.8	2.7	2

[a,b]Different samples

[c]Used PCB (2 years in heat exchanger)

SOURCE: Bowes et al. 1975a, Morita et al. 1977

12.4 ppm CDFs. Buser et al. (1978a) analyzed the same used PCB mixture and found slightly higher levels of CDFs (15.6 ppm).

High levels of CDFs were also found in the contaminated rice oil responsible for the disease known as Yusho. This disease occurred in Western Japan in 1968 among individuals who had consumed rice oil which had been contaminated by PCBs from a leaking heat exchanger. Estimates of the amount of CDFs in the "Yusho oil" have ranged from 2.68 ppm (Morita et al. 1977) to 5 ppm (Nagayama et al. 1976) and 5.6 ppm (Buser et al. 1978a). This corresponds to about 0.5% of the amount of PCBs in the Yusho oil. The high levels of CDFs in used PCBs may be the result of thermal decomposition of the PCB since CDFs are formed if PCBs are heated in air at temperatures above 270°C (Buser et al. 1978b, Morita et al. 1978). In addition to the PCBs and CDFs, the rice oil responsible for the Yusho incident also contained over 800 ppm of polychlorinated quaterphenyls (PCQs) (Miyata et al. 1978); polychlorinated quaterphenyl ethers (PCQEs) have also been identified in the rice oil (Miyata et al. 1979). Like CDFs, PCQs are formed when PCBs are heated, and up to 31,000 ppm of PCQs has been found in used PCB mixtures (Miyata et al. 1978). Very little is known about the toxicity of PCQs.

The presence of CDFs in PCB mixtures complicates interpretation of toxicology studies since CDFs are generally more toxic than PCBs (see Section III). However, the presence of CDFs

cannot be ignored, particularly if the finding of higher levels of CDFs in used than in unused PCBs is of general applicability.

II. Toxicity of PCBs

The toxicology of PCBs has been extensively reviewed in the past. Appendix C lists 25 reviews published since 1972. The following description of major toxicological findings is based upon these reviews, but emphasizes recent important studies.

A. Chloracne and Yusho

Current knowledge of the effects of PCB exposure in humans comes largely from cases of accidental contamination of food by PCBs and from cases of occupational exposure to PCBs. The effects of occupational exposure to PCBs have been reviewed in detail by NIOSH (1977). The classic symptom of occupational PCB exposure is chloracne, a disfiguring skin disease characterized by small dermal cysts, pustules and comedones, most commonly on the face, ears, and neck, but also on areas in contact with contaminated clothing. However, chloracne is a symptom of systemic poisoning and not just the result of skin contact since symptoms of chloracne occurred in cases of eating contaminated food in the Yusho incident in Japan (Kuratsune et al. 1972) and in a similar case in Taiwan (Chang et al. 1980a, 1980b, 1981). NIOSH (1977) concluded that chloracne may occur in individuals exposed to PCB vapor concentrations as low as 0.1 mg/m^3 for several months, or with blood PCB levels of about 200 ppb or more. Other effects that have been attributed to

occupational exposure to PCBs include digestive disturbances, eye irritation, liver injury, and impotence (NIOSH 1977).

More recently, Warshaw et al. (1979) reported an unusual incidence of abnormalities in pulmonary function in a group of capacitor-manufacturing workers exposed to PCBs. Among 243 workers with no history of exposure to asbestos, talc, or textile fibers which might affect pulmonary function, 34 (14%) showed impaired forced vital capacity (FVC). Impairment was defined as an age- and sex-specific FVC less than 79.5% of that predicted by standard values for healthy nonsmoking adults.

The incidence of impaired FVC among the capacitor workers (34/243, 14%) was similar to that seen by the authors among asbestos insulation workers (22/182, 12.1%) and greater than among nonsmoking adults (54/957, 5.5%). Among the 34 workers with impaired FVC, 27 had restrictive impairment but only one of these had radiographic abnormalities on a chest X-ray. The authors noted that restrictive impairment without radiographic changes is unusual in occupational exposures and that a reduction in FVC is not a characteristic change in cigarette smokers except when accompanied by generalized airway obstruction, rather than restriction. This finding of impaired pulmonary function among workers exposed to PCBs deserves further study.

Alvares et al. (1977) found that the plasma half-life of aminopyrine in five workers exposed to Aroclor 1016 for 2 years and other Aroclors prior to that was shorter than the

plasma half-life in a control group. Since aminopyrine is metabolized by the hepatic mixed function oxidase (MFO) system, the shorter half-life indicates these hepatic enzymes were induced in the exposed workers.

PCBs present in human mothers are transferred to babies via the milk (Kuwabara et al. 1978). Mothers (N=20) occupationally exposed to Kanechlor 300 and/or Kanechlor 500 had PCB blood levels of 8.3 to 84.5 ppb. while their children (N=39) had blood levels of 0.8 to 93.2 ppb. The PCB levels in the children aged 0-13 years were directly related to the length of time each was nursed. Infants not breast-fed by exposed mothers had PCB blood levels lower than their mothers'. Gas chromatographic analysis of mother and child's blood showed the same general peak pattern, but the peaks were smaller in the children. The maternal exposure or absorption of PCB was not quantified.

Two major incidents of dietary exposure to PCBs have been reported. The first occurred in 1968 in western Japan. The initial investigations of this disease have been reviewed by Kuratsune et al. (1972). The symptoms first reported were a chloracne-like skin disease which was given the name Yusho (oil disease) when the cause was identified as a particular brand of rice oil that had been contaminated during manufacture by a leaking heat exchanger. Recent estimates indicate that the most contaminated batch of rice oil contained about 1000 ppm PCBs, 5 ppm CDFs, and 866 ppm PCQs (Hayabuchi et al. 1979);

the presence of PCQEs has also been reported (Miyata et al. 1979). More than 1,000 individuals were affected by the disease. Common symptoms are indicated in Table B.3 which is taken from Kuratsune et al. (1972).

A dose-response relationship was noted between the amount of contaminated oil used and the severity of the disease as indicated in Table B.4 (Kuratsune 1972). More recently Hayabuchi et al. (1979) estimated the oil consumption of 72 Yusho victims and determined that the severity of the symptoms correlated well with the total oil consumption but not with the daily consumption on a μl/kg/day basis. These authors estimated that the average total amounts of PCBs, CDFs, and PCQs consumed by Yusho victims were 466, 2.5, and 439 mg, respectively, while the smallest total amounts consumed by symptomatic individuals were 111, 0.6, and 105 mg respectively, corresponding to daily doses of 29, 0.16, and 27 μg/kg/day, respectively.

Symptoms of the disease were seen in babies born to women exposed to PCBs either during pregnancy or during breast feeding. The babies exposed in utero had grayish, dark-brown stained skin at birth, most had increased eye discharge, and several were small-for-date. One baby born before its mother was exposed apparently contracted the disease subsequently through breast feeding (Kuratsune et al. 1976). One stillborn fetus showed marked hyperkeratosis and atrophy of the epidermis, and systic dilation of hair follicles, especially on the head (Kuratsune et al. 1972).

TABLE B.3

DISTRIBUTION OF SYMPTOMS REPORTED BY 189 YUSHO VICTIMS EXAMINED BEFORE OCTOBER 31, 1968

Symptoms	Females (N=89) (%)	Males (N=100) (%)
Dark brown pigmentation of nails	83.1	75.0
Distinctive hair follicles	64.0	56.0
Increased sweating at palms	50.6	55.0
Acnelike skin eruptions	87.6	82.0
Red plaques on limbs	20.2	16.0
Itching	42.7	52.0
Pigmentation of skin	75.3	72.0
Swelling of limbs	20.2	41.0
Stiffened soles in feet and palms of hands	24.7	29.0
Pigmented mucous membrane	56.2	47.0
Increased eye discharge	88.8	83.0
Hyperemia of conjuctiva	70.8	71.0
Transient visual disturbance	56.2	55.0
Jaundice	11.2	11.0
Swelling of upper eyelids	71.9	74.0
Feeling of weakness	58.4	52.0
Numbness in limbs	32.6	39.0
Fever	16.9	19.0
Hearing difficulties	18.0	19.0
Spasm of limbs	7.9	8.0
Headache	30.3	39.0
Vomiting	23.6	28.0
Diarrhea	19.1	17.0

TABLE B.4

RELATION BETWEEN AMOUNT OF RICE OIL USED AND CLINICAL SEVERITY OF YUSHO

Amount of oil used	Unaffected		Light cases		Severe cases		Total	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Less than 720 ml	10	(12)	39	(49)	31	(39)	80	(100)
720-1440 ml	0	(0)	14	(31)	31	(69)	45	(100)
More than 1440 ml	0	(0)	3	(14)	18	(86)	21	(100)

These authors also reported that after exposure had ceased, during the period between summer 1969 and 1970, of 159 patients examined 81 had improved, 20 had worsened, and 58 had remained unchanged, and that even among those who had improved many still had serious complaints including persistent headache, general fatigue, weakness, numbness of the limbs, and weight loss (Kuratsune et al. 1972). Some patients displayed a peripheral neuropathy that was selective for sensory nerves (Murai and Kuroiwa 1971). By 1974, the skin symptoms had generally improved but symptoms such as general fatigue, poor appetite, headache, numbness and pain in the legs, cough and expectoration of sputum continued to be prominent for at least 10 years after exposure (Kuratsune et al. 1976, Urabe et al. 1979). Kuratsune et al. (1976) also reported a high incidence of menstrual disorders among Yusho

victims in 1974. The respiratory symptoms (cough and expectoration) were frequently associated with shadows on chest X-rays, and among 12 patients with respiratory distress who were studied in detail, 5 had chronic viral or bacterial airway infection suggesting reduced resistance to infection, possibly associated with the known effects of PCBs on the immune system (Shigematsu et al. 1978). The affected babies born to mothers exposed during pregnancy improved as they grew older (Kuratsune et al. 1972, 1976) and have not displayed any neurobehavioral effects as have been seen in monkeys and mice exposed during gestation and via breast milk.

The second major incident of contamination of food with PCBs also affected more than 1,000 persons and occurred under similar circumstances in central western Taiwan in 1979 (Chang et al. 1980 a,b, 1981). Once again contamination of rice bran oil by PCBs was responsible and a similar spectrum of symptoms was noted; acne-like skin eruptions, pigmentation of the nails, swelling of the eyelids and increased eye discharge (hypersecretion of Meibomian gland), headache, nausea, and numbness of the limbs. In addition to the effects seen in the Yusho incident, liver damage, immunologic impairment, and increased urinary excretion of heme precursors were noted. These effects had previously been observed in animals (see below). Liver damage was indicated by increased activities of the enzymes SGOT, SGPT, and alkaline phosphatase in blood serum (Chang et al. 1980a). The individuals exposed to PCBs had lower serum

γ-globulin levels and displayed decreased delayed-type-hypersensitivity responses to streptokinase and streptodornase (Chang et al. 1980a). These individuals also had decreased levels of immunoglobulins IgA and IgM in their serum, and lower percentages of T cells, especially helper T cells, among their lymphocytes (Chang et al. 1981). Chang et al. (1980b) examined the urinary excretion of heme precursors in 69 patients exposed to PCBs and 20 normal individuals. Significantly increased levels of δ-aminolevulinic acid and uroporphyrin were noted in the 24-hour urine of the PCB-exposed individuals compared to the normal subjects. No effect on urinary excretion of porphobilinogen or coproporphyrin was noted. Reports of the Taiwan incident have not mentioned CDFs, PCQs, or other contaminants.

In a recent epidemiological study of 458 members of a community in Alabama with no unusual exposure to PCBs, except that from a high intake of fish caught locally, a significant ($p<0.05$) positive correlation between serum PCB level (range 3.2-157.4 μg/liter, geometric mean 17.2 μg/liter) and diastolic blood pressure in adults was noted (Kreiss et al. 1981). Positive correlations were also observed between serum PCB concentration and gamma-glutamyl transpeptidase (GGTP) serum level, an indicator of liver disfunction, and between PCB level and serum cholesterol level. This study is of particular importance since it suggests the occurrence of subtle adverse effects resulting from exposure to relatively low ambient levels of PCBs. In a study of a smaller number of individuals (148)

with varying degrees of exposure to PCBs, Baker et al. (1980) also observed a correlation between serum PCB and GGTP levels; however, this correlation was eliminated when alcohol drinkers were excluded from the analysis. Baker et al. also noted a positive correlation between PCB level and serum triglyceride level as had been seen in Yusho victims in Japan (Kuratsune 1972); this correlation remained significant when analysis was limited to nondrinkers. However, it is not clear whether these associations between PCB levels in the blood and indicators of cardiovascular risks would indicate a cause-and-effect relationship. Since PCBs are associated with lipids in the blood, it is possible that individuals with elevated serum triglycerides would have elevated PCB levels for that reason.

B. Evidence of Carcinogenicity in Humans

There is no direct evidence that PCBs are carcinogenic in humans. However, Unger and Olsen (1980) have noted a statistically significantly ($p<0.01$) greater concentration of PCBs and DDE (a metabolite of the insecticide DDT) in adipose tissue of terminal cancer patients with a wide variety of types of cancer, compared to that of patients who died of other diseases, when the statistics were adjusted for age and sex. Also, Wassermann et al. (1978) observed higher levels of PCBs in the tissues of patients with gastric carcinoma than in the controls ($p<0.05$); and within the tissues of the cancer patients, the level of PCBs was higher in the tumor tissue than in adjacent normal

gastric mucosa ($p<0.01$). However, similar associations were observed with DDE and other organochlorines, and these findings are therefore ambiguous.

In a retrospective cohort mortality study of PCB-exposed workers making electrical capacitors (Brown and Jones 1981), mortality for all causes was lower than expected on the basis of U.S. age- and sex-adjusted, cause-specific mortality rates (163 observed, 182.4 expected). Mortality from all types of cancer combined was also lower than expected (39 observed, 43.8 expected). There was, however, a slight but nonsignificant excess of rectal cancer (4 observed, 1.19 expected) and liver cancer (3 observed, 1.07 expected), and in one plant there was a slight excess of deaths due to cirrhosis of the liver (5 observed, 3.2 expected). The latter two effects may be consistent with the known hepatotoxic effects of PCB, but the numbers involved are too small for any reliable conclusions to be drawn.

Bahn et al. (1976) reported an excess of melanomas (2 observed, 0.04 expected) among 31 men previously exposed to PCB in the research laboratory of a petrochemical plant. However, the extent of exposure to other potential carcinogens was not reported. Hence the cause of the melanomas is not clear.

A somewhat elevated incidence of death due to cancer has also been noted among Yusho victims. Among 31 deaths whose causes were confirmed up to 1977, 11 were from neoplasms (35.4% of the total). This fraction is higher than that observed

(21.1%) for deaths due to neoplasms among inhabitants of the same area of Japan in 1977 (Urabe et al. 1979). However, this comparison was not standardized for age or other differences between the two populations. Among the cancer deaths were 2 with stomach cancer, 1 with both stomach and liver cancer, 2 with liver cancer and liver cirrhosis, and 3 with tumors of the lung.

C. Effects Observed in Experimental Animals

Many of the effects of PCB exposure seen in humans are also observed in animals, and in many cases these effects can be studied more easily in animals than in humans. In addition, there are effects seen in animals that may potentially occur in humans; but evidence for their occurrence in humans is lacking, especially carcinogenicity and mutagenicity. The major effects of repeated exposure of animals to PCBs are briefly summarized below.

1. Carcinogenicity

There is evidence from several studies to implicate PCBs in the production of liver tumors in rats and mice, and there is some evidence to suggest that PCBs may also induce tumors of the stomach and lower gastrointestinal tract in rats.

Kimbrough et al. (1975) fed Aroclor 1260 at 100 ppm in the diet of female Sherman rats for 21 months. Among the 184 surviving treated rats, 26 had hepatocellular carcinoma and an additional 144 had neoplastic nodules in the liver. Among

173 surviving control animals, only 1 had liver carcinoma and none had neoplastic nodules.

The National Cancer Institute (1978) performed a carcinogenesis bioassay on Aroclor 1254. Groups of 24 male and 24 female Fisher 344 rats were fed diets containing 0, 25, 50, and 100 ppm Aroclor 1254 for 104-105 weeks. There was a small, dose-related increase in the incidence of liver hepatocellular adenoma and carcinoma and a larger increase in the incidence of nonneoplastic liver nodular hyperplasia as shown in Table B.5 below.

TABLE B.5

INCIDENCE OF LIVER LESIONS IN RATS IN NCI BIOASSAY

	Control	25 ppm	50 ppm	100 ppm
Hepatocellular adenoma and carcinoma (males)	0/24	0/24	1/24	3/24
Hepatocellular adenoma and carcinoma (females)	0/23	0/24	1/22	2/24
Nodular hyperplasia (males)	0/24	5/24	8/24	12/24
Nodular hyperplasia (females)	0/23	6/24	9/22	17/24

If males and females are combined, the incidence of hepatocellular adenoma and carcinoma is significantly greater in the 100 ppm group than in the control group ($p=0.030$, Fisher's exact test). In addition to these liver lesions, there was

a total of four adenocarcinomas and one carcinoma in the gastro-intestinal tract of treated rats but none in the controls. These are uncommon tumors in this strain of rats. The historical incidence of such tumors is 6/600 in males and 2/600 in females. NCI concluded that these tumors may have been related to the Aroclor 1254 treatment. The incidence of hepatocellular adenoma and carcinoma seen at 100 ppm in this study (10.4%) is consistent with the incidence (14.1%) observed in the study by Kimbrough et al. (1975), but the high incidence of neoplastic nodules seen in the Kimbrough et al. (1975) study was not seen in the NCI bioassay. A high incidence of nodular hyperplasia was seen, however. Nodular hyperplasia is considered an early, preneoplastic lesion which may progess to neoplasia under suitable circumstances (Pitot and Sirica 1980). Thus the main difference between the results of the two experiments is that the tumors developed more slowly in the NCI study.

Kimbrough and Linder (1974) also reported that Aroclor 1254 fed to BALB/cJ male mice at 300 ppm in the diet for 11 months induced hepatomas in 9/22 surviving animals. No hepatomas were seen in the livers of 58 mice fed a normal diet for 11 months. The PCB-fed mice also had greatly enlarged livers and adenofibrosis of the liver.

2. Interactions with Other Carcinogens

Early studies of interaction indicated that treatment of animals with certain carcinogens and with PCBs at the same time delayed or inhibited the action of the carcinogen. For

example, Makiura et al. (1974) observed a greatly reduced incidence of liver tumors in rats fed PCB at the same time as 3'-methyl-4-dimethylaminoazobenzene (3'-Me-DAB), N-2-fluorenylacetamide (2-FAA) or diethylnitrosamine (DENA). The authors speculated that the inhibitory effects may be attributed to stimulation of microsomal enzymes by PCB, enhancing metabolism of the carcinogens.

More recently, several studies have indicated that when PCBs are administered to rats following a low dose of a liver carcinogen, the incidence of liver tumors is greatly enhanced by the PCB treatment. This promoting effect has been observed with DENA (Nishizumi 1976, 1979, Preston et al. 1981), 2-FAA (Ito et al. 1978, Tatematsu et al. 1979), and 3'-Me-DAB (Kimura et al. 1976). In the study by Preston et al. (1981), for example, groups of 40 male Sprague-Dawley rats were given drinking water containing DENA at 66 µg/ml for 5 weeks, and then Aroclor 1254 was added to the diet of one group for a further 18 weeks. An additional group of 40 did not receive DENA but were given Aroclor 1254 in weeks 6-23. An untreated group was also included. In rats surviving to 23 weeks, none of the control rats or rats receiving only Aroclor had liver tumors. Of 32 rats receiving only DENA, 5 (16%) had hepatocellular carcinomas, while 21/33 (64%) of the rats given DENA followed by Aroclor had hepatocellular carcinomas. In the study by Kimura et al. (1976), Kanechlor 400 at 400 ppm in the diet for 6 months enhanced the production of hepatocellular carcinoma in rats previously fed 3'-Me-DAB at 600 ppm in the diet for 2 months. However,

the incidence of carcinoma was reduced if Kanechlor was given before or concurrently with 3'-Me-DAB. Also, when rats were exposed in utero and via their mothers' milk to PCBs (Kanechlor 500), they were less sensitive than unexposed rats to subsequent induction of liver tumors by DENA (50 ppm for 5 weeks after weaning), showing a significantly reduced ($p<0.05$) number of liver tumors per rat (1 tumor/rat in males, 0 in females) compared to rats not exposed to Kanechlor (3 tumors/rat in males, 1.1 in females) (Nishizumi 1980). The fact that increased tumor yield occurs only when PCBs are given after the carcinogen suggests that the effect is not simply related to the ability of PCBs to induce liver enzyme systems and increase metabolic activation of the carcinogen. Rather, PCBs appear to be acting as promoters. However, PCBs neither have promoting activity in the classical two-stage mouse skin tumorigenesis system using 7,12-dimethylbenz(a)anthracene as the initiator (Berry et al. 1978), nor in a system in which the cervical epithelium of mice was treated with 3-methylcholanthrene (MC) for 4 weeks and the mice given a diet containing 10 or 100 ppm Kanechlor 400 during and for 3 weeks after MC treatment (Uchiyama et al. 1974). However, these authors did not try administering PCBs only after treatment with the carcinogen, but used concurrent treatments.

3. Mutagenicity

Most studies of the mutagenicity of PCBs have given negative results, including assays for reversion in *Salmonella typhimurium*

(Hsia et al. 1978, Schoeny et al. 1979), chromosome aberrations in rat bone marrow (Green et al. 1975a), dominant lethal mutation in rats (Green et al. 1975b), and chromosome breakage in Drosophila (Nilsson and Ramel 1974). These studies used 2,2',5,5'-tetrachlorobiphenyl, Aroclors 1242 and 1254, and Clophens A30 and A50. However, another study has provided evidence that chlorinated biphenyls with a lower degree of chlorination may be mutagenic in Salmonella strain TA1538 in the presence of a rat liver metabolic activation system (Wyndham et al. 1976). Wyndham et al. (1976) also noted binding of ^{3}H-4-chlorobiphenyl to protein and RNA when the chemical was added to a liver microsome preparation. In a later study, Wyndham and Safe (1978) presented evidence that 4-chlorobiphenyl was metabolized via an arene oxide intermediate. Arene oxide intermediates are the reactive derivatives believed to be involved in the binding of carcinogenic polynuclear aromatic hydrocarbons to DNA. It is likely that the arene oxide intermediate is responsible for the mutagenic activity of 4-chlorobiphenyl. Negative results were obtained with 4-chlorobiphenyl in a modified assay for mutagenicity in Salmonella (McMahon et al. 1979), but it is unclear what doses were tested or how the modifications used may have affected the sensitivity of the assay.

4. Reproductive, Teratogenic, and Postnatal Effects

Exposure to PCBs at various times before, during and after pregnancy has resulted in various degrees and types of adverse effects on reproduction and on the offspring in many species.

Among the species most sensitive to these effects of PCBs are the monkey and the mink, but all species that have been tested, including rats, mice, rabbits, and miniature swine, have shown effects. Studies with monkeys (Allen et al. 1979, 1980; Bowman et al. 1978, 1981) have examined the reproductive effects of PCBs and the redistribution of maternal PCBs to the fetus transplacentally and to the nursing offspring via the milk.

Adult female rhesus monkeys received Aroclor 1248 at dietary levels of 0.5, 1.0, 2.5 or 5.0 ppm for 18 months. Prolonged menses and elevated serum progesterone levels were observed after 4 months of treatment. The females were mated with untreated males after 7 months of treatment and again 1 year after PCB treatment was stopped. The results of mating for the females in the 2.5 and 5.0 ppm group are shown in Table B.6 below.

TABLE B.6

REPRODUCTIVE PERFORMANCE OF MONKEYS EXPOSED TO POLYCHLORINATED BIPHENYLS IN THEIR DIETS FOR 18 MONTHS

	During PCB Exposure		1 Year After PCB Exposure	
	2.5 ppm	5.0 ppm	2.5 ppm	5.0 ppm
Total impregnated	8/8	6/8	8/8	7/7
Absorptions/resorptions	3/8	4/8	1/8	1/7
Stillborn	0/8	1/8	0/8	1/7
Normal births	5/8	1/8	7/8	5/7

Infants in each treatment group in each mating had reduced body weights at birth. No gross external malformations were reported. After the first mating, the six infants were permitted to nurse for 4 months. Within 2 months focal areas of hyperpigmentation, swollen lips and eyelids, loss of eyelashes, and acneform lesions of the face developed in the infants. The skin of these infants showed a decided increase in the PCB level over this period. Within 4 months, three of the six infants died (one in the 5.0-ppm group and two in the 2.5-ppm group) due to PCB intoxication. After weaning, the remaining three showed improvement of the skin lesions during the subsequent 4-month period. At weaning and 2 years later, the surviving offspring of the first mating in the 0.5, 1.0, and 2.5-ppm groups were similarly hyperactive and had comparable deficits in learning ability. At 4 years of age these offspring were hypoactive (Bowman et al. 1981).

After the second mating, the breast milk of the mothers contained 0.02-0.19 μg PCB/g whole milk, and the hairline of the infants showed hyperpigmentation. Two infants in each group died after weaning. These four infants showed hypocellularity of the thymus, grossly small spleens, and reduced number of lymph nodes. Histologically the lymph nodes were hypocellular and devoid of germinal centers, while the bone marrow was hypoactive as evidenced by the majority of cells being mature (Allen et al. 1980). These histologic findings are indicative of

impairment of the immune system, an effect of PCBs which is discussed in more detail later.

Male monkeys appear to be less susceptible than females to reproductive dysfunction by PCBs (Allen and Norback 1976). Four adult male rhesus monkeys were given a diet containing 5.0 ppm Aroclor 1248 for 17 months (average total intake of PCBs 460 mg). They began to develop a slight periorbital edema after 6 months of exposure; however, it was much less severe than in the female monkeys receiving a similar level of PCB. The morphological features and viability of the spermatozoa, as well as the ability to fertilize control monkeys, was unaffected during the initial 12 months of PCB exposure. Subsequently, one of the four males lost weight and developed alopecia, acne, periorbital edema, and decreased libido. A testicular biopsy of this animal showed a decided hypoactivity of the seminiferous tubules. There was an absence of mature spermatozoa and a predominance of Sertoli cells of the tubules. The remaining three males remained healthy and sexually active (Allen and Norback 1976).

Reproduction in mink is also adversely affected by low levels of PCBs. The degree of reproductive impairment is different for different PCB mixtures. Aroclor 1254 at 2 ppm in the diet dramatically decreased the number of live kits born per female. Aroclor 1242 had a similar effect at 5 ppm in the diet. Aroclor 1016, however, had considerably less effect on reproduction. A dietary level of 2 ppm was without effect,

while 10 ppm reduced the number of successful pregnancies but did not affect the number of kits per litter (Aulerich and Ringer 1977, 1980, Bleavins et al. 1980).

The teratogenic potential of PCBs, both individual isomers and commercial mixtures, has been studied in several species. In a study by Masuda et al. (1979), mice were fed diets containing known levels of each of seven chlorobiphenyl isomers (tri- to octachloro) for 18 days either before or during pregnancy.

Several isomers reduced the number offspring per female, but the only isomer that caused measurable defects in the offspring was 3,3',4,4'-tetrachlorobiphenyl. Offspring of mice treated with this chemical showed increased locomotor activity and general restlessness ("waltzing syndrome") within 2-3 weeks of birth. It could not be determined whether placental transfer or uptake of PCB from maternal milk was the critical route of exposure (Lucier et al. 1978).

Tilson et al. (1979) and Marks et al. (1981) also reported neurobehavioral defects in the offspring of female mice treated with 3,3',4,4'-tetrachlorobiphenyl and 3,3',4,4',5,5'-hexachlorobiphenyl during pregnancy. However, these isomers are only minor components in commercial PCB mixtures, so the relevance of these studies to risk assessment for environmental PCBs is limited.

Several studies of the effects of PCB mixtures have also been conducted. Villeneuve et al. (1971) reported that single oral doses of 12.5, 25, and 50 mg/kg Aroclor 1254 administered

to pregnant rabbits were fetotoxic, but did not induce teratogenic effects. Linder et al. (1974) reported that Aroclors 1254 and 1260 had minor fetotoxic effects when administered at 100 mg/kg/day to female rats on days 7-15 of pregnancy; Aroclor 1254 also caused substantial mortality in pups prior to weaning.

Earl et al. (1974) reported that Aroclor 1254 caused reproductive impairment and skeletal abnormalities in the offspring of beagle dogs and miniature swine exposed during pregnancy to doses of 5 mg/kg/day and 10 mg/kg/day, respectively. However, this study was reported only in an abstract, and details are not available for review.

In summary, PCB mixtures have been reported to affect reproduction in a number of animal species, but rhesus monkeys and mink appear to be much more sensitive than other species. Teratogenic effects have not been convincingly reported, except for neurobehavioral effects in mice caused by isomers that are only very minor components in commercial mixtures.

5. Liver Toxicity

An increase in liver weight and/or in liver-to-body weight ratio in response to PCB treatment has been noted in many studies. Litterst et al. (1972) observed increased liver-to-body weight ratios in rats fed 50 and 500 ppm of Aroclors 1242, 1248, 1254, and 1260 for only 4 weeks. Similar increases in liver weight have been noted in long-term feeding studies with these mixtures in rats (Bitman et al. 1972; Linder et al. 1974). In addition,

effects were noted at much lower dietary levels in offspring of treated rats (exposed during gestation and prior to weaning): significant increases in liver weight were noted in weanling rats after maternal exposure to only 5 ppm Aroclor 1260 and only 1 ppm Aroclor 1254 (Linder et al. 1974).

Increase in liver weight has been noted as an effect of PCBs in many other species (Vos 1972, Nishizumi 1970, Barsotti and Allen 1975, Hansen et al. 1975).

The initial increase in liver weight is due mainly to proliferation of smooth surfaced membranes of the endoplasmic reticulum, a network of interconnected channels present in the cytoplasm of most animal cells. Norback and Allen (1972) observed a proliferation of smooth endoplasmic reticulum (SER) in rats fed PCBs for one to five weeks. Similar proliferation of SER has been observed in mouse and monkey livers (McNulty 1976, Nishizumi 1970).

Changes in biochemical composition of the liver after exposure to PCBs include a significant increase in total lipid content (Grant et al. 1971). Triglyceride content of the liver increased with increased dosage of PCBs (from 5 to 500 ppm) in the diet (Litterst et al. 1972). This increase was greater with Aroclor 1248 than with 1242, 1254, or 1260. Norback and Allen (1972) found the ratio of phospholipids to protein increased and the ratio of cholesterol to protein increased. Hinton et al. (1978), on the other hand, found that although the total amount of liver phospholipid and cholesterol increased, the

phospholipid/protein and cholesterol/protein ratios did not change when rats were treated with large doses of Aroclor 1254 (25 and 50 mg/kg). Both the total triglyceride and triglyceride/protein ratio increased markedly. They found the increase in phospholipids and triglycerides was caused by a decreased degradation or removal of the lipids from the liver and not an increase in synthesis. Marked increases in liver lipids have also been noted in treated rabbits (Ito et al. 1971).

6. Induction of Hepatic Mixed Function Oxidases

The hepatic mixed function oxidases (MFO) make up a membrane-bound enzyme system found mainly in the SER of the liver cells. MFO usually increases in activity with an increase in the SER. This enzyme system is able to metabolize and detoxify oxidatively a wide variety of exogenous and endogenous compounds. A major component of this system is a cytochrome enzyme, which because of its ability to absorb light, under specific conditions, with wavelengths around 450 nm, is called cytochrome P-450. Initially it was believed there was only one such enzyme, but it is now known that there is a family of these enzymes. Each cytochrome P-450 has its own enzymatic activities and spectral properties. In the normal animal not all the cytochrome P-450s are present. A variety of chemicals, such as PCBs, are, however, able to cause the synthesis of specific cytochromes and thus cause an increase in the total amount of enzyme and the enzymatic activity. This is considered induction of the MFO.

Disruptions in normal hepatic MFO activity have been observed with PCBs even at dose levels which had no effect on liver weight or on liver-to-body weight ratios (Litterst et al. 1972) Several hepatic enzyme systems are affected in rats at dietary levels as low as 5 ppm (Chen and Dubois 1973) or even 0.5 ppm (Litterst et al. 1972), and "no-effect levels" have not yet been found. Application of very small amounts of PCBs to the skin of experimental animals can cause a marked increase in MFO activity (Kappas and Alvares 1975).

After termination of exposure, the enzyme-inducing effect of PCBs appears to be reversible. Litterst and Van Loon (1974) maintained rats on a high dietary concentration of 50 ppm PCB for seven days. Discontinuation of PCB treatment resulted in a slow decay of the induced enzyme activity to approximately control levels after 10 days. The various effects of PCBs on liver microsomal enzymes can be blocked by the prior administration of actinomycin D (Kimbrough 1974). Actinomycin D acts as an inhibitor of DNA-dependent RNA synthesis. Alvares et al. (1973) interpreted the inhibitory effect of actinomycin D on PCB-induced increases in enzyme activity as support for the view that PCBs enhance the synthesis of a distinct microsomal hemo-protein not present in liver of untreated rats.

There are two general classes of inducers of MFOs. These classes are characterized by the compounds phenobarbital (PB) and 3-methylcholanthrene (3-MC). The two compounds induce different species of cytochrome P-450. Ryan et al. (1979)

isolated from rat liver the cytochrome P-450s induced by these compounds and by Aroclor 1254. Three cytochrome P-450s were isolated from treated rat liver and designated P-450a, P-450b, and P-450c. Phenobarbital induced P-450a and P-450c while 3-MC induced P-450a and P-450b. Molecular weight analysis, spectral properties, catalytic activity, reactivity with antibodies, and peptide mapping all showed that Aroclor 1254 induced three individual forms of P-450 and that they were identical to those induced by PB or 3-MC. Thus Aroclor 1254 has the characteristics of both PB and 3-MC for induction of MFOs.

A number of recent studies have started to elucidate structure-activity relationships in enzyme induction by chlorobiphenyls in rats (Ecobichon 1976, Poland and Glover 1977, Yoshimura et al. 1979, Goldstein 1979). The activity of PCB mixtures in inducing the specific enzymes characteristic of both PB and 3-MC type inducers has been shown to be caused by individual isomers that are either PB or 3-MC type inducers (Poland and Glover 1977, Goldstein et al. 1977, Goldstein 1979, Yoshimura et al. 1979). In the study by Yoshimura et al. (1979), the effect of individual isomers on the rat hepatic MFO activities of benzphetamine N-demethylase (BZ) and arylhydrocarbon hydroxylase (AHH) were measured as well as the concentration of cytochrome P-450. BZ activity, representative of PB type induction, was increased by specific PCB isomers, while AHH activity, representative of 3-MC type induction, was increased by other PCB isomers. The absorption spectrum of the cytochrome P-450

induced by the latter isomers was similar to that found with 3-MC induction, which causes a peak absorption at 448 nm, not 450 nm, and is thus referred to as cytochrome P-448. The absorption spectrum of the cytochrome P-450 induced by isomers with PB-type activity was similar to the PB-induced cytochrome P-450 spectrum with a peak absorption at 450 nm.

The toxicity of the individual isomers was also correlated to their type of MFO induction. The 3-MC type inducers were more toxic than PB type inducers. This toxicity, however, was not directly related to the induction of cytochrome P-448/P-450 (Yoshimura et al. 1979).

McKinney and Singh (1981) examined crystallographic, theoretical and toxicological data in developing an hypothesis on the structural specificity of PCB for 3-MC-type induction of cytochrome P-448. They found that the planar structure of PCBs with chlorines at the para positions of each ring and at least one meta position of each ring was very similar to the planar structure of 2,3,7,8-tetrachlorodibenzo-p-dioxin, a very potent 3-MC-type inducer. Such a structure can fit into a 3 x 10 Å rectangle. In addition to the ability to form this planar structure, relatively high polarizability of the molecule, which is determined by the number and position of the chlorines, is important for the molecule to have a high affinity to the receptor site responsible for MFO-induction.

7. Induction of Porphyria

Porphyria cutanea tarda in humans is an acquired defect in hepatic porphyrin metabolism, characterized by uroporphorinuria (excretion of porphyrins in the urine), photosensitivity as manifested by blisters, and mechanical fragility of the skin (Kimbrough 1974). Normally, porphyrin synthesis is well regulated to provide the necessary amount of porphyrins for heme synthesis. The hepatic porphyria which is responsible for an increase in porphyrins and for the skin photosensitivity can be produced experimentally by a number of drugs and chemicals which have the ability to stimulate activity of the initial enzyme of heme synthesis, δ-aminolevulinic acid (ALA)-synthetase (Strik and Wit 1972).

PCBs have been shown to cause hepatic porphyria in animals (Goldstein et al. 1974, Vos and Beems 1971). Goldstein et al. (1974) fed rats a diet containing 100 ppm Aroclor 1254 for up to 13 months. After 2-7 months, there was an increase in the urinary excretion of several intermediary compounds of the metabolic pathway for heme synthesis. Uroporphyrin excretion increased up to 540-fold while the excretion of coproporphyrin increased 27-fold, porphobilinogen increased 50-fold, and δ-ALA increased 18-fold. The activity of δ-ALA synthetase, the rate-limiting enzyme of the metabolic pathway, was increased after 3 months on the diet. At 4 months, the porphyrin concentration in the livers of treated rats was 1410 μg/g of liver compared to the concentration in the livers of control animals

of <0.1 μg/g. Aroclors 1016 and 1242 also induce porphyria in rats (Iverson et al. 1975, Goldstein et al. 1975). After dosing at 10 and 100 mg/kg/day for 21 days, both mixtures caused a significant accumulation of porphyrins in both sexes, but Aroclor 1242 was nearly twice as effective at 100 mg/kg and produced a significant effect at the lower dose.

Rabbits developed symptoms of porphyria after application of Clophen A50, Phenoclor DP6, and Aroclor 1260 to their back skin (Vos and Beems 1971).

8. Immunotoxicity

The ability of PCBs to inhibit immune responses has been reviewed by Vos (1977) and by Silkworth and Loose (1981). Treatment with PCBs has been shown to reduce the level of serum antibodies to pseudorabies virus in rabbits and to tetanus toxin in guinea pigs, reduce the delayed-type hypersensitivity response to tuberculin in rabbits and to Freund's complete adjuvant in guinea pigs, reduce the mixed lymphocyte response in guinea pigs, and increase the susceptibility of ducks to infection with duck hepatitis virus. PCBs also cause atrophy of the thymus and damage to the spleen in several species. Since the thymus and spleen are involved in immunologic reactions, these adverse effects are indicators of reduced immunocompetence.

More recently, Aroclor 1254 at 63, 135, 250 and 550 mg/kg has been shown to produce a dose-dependent reduction in plaque-forming cells in the spleen of mice in response to a challenge

with sheep red blood cells. This indicates that Aroclor 1254 inhibited the formation of antibody-producing cells in the spleen (Wierda et al. 1981). A similar effect was seen in Rhesus monkeys fed Aroclor 1248 at 5 ppm in the diet for 11 months. These animals had reduced hemolysin titers in response to injection with washed sheep red blood cells and reduced levels of γ-globulin in blood serum compared to control animals not exposed to PCBs (Thomas and Hinsdill 1978).

C. Toxicity of Chlorinated Dibenzofurans (CDFs)

As described earlier, commercial PCBs are contaminated with low levels of CDFs. CDFs may be formed from PCBs during heating and during use in heat exchangers, and high levels of CDFs were found in the rice oil responsible for the Yusho incident in Japan. CDFs have been detected in the adipose tissue and liver of Yusho victims at levels of about 0.01 ppm on a whole tissue basis (Kuratsune et al. 1976). Indeed they appear to be preferentially retained compared to PCBs since the ratio of PCB to CDF in the livers of the patients 7 years after exposure was about 4:1 compared to 200:1 in the contaminated rice oil.

The association of CDFs with PCBs and the apparent formation of CDFs from PCBs when heated are of particular concern because CDFs are considerably more toxic than PCBs. For example, in a comparative toxicity study, Oishi et al. (1978) examined the toxicity of a PCB mixture (Kanechlor 500) and a mixture of CDFs produced by chlorination of dibenzofuran. The CDF

mixture contained tetrachloro-, pentachloro-, and hexachlorodibenzofurans (average number of chlorines per molecule, 4.7). Groups of 10 male Sprague-Dawley rats were fed for 4 weeks on diets containing 100 ppm PCB, 10 ppm CDF, or 1 ppm CDF; an additional group was given untreated feed. Body weight gains were less in the treated groups than in the control group. This effect increased in severity in the order 100 ppm PCB < 1 ppm CDF < 10 ppm CDF. The relative weights (g/100 g body weight) of brain, spleen, and liver were significantly increased in the animals fed 100 ppm PCBs. These effects were also produced by both dose levels of CDFs. In addition, both 1 ppm and 10 ppm CDFs significantly increased the relative weights of heart, lungs, adrenals, and testes, and significantly decreased the absolute and relative thymus weight. CDFs at 10 ppm also significantly decreased the relative weights of seminal vesicles and ventral prostate. Both doses of CDFs significantly reduced the blood hemoglobin concentration and hematocrit compared to the control group. This effect was not produced by the PCB treatment. All three treatments significantly increased the serum cholesterol concentration, significantly reduced the serum triglyceride concentration and significantly increased the concentration of lipid in the liver. It appears that 1 ppm CDF produced effects more severe than 100 ppm PCB in this study.

Although the toxicity of individual isomers of CDFs has not been studied in detail, emphasis has been placed on the isomer 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF) since

it is likely to be the most toxic by analogy with the structurally similar chlorodibenzo-p-dioxins (CDD), of which 2,3,7,8-TCDD is the most toxic (Poland and Glover 1973). 2,3,7,8-TCDF is also one of the isomers that is found in commercial PCBs (Bowes et al. 1975a, b), is formed during heating of PCBs (Morita et al. 1978), and is the major CDF in Yusho oil, in which it was present at 0.45 ppm, about 8% of the total CDFs (Buser et al. 1978a).

In rhesus monkeys, 2,3,7,8-TCDF at 5 and 50 ppb in the diet caused sickness and some deaths in groups of three animals fed for 6 and 2 months, respectively. The principal pathologic effects were atrophy or squamous metaplasia of the sebaceous glands, mucous metaplasia and hyperplasia of the gastric mucosa, involution of the thymus, and hypoplasia of the bone marrow. The effects were most severe at the 50 ppm dose level, but were also apparent at the lower dose level. The survivors recovered after 3 months on a TCDF-free diet (McNulty et al. 1981)

CDFs are also much more potent inducers of liver microsomal enzymes than PCBs. Kawano and Hiraga (1978) observed a greater increase in liver cytochrome P-450 content in rats given three daily doses of mixed CDFs at 100 µg/kg/day than in rats given three daily doses of a PCB mixture (Kanechlor 500) at 10 mg/kg/day. Also, Goldstein et al. (1978) observed that the highly toxic isomer 2,3,7,8-TCDF was active as an inducer of the liver microsome enzyme aryl hydrocarbon hydroxylase in rats when given

as three daily intraperitonal doses of 0.1 μg/kg/day. This was the lowest dose tested, and a no-effect level for this isomer has not been identified. Indeed, contamination of a commercial, 99% pure hexachlorobiphenyl isomer with 44 ppm 2,3,7,8-TCDF was responsible for the induction of cytochrome P-448 and aryl hydrocarbon hydroxylase by the commercial hexachlorobiphenyl (Goldstein et al. 1978). These results indicate that 2,3,7,8-TCDF was at least 20,000 times more potent as an inducer of AHH than 2,2',4,4',5,5'-hexachlorobiphenyl.

APPENDIX C

TOXICOLOGICAL DATA NOT USED IN THE RISK ASSESSMENT

In Section III of this report, we selected three types of toxic effect of PCBs as the basis for assessment of risks at low exposure levels. Chloracne is the best documented effect in humans and is an effect for which the exposure-response relationship has been defined reasonably clearly. Reproductive toxicity is the effect that has been observed in animal experiments at the lowest dose level. Carcinogenesis in animals is an effect of significant public health concern and an effect for which there are scientific reasons to believe that risks may exist at very low dose levels.

In addition to these types of toxic effect, several other effects of PCBs have been reported, but were not used in our risk assessment. The most important of these reported effects are listed below.

1. Data suggesting abnormal lung function in workers exposed to PCBs (Warshaw et al. 1979). In our judgment these findings need independent confirmation.

2. Data suggesting correlations between PCB levels in tissues and indicators of cardiovascular risks (Kreiss et al. 1981, Baker et al. 1980). Although these are potentially significant risk factors, it is not clear whether the elevated PCB levels associated with them are causes or effects.

3. Data on mutagenicity of lower chlorinated biphenyls (Wyndham et al. 1976) and on binding of metabolites to DNA

and RNA (Morales and Matthews 1979). The significance of these findings for risk assessment is not clear, since the mutagenic components are not found in commercial mixtures such as Aroclor 1254.

4. Data on the sensitivity of mink to low levels of PCBs. The validity of the mink as an experimental model for toxic effects in humans is questionable.

5. Data on teratogenic effects of PCBs. Studies by Earl et al. (1974) have not been reported in sufficient detail; Lucier et al. (1978) used 3,3',4,4'-tetrachlorobiphenyl, a highly toxic isomer that is only a minor component in commercial mixtures.

6. Data on induction of liver enzymes at low doses. Although several human studies have shown increased activity of certain liver enzymes (SGOT, SGPT, and GGP), the health significance of these findings is not clear. In theory, the increased activity of mixed function oxidases could either increase the risks of cancer (by augmenting the conversion of carcinogens into active metabolites), or decrease it (by accelerating the breakdown of these active metabolites). In practice, most studies have indicated a decrease in effects when PCBs are administered prior to administration of a carcinogen that requires metabolic activation (see Appendix B). Hence, we will assume that the net effect of enzyme induction by PCBs is likely to be beneficial or neutral.

APPENDIX D

POSSIBLE RISKS POSED BY TCDD

After the risk assessment of PCBs presented in this report was completed, trace quantities (up to 18 ppb) of 2,3,7,8-tetrachloro-p-dioxin (TCDD) were reported as having been identified in sludges from lagoons 4 and 5. In many respects, the biological effects of TCDD and PCBs are similar but TCDD is roughly 100,000 times more potent than PCB mixtures of the type found in sludges at the OLD site (Parkinson and Safe 1981). But, the intrinsic hazard posed by TCDD at concentrations of 5-18 ppb are somewhat greater than those posed by PCBs at concentrations around 100 ppm. However, this difference is at least partially offset by the fact that TCDD is less volatile than PCBs, is more strongly adsorbed to surfaces, and is less liable to move in groundwater. Hence the risk posed by TCDD at the level recorded at the OLD site are probably of the same order of magnitude as those posed by PCB. With appropriate changes, the conclusions drawn in this report about the risks posed by PCBs are equally applicable to TCDD.

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AGENDA

Chemical Waste Management, Inc.
Presentation on Remedial Plan
and Facility Upgrade at CWM's
Vickery, Ohio Facility

to

Ohio Environmental Protection Agency
U.S. Environmental Protection Agency
Sandusky County Board of Health

July 28, 1983

1. Overview: Jeffrey G. Miller, Esq., Bergson, Borkland, Margolis & Adler.
2. Site Hydrology: Gary Collison, Golder Associates.
3. PCB Values: Kathy Trent, Chemical Waste Management.
4. Remedial Options: Al Zupko, Weston
5. Risk Analysis of Options: Dr. Ian Nesbit, Clement Associates
6. Facility Upgrade: Bill Abel, Chemical Waste Management
7. Questions, Answers and Discussion.
8. Summary: George Vander Velde, Chemical Waste Management.

WSCA

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- C. CWM laboratory report forms for oil sold that CWM has retained in its files.
- D. Results of analyses performed by CWM's consultants on oil retained by customers.
- E. Examples of BS&W test logs.

III. Attachment B

- A. CWM Proposal for Remedial Action and Environmental Control Upgrading.
- B. Exhibit I - Analytical data from ETC re: Sludge PCB Analysis.
- C. Exhibit II - Sludge Remedial Operations.
- D. Exhibit III - Site Integrity.
- E. Exhibit IV - RCRA Landfill.
- F. Exhibit V - Draft Consent Decree.

IV. Attachment C

- A. Truck Spill Prevention Inspection Procedures.

Chemical Waste Management, Inc.
[illegible]

July 28, 1983

Robert R. Maynard, Director
Ohio Environmental Protection
Agency
361 East Broad Street
Columbus, Ohio 43216

Re: Findings and Orders of June 30, 1983 and July 19, 1983, Chemical Waste Management, Inc., Vickery, Ohio Facility

Dear Mr. Maynard:

The above-cited Orders are seventeen in number. Set forth below are the actions Chemical Waste Management, Inc. ("CWM") has or is taking with regard to each Order.

1. CWM's Vickery Facility is not presently accepting oily wastes, as previously defined, see letter of Charles J. Wilhelm to Donald Wallgren, dated April 8, 1983. It has received permission from Ohio EPA to remove PCB-contaminated oily wastes from the site, see letter of Robert Maynard to Milo Harrison, dated April 28, 1983. CWM has completed removal of tanked material which CWM, Ohio EPA and federal EPA agreed were PCB-contaminated and has skimmed oil from all the ponds and removed it. CWM continues to remove such wastes as small amounts of PCB-contaminated oil rise to the surface of and are skimmed off the site's ponds. CWM plans to recommence reclaiming and sale of waste oil after decontaminating its reclamation facilities.

2. A report of oil sales since 1979 is enclosed as Attachment A.

3. CWM is presently injecting aqueous wastes with Ohio EPA permission, see letter of Robert Maynard to Lee Archambeau, dated June 30, 1983.

4. CWM has corrected past deficiencies and presently conducts its business in full compliance with its waste analysis plan.

5. CWM is complying with applicable federal laws and regulations regarding PCBs. It is aware of no state laws or regulations regarding PCBs. Indeed, you publically stated in Fremont, Ohio recently that there were no state laws or regulations regarding PCBs.

6. CWM is making a proposal today to your staff for complete remedial work and future environmental control at the Vickery Facility, including disposal of PCB-contaminated sludges at the facility. A summary of the proposal is enclosed as Attachment B.

7. Any storage of tanked PCB-contaminated oil at the facility prior to shipment is in compliance with applicable federal regulations. Tanks are locked. CWM is aware of no state regulations applicable to PCB storage.

8. CWM has previously delivered to you its reports on off-site and on-site surface water and soil samples. As additional samples are analyzed, the resulting reports will be delivered. A summary of the results is being presented to your staff today as Exhibit I to Attachment B.

9. As discussed between our attorney, Jeffrey G. Miller, and your Mr. Styduhar on several occasions, CWM cannot complete closure of Pond 4 without Ohio EPA and U.S. EPA approval. CWM has at all times been willing to proceed with closure in accordance with its closure plan upon receiving such approval. It could have met the 90-day deadline if it had previously received such approval. At this point, it cannot, even if it received approval today. CWM is making a proposal for upgrading its closure plan for Pond 4 to your staff today. As soon as CWM receives approval of the upgraded plan or of any other subsequent proposal, it will immediately recommence closure and will complete it expeditiously.

Despite its willingness to commence closure of Pond 4 immediately after receiving the required approvals, CWM continues to recommend that closure not be undertaken during summer months when emissions, including odor, will be at

their maximum. CWM recommends that closure be performed during colder weather.

10. CWM is not moving wastes into or out of Ponds 5 or 7, except with your approval. As previously explained, there is no environmental or public health reason not to use Pond 7 to receive wastes, in fact it is preferable from safety and management perspectives to do so, see letter of George Vander Velde to Robert Maynard, dated June 29, 1983. Receipt of wastes into Pond 7 would not result in any greater inventory of aqueous wastes on site. CWM is in receipt of your approval, dated July 20, 1983, to receive wastes into Pond 7 and is constructing the spill diversion pad requested in your letter.

11. CWM continues to notify Ohio EPA in advance of non-routine environmental sampling at the Vickery Facility.

12. CWM will comply with applicable portions of Rule 3745-66-12 of the Administrative Code in pond closures.

13. CWM is proceeding with the interim control measures previously proposed by it, see letter of George Vander Velde to Robert Maynard, dated April 27, 1983, Attachment H, and letter of Jeffrey G. Miller to Robert Maynard, dated June 13, 1983. You approved this proposal in your letter to Milo Harrison, dated May 6, 1983. CWM has experienced delays in putting this interim system into operation because of reactions of and between the waste streams involved, but anticipates meeting the November 30 date. As previously explained, this should solve odor problems from newly received odorous waste streams with organic wastes entering the system, but will not solve all odor problems at the site. CWM believes, based on your letter of May 6 and conversations with your staff, that this system satisfies the requirements of Order 13.

14. CWM is making a proposal to your staff today to phase out use of ponds at the site and to replace them with an enclosed treatment and storage system. A summary of that proposal is enclosed as Attachment B.

15. CWM is not allowing third parties on site without the required approval. It will look to you for indemnification

for any damages resulting from its compliance with this Order, e.g., refusal to admit doctors, police, ambulance, other governmental agencies, fire department, etc. CWM acknowledges your approval dated July 20, 1983, of entry by persons doing business with CWM at the facility and media.

16. CWM continues to supply Ohio EPA with copies of analytical results, consultant reports, etc., qualified as previously discussed.

17. CWM's plan to investigate spills from trucks is described in Attachment C. CWM has developed spill response capacity and will exercise it for spills from trucks owned and operated by CWM. **CWM has and accepts no responsibility for spills from trucks not owned or operated by it.** Such responsibility can only be created by explicit legislative action changing common law doctrines of vicarious liability, see, Isbandtsen Co. v. Johnson, 343 U.S. 779 (1953), and Amoco Oil Co. v. EPA, 501 F.2d 722 (D.C. Cir. 1974). **CWM may voluntarily respond to spills from such trucks in appropriate circumstances.**

Although CWM is proceeding as outlined above, it does not waive its rights to contest the validity of the Findings and Orders. Indeed, it is noticing appeal of them. As with CWM's appeal of your previous Order, CWM will agree to suspension of the appeal proceedings during negotiation to reach an agreed upon resolution of this matter. CWM renews and continues its request that correspondence and documents submitted by it be **treated as confidential information.**

Very truly yours,

George Vander Velde

George Vander Velde
Vice President, Technical
Development and Services

GV/sep

cc: Basil G. Constantelos

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A. Truck Spill Prevention Inspection Procedures.

ATTACHMENT A

CWM, VICKERY, OHIO RECLAIMED OIL CUSTOMERS

Ohio EPA has requested from CWM a report identifying purchases of reclaimed oil from CWM's Vickery, Ohio facility, together with the quantity and characteristics of the oil sold to them, the results of analyses on such oil performed by CWM or its consultants, and the quantity of oil still in the possession of the purchasers. With the exception of some analytical data, that report was delivered to Ohio EPA on May 12, 1983. Attached are: 1) a copy of the May 12, 1983 report, amended to show subsequent receipt of ETC data; 2) copies of CWM laboratory report forms for oil sold that CWM has retained in its files; 3) copies of the results of analyses performed by CWM's consultants on oil retained by customers; and 4) examples of BS&W test logs. With regard to CWM's laboratory report forms, it should be noted that CWM did not routinely test every outgoing load of oil or retain copies of the results of all tests run. In addition, not all of such records that it initially kept are still in its files. Most BS&W results were transferred to BS&W logs, examples of which are attached. These logs do not indicate whether the test results are for oil received by, stored at or sold from the facility. If requested, CWM will furnish copies of all such logs and attempt to reconstruct, to the best of its ability, which BS&W results may have been of oil sold.

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EXHIBIT F

CHEMICAL WASTE MANAGEMENT, INC.

VICKERY, OHIO

OIL SHIPPED OFF-SITE

1-80 Through 3-83*

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*Based on combination of company records and telephone calls to customers. No representations are made to the complete accuracy of the information presented.

Al-Cat Petroleum
11636 Champaign Street
Warren, Michigan 48089
313-827-8579 Bill Katzstein
Use: Blended into fuel stock
Volume: 4-81 through 5-81, 70,449 gallons
Customer List: Al-Cat refused to release customer list
Oil On Hand: None

Allied Oil Co.
Cleveland, Ohio
216-771-3400 Mike Swan
Use: Blended into fuel stock
Volume: 1-80 through 10-82, 1,512,948 gallons
Customer List: Would not reveal customer list, but said all CWM oil was burned in industrial boilers.
Oil On Hand: None

Beck Suppliers
1000 North Front Street
Fremont, Ohio 43420
419-332-5527 Larry Beck
Use: Blended for use as fuel
Volume: 6-82 through 7-82, 89,090 gallons
Customer List: Information is available, but Beck Suppliers would not release it to CWM at this time.
This was #2 oil which was purchased from American Standard Corp., Tiffin, Ohio and stored at the Vickery site. The oil was resold to Becks and was not blended with the #4 oil which CWM sold as fuel.

Bowling Green Street Department
Bowling Green, Ohio
419-352-0067 Dave Barber
Use: Used for dust control in streets and alleys.
Volume: 6-81, 1,709 gallons
Oil On Hand: None, the 1709 gallons were picked up at Vickery in the Bowling Green Street Department truck that spread the oil and all the oil was spread within one week.

CONFIDENTIAL

Can-Am
Box 40
Breslau, Ontario NOB 1MO
519-648-2226 Murry Crispin
Use: Solvents - Blended with waste oil and sent to cement kiln for fuel
Volume: 1-80 through 5-80, 1,421 gallons
Customer List: St. Lawrence Cement Company
2391 Lake Shore Road West
Clarkson Mississanga, Ontario L5J1K1

5/11/83

Cantrell Oil
626 North Fifth Street
Fremont, Ohio 43420
419-332-0901 Charles Cantrell
Use: Cantrell reports the product was resold as fuel
Volume: 6-81 through 7-81, 13,794 gallons
Customer List: Not available
Oil On Hand: None

Chemical Waste Management, Inc.
3106 Snyder-Domer Road
Springfield, Ohio 45002
513-969-8346 Rick Tighe
Use: Fuel for asphalt plants and drying kilns
(See customer list from CWM, Springfield, Ohio below
OLD oil was sold through the Springfield operation, it may or may not have moved through the Springfield facility).
Volume: 5-81 through 10-82, 783,761 gallons

CHEMICAL WASTE MANAGEMENT, INC.
SPRINGFIELD, OHIO
OIL SOLD 1-80 THROUGH 3-80*

Northwood Stone & Asphalt
1558 Co. Rd. 105
Belle Center, Ohio 43310
Use: Fuel for drying kiln
Volume: 631,385 gallons
Oil On Hand: 7000 gallons (estimated)
Sample: Sample picked up and analyzed by Alert Labs (See Attached Data)

United Asphalt
Box 266, Park Drive
Thornville, Ohio 43076
614-246-6315 Dick Shelley
Use: Fuel for asphalt plant
Volume: 420,462 gallons
Oil On Hand: None

CONFIDENTIAL

Staco Energy - Delrich Products
301 Gaddis Blvd.
Dayton, Ohio 45403
513-253-1191 Jim Gudgell
Use: Fuel for industrial boiler
Volume: 93,671 gallons
Oil On Hand: 4000 gallons (estimated)
Sample: Sample picked up and analyzed by Alert Labs and ETC (See Attached Data)

5 11 '83

Ray Hensley, Inc.
3790 Crabill Road
Springfield, Ohio 45502
513-323-3040 (1-800-762-3602)
Use: Fuel for asphalt plant
Volume: 105,600 gallons
Oil On Hand: None

Ohio Road Paving
Section Line Road
Delaware, Ohio 43015
614-224-8111 Chuck Rohl
Use: Fuel for asphalt plant
Volume: 66,000 gallons
Oil On Hand: None

Valley Asphalt
1901 Springboro Pike
Dayton, Ohio 45439
513-293-4119 Mel Levy
Use: Fuel for asphalt plant
Volume: 177,679 gallons
Oil On Hand: None

Brock Asphalt
S.R. 41 S.E.
Washington Court House, Ohio 43160
614-335-6301 Charles Armbrust
Use: Fuel for asphalt plant
Volume: 142,198 gallons
Oil On Hand: None

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Miami Asphalt
615 E. Dakota Street
Troy, Ohio 45373
513-335-8311 William Tanner
Use: Fuel for asphalt plant
Volume: 18,410 gallons
Oil On Hand: None

Don Cise Inc.
504 First National Bank Building
Hamilton, Ohio 45011
Use: Fuel for asphalt plant
Volume: 5,675 gallons
Oil On Hand: None

Cresent Chemical
Main Street
Weston, Ohio 43569
419-669-2041 George Beatty
Use: Blended into product used as concrete form release oil
Volume: 5-80, 3,803 gallons
Oil On Hand: 1000 to 2000 gallons in packaged product
Sample: Sample was picked up and analyzed by Alert Labs and ETC (See Attached Data)

Erie Blacktop
P.O. Box 2351
Sandusky, Ohio 44870
419-588-2618 Dean Wycol
Use: Fuel for asphalt mfg.
Volume: 1-80 through 10-82, 87,880
Oil On Hand: 500 gallons (estimated). Oil has been mixed with two other loads since our last shipment .
Sample: Sample picked up and analyzed by Alert Labs and ETC (See Attached Data)

Fluid Engineering
2500 New York Avenue
Whiting, Indiana 43694
219-932-9000 Jim Salmon
Use: Blended for use as fuel for open hearth steel furnaces and coke ovens
Volume: 12-81 through 1-82 52,652 gallons
Customer List: Fluid Engineering refused to release customer list to CWM
Oil On Hand: None (See attached analysis of our oil)

Henry Packing
924 Fremont Pike
Perrysburg, Ohio 43551
419-874-4369 Ron Henry
Use: Fuel for industrial boiler
Volume: 7-80 through 1-83 49,939 gallons
Oil On Hand: 4000 gallons (estimated)
Sample: Sample picked up and analyzed by Alert Labs and ETC (See Attached Data)

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J. E. Baker
3964 County Road #41
Millersville, Ohio 43448
419-638-2511
Use: Fuel for drying kiln and coating for RR cars
Volume: 1-81 through 1-83 68,217 gallons
Oil On Hand: None

Keenan Oil
2350 Seymour Avenue
Cincinnati, Ohio 45200
513-631-2900 Tim Wolfe
Use: Blended into fuel
Volume: 1-80 through 4-80, 36,007 gallons
Customer List: Keenan refused to release customer list
Oil On Hand: None

Kopper's
2401 Front Street
Toledo, Ohio 43605
Andy Screptack - 419-691-4641
Use: Fuel for industrial boiler
Volume: 1-80 through 4-80, 393,214 gallons
Oil On Hand: Residual amount in virtually empty 1,000,000 tank
Sample: ETC analysis attached.

Matco
P.O. Box 29
Maumee, Ohio 43557
419-893-7645 Jim Menges
Use: Fuel for asphalt plant
Volume: 6-80 through 6-82, 102,189 gallons

Michigan Petroleum
13650 Helen Street
Detroit, Michigan 48089
313-827-8579 John Picci
Use: Cutting Oil
Volume: 1-81 through 3-81 103,280 gallons
Customer List: Refused to release customer list
Oil On Hand: None

CONFIDENTIAL

Ohio Road Paving
204 Strub Road
Sandusky, Ohio 44870
419-626-4067 Bob Huff
Use: Used as fuel for asphalt plant
Volume: 1-80 through 8-80 128,990 gallons
Oil On Hand: None

Reserve Petroleum
1386 Old Free Port Road
Pittsburgh, PA 15238
412-781-5200 Don Smith
Use: Used as blend for fuel
Volume: 12-81 through 1-83, 1,638,254 gallons
Customer List: Refused to release customer list, but all fuel burned in industrial boilers
Oil On Hand: None

Sandusky Speedway
614 W. Perkins Avenue
Sandusky, Ohio 44870
419-625-4084 Dick Decker
Use:
Volume: 5-80 985 gallons
Oil On Hand: 500 gallons
Sample: Sample picked up and analyzed by Alert Labs and ETC (See Attached Data)

United Asphalt
3052 Route 20
Ashtabula, Ohio 44044
Dick Shelley - 614-246-6315
Use: Fuel for asphalt plant
Volume:
Oil On Hand: None

Wiseman Oil
Fort Pitt Federal Bldg.,524 Penn Ave.
Pittsburgh, Pa. 15222
412-262-9290
Use: Blended into fuel stock
Volume: 11-80 through 8-81, 1,368,087 gallons
Unable to reach due to bankruptcy

CONFIDENTIAL

5/11/83

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 1465 CUSTOMER: KEENAN OIL

WASTE DESCRIPTION: OUTGOING OIL COMPOSITE

DISCHARGED TO: DATE RECEIVED: 4/23/80 ANALYZED: MSC 5-23-80

RESULTS:

✓BOTTOM SLUDGE & WATER: 94% OIL 5.5% H_2O 0.5% SLUDGE

✓FLASH POINT: 337°F

✓SPECIFIC GRAVITY: 0.889

API GRAVITY:

✓CARBON: 1.9%

✓ASH: 0.5%

✓SULFUR: NONE FOUND

✓VISCOSITY: 144 SECS.

HEATING VALUES:

✓TOTAL BTU'S/lb. 18,312

✓NET BTU'S/lb. 17,030

✓CHLORIDE SCRUB: 0.007 mg/g = negligible

✓ACID SCRUB: 0.075 meq/g = 0.37% sulfuric acid

✓OIL COMPATABILITY: MIXES.

OTHER: PCB's: Lot of Polychlorinated Hydrocarbon both aromatic and aliphatic. Possible lower PCB (such as 1016, 1221, 1248 also present at trace level

COMMENTS:

BB

CONFIDENTIAL

FORM 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 1465 CUSTOMER: Keenan Oil (25122)

WASTE DESCRIPTION: OLD, dirc. fuel oil to Keenan

DISCHARGED ~~TO~~ FROM: TANK A DATE RECEIVED: 3/4/80 ANALYZED: 3/4/80

RESULTS:

* BOTTOM SLUDGE & WATER: 99% Oil 0.5% H_2O 0.5% Sludge

FLASH POINT: _____

* SPECIFIC GRAVITY: 0.875

API GRAVITY: _____

CARBON: _____

ASH: _____

SULFUR: _____

VISCOSITY: _____

HEATING VALUES:

TOTAL BTU'S/lb. _____

NET BTU'S/lb. _____

CHLORIDE SCRUB: _____

ACID SCRUB: _____

OIL COMPATABILITY: _____

OTHER: _____

CONFIDENTIAL

COMMENTS: _____

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 1467 CUSTOMER: Keenan Oil (25273)

WASTE DESCRIPTION: Oil

DISCHARGED TO: DATE RECEIVED: 3/10/80 ANALYZED: 3/10/80

RESULTS:

BOTTOM SLUDGE & WATER: 90% Oil 8% H_2O 2% Sludge

FLASH POINT:

SPECIFIC GRAVITY: 0.894

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 844 CUSTOMER: Henry Packing (26950)

WASTE DESCRIPTION: ~~[illegible]~~ OLD Waste oil to Henry Packing

DISCHARGED TO: DATE RECEIVED: 2/25/80 ANALYZED: 2/25/80

RESULTS:

* BOTTOM SLUDGE & WATER: 99.5% Oil .5% H_2O

FLASH POINT:

* SPECIFIC GRAVITY: 0.850

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.

LABORATORY REPORT FORM

FOR OIL

NW 1171 CUSTOMER: Crescent Chem 26573

WASTE DESCRIPTION: Dirt - oil

DISCHARGED TO: DATE RECEIVED: 2/6/80 ANALYZED:

RESULTS:

% BOTTOM SLUDGE & WATER: 97 oil

FLASH POINT:

SPECIFIC GRAVITY: .896

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

COMMENTS:

CONFIDENTIAL

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

Special

NW#: 2186 CUSTOMER: Fluid Engineering, Whiting, IN.

WASTE DESCRIPTION: Fuel Oil Outgoing; Tank W-6 composite

DISCHARGED TO: Special DATE RECEIVED: 12-3-81 ANALYZED: 12/15/81

RESULTS:

✓ BOTTOM SLUDGE & WATER: 98.8% oil 0.1% H_2O 1.1% sludge

✓ closed cup FLASH POINT: 105°F

✓ SPECIFIC GRAVITY: 0.892

✓ API GRAVITY: 26.9

CARBON:

ASH:

✓ SULFUR: 1.23 %

✓ VISCOSITY: 111 SSU

✓ HEATING VALUES:

✓ TOTAL BTU'S/lb. 17,900

✓ NET BTU'S/lb. 16,700

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER: Pour Point: below 20°F.

ASTM D95,46 Water Distillation: (38) 1.0%

COMMENTS: Samples taken at 1 ft. intervals and composited.

CONFIDENTIAL

Form 214

copy to D.E. 12/16/81

CHEMICAL WASTE MANAGEMENT, INC.

CUSTOMER SAMPLE REPORT

Custom Special

~~NW#~~ Koppers Tank - 571 - F2 DATE RECV'D: 5-6-83

CUSTOMER: Koppers DATE RUN: 6-6-83

SAMPLE CODE: X-Koppers DISCHARGED TO: Lab

SAMPLE IDENTIFICATION: Oil from customer

COLOR:

TEST RESULTS

PH	PHENOL
TOTAL AL or AC	CL
SS	SO_4
DS	COND.
TS	SpGr
ASH	
CO	
O&G( )	
FLASH	

REACTION/POND 5:

OTHER TESTS: PCB's 120ppm 1248
85ppm 1254+1260 combine
James E Maggay, Alert Sales
205ppm Aroclor

REMARKS:

CONFIDENTIAL

LAP

Form 202

~~ANALYST~~: BB

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 260600

WASTE DESCRIPTION: Outgoing Oil

DISCHARGED TO: Tank A DATE RECEIVED: 1/12/80 ANALYZED: 1/12/80

RESULTS:

BOTTOM SLUDGE & WATER: 99% Oil, 0.75% H2O, 0.25% Sldg.

FLASH POINT:

SPECIFIC GRAVITY: 0.925

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

CONFIDENTIAL

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 260055

WASTE DESCRIPTION: Outgoing oil

DISCHARGED TO: Tank D DATE RECEIVED: 1/12/80 ANALYZED: 1/12/80

RESULTS:

BOTTOM SLUDGE & WATER: 99% Oil; 0.75% H2O; 0.25% Sldg

FLASH POINT:

SPECIFIC GRAVITY: 0.920

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

CONFIDENTIAL

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26065

WASTE DESCRIPTION: Outgoing Oil

DISCHARGED TO: Tank A DATE RECEIVED: 1/12/80 ANALYZED: 1/12/80

RESULTS:

BOTTOM SLUDGE & WATER: 99% Oil, 0.75% H_2O, 0.25% Sldg

FLASH POINT:

SPECIFIC GRAVITY: 0.922

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

CONFIDENTIAL

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26068

WASTE DESCRIPTION: Outgoing Oil

DISCHARGED TO: Tank A DATE RECEIVED: 1/13/80 ANALYZED: 1/13/80

RESULTS:

BOTTOM SLUDGE & WATER: 98.5% Oil; 1.2% H_2O; 0.3% Sldg.

FLASH POINT:

SPECIFIC GRAVITY: 0.912

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

CONFIDENTIAL

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26069

WASTE DESCRIPTION: Outgoing

DISCHARGED TO: Tank D DATE RECEIVED: 1/13/80 ANALYZED: 1/13/80

RESULTS:

BOTTOM SLUDGE & WATER: 99.5% OS; 0.3% H_2O; 0.2% Sldg

FLASH POINT:

SPECIFIC GRAVITY: 0.913

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

CONFIDENTIAL

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26096

WASTE DESCRIPTION: Outgoing OD

DISCHARGED TO: W-2 DATE RECEIVED: 1/14/80 ANALYZED: 1/14/80

RESULTS:

BOTTOM SLUDGE & WATER: 98% oil; 1.5% H_2O; 0.5% Sldg

FLASH POINT:

SPECIFIC GRAVITY: 0.909

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26662

WASTE DESCRIPTION: Out-oil

DISCHARGED TO: A-B-C-D DATE RECEIVED: 2/11/80 ANALYZED:

RESULTS:

% BOTTOM SLUDGE & WATER: 94 oil

FLASH POINT:

SPECIFIC GRAVITY: 0.922

API GRAVITY: 22

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26650

WASTE DESCRIPTION: Cut-oil

DISCHARGED TO: A DATE RECEIVED: 2/9/80 ANALYZED:

RESULTS:

% BOTTOM SLUDGE & WATER: 97 oil

FLASH POINT:

SPECIFIC GRAVITY: 0.916

API GRAVITY: 23 @ 80°

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

COMMENTS:

CONFIDENTIAL

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26656

WASTE DESCRIPTION: Cut-oil

DISCHARGED TO: A+B DATE RECEIVED: 2/10/80 ANALYZED:

RESULTS:

% BOTTOM SLUDGE & WATER: 96 oil

FLASH POINT:

SPECIFIC GRAVITY: 0.925

API GRAVITY: 21.4

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26657

WASTE DESCRIPTION: Out-oil

DISCHARGED TO: A DATE RECEIVED: 2/10/80 ANALYZED:

RESULTS:

% BOTTOM SLUDGE & WATER: 97 oil

FLASH POINT:

SPECIFIC GRAVITY: 0.904

API GRAVITY: 25.1 @ 138°

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26660

WASTE DESCRIPTION: Cut-oil

DISCHARGED TO: A+B DATE RECEIVED: 2/12/80 ANALYZED:

RESULTS:

% BOTTOM SLUDGE & WATER: 47 oil

FLASH POINT:

SPECIFIC GRAVITY: 0.917

API GRAVITY: 22.8

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26647

WASTE DESCRIPTION: Cut-oil

DISCHARGED TO: ? DATE RECEIVED: 2/8/86 ANALYZED:

RESULTS:

% BOTTOM SLUDGE & WATER: 47 oil 0 H_2O 3 Sludge

FLASH POINT:

SPECIFIC GRAVITY: 0.911

API GRAVITY: 23.8 @ 90°

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 27922

WASTE DESCRIPTION: ~~Ou~~ Outgoing Oil

DISCHARGED TO: Tank A DATE RECEIVED: 1/5/80 ANALYZED: 1/5/80

RESULTS:

BOTTOM SLUDGE & WATER: 99% Oil; 0.75% H_2O; 0.25% Sldg.

FLASH POINT:

SPECIFIC GRAVITY: 0.910

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

CONFIDENTIAL

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 27925

WASTE DESCRIPTION: Outgoing Oil

DISCHARGED TO: Tank B DATE RECEIVED: 1/6/80 ANALYZED: 1/6/80

RESULTS:

BOTTOM SLUDGE & WATER: 97% Oil; 3% H_2O

FLASH POINT:

SPECIFIC GRAVITY: 0.910

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 27912

WASTE DESCRIPTION: Outgoing Oil

DISCHARGED TO: Tank A DATE RECEIVED: 1/5/80 ANALYZED: 1/5/80

RESULTS:

BOTTOM SLUDGE & WATER: 99% Oil; 0.75% H_2O; 0.25% Sldg

FLASH POINT:

SPECIFIC GRAVITY: 0.905

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

CONFIDENTIAL

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 27821

WASTE DESCRIPTION: Oil (outgoing)

DISCHARGED TO: Tank C DATE RECEIVED: 1/1/80 ANALYZED: 1/1/80

RESULTS:

BOTTOM SLUDGE & WATER: 99.6% Oil; 0.2% H_2O; 0.2% Sldg.

FLASH POINT:

SPECIFIC GRAVITY: 0.907

API GRAVITY: 24.6

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 27822

WASTE DESCRIPTION: Oil (antgoing)

DISCHARGED TO: Tank C DATE RECEIVED: 1/1/80 ANALYZED: 1/1/80

RESULTS:

BOTTOM SLUDGE & WATER: 99.6% Oil; 0.2% H_2O; 0.2% Slag

FLASH POINT:

SPECIFIC GRAVITY: 0.907

API GRAVITY: 24.6

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 27909

WASTE DESCRIPTION: Outgoing O.D

DISCHARGED TO: B+D DATE RECEIVED: 1/5/80 ANALYZED: 1/5/80

RESULTS:

BOTTOM SLUDGE & WATER: 99% O.D; 0.75% H_2O; 0.25% Sldg

FLASH POINT:

SPECIFIC GRAVITY: 0.910

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 27923

WASTE DESCRIPTION: Outgoing Oil

DISCHARGED TO: Tank A DATE RECEIVED: 1/6/80 ANALYZED: 1/6/80

RESULTS:

BOTTOM SLUDGE & WATER: 99% Oil; 0.75% H_2O; 0.25% Sldg

FLASH POINT:

SPECIFIC GRAVITY: 0.900

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26151

WASTE DESCRIPTION: Outgoing Oil

DISCHARGED TO: W-2 DATE RECEIVED: 1/17/80 ANALYZED: 1/17/80

RESULTS:

BOTTOM SLUDGE & WATER: 98.5% Oil; 1.0% H_2O; 0.5% Sldg

FLASH POINT:

SPECIFIC GRAVITY: 0.906

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26124

WASTE DESCRIPTION: Outgoing Oil

DISCHARGED TO: W-2 DATE RECEIVED: 1/16/80 ANALYZED: 1/16/80

RESULTS:

BOTTOM SLUDGE & WATER: 98.5% Oil; 1.0% H_2O; 0.5% Sldg

FLASH POINT:

SPECIFIC GRAVITY: 0.907

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

CONFIDENTIAL

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 603 CUSTOMER: Kenrow 26208

WASTE DESCRIPTION: Cutting Oil

DISCHARGED TO: Tank A DATE RECEIVED: 1/20/80 ANALYZED: 1/20/80

RESULTS:

BOTTOM SLUDGE & WATER: 99% OIL; 1% H_2O

FLASH POINT:

SPECIFIC GRAVITY: 0.90

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

CONFIDENTIAL

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26209

WASTE DESCRIPTION: Outgoing Oil

DISCHARGED TO: Tank A DATE RECEIVED: 1/20/80 ANALYZED: 1/20/80

RESULTS:

BOTTOM SLUDGE & WATER: 96% Oil; 3.5% H_2O; 0.5% Silica

FLASH POINT:

SPECIFIC GRAVITY: 0.910

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

CONFIDENTIAL

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Eppers 26206

WASTE DESCRIPTION: Outgoing Oil

DISCHARGED TO: Tank A DATE RECEIVED: 1/19/80 ANALYZED: 1/19/80

RESULTS:

BOTTOM SLUDGE & WATER: 99% Oil, 1% H_2O

FLASH POINT:

SPECIFIC GRAVITY: 0.950

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

CONFIDENTIAL

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26246

WASTE DESCRIPTION: Outgoing Oil

DISCHARGED TO: Tank A DATE RECEIVED: 1/22/80 ANALYZED: 1/22/80

RESULTS:

BOTTOM SLUDGE & WATER: 92% Oil; 7.5% H_2O; 0.5% Sldg

FLASH POINT:

SPECIFIC GRAVITY: 0.940

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

CONFIDENTIAL

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26322

WASTE DESCRIPTION: Outgoing Oil

DISCHARGED TO: Tank A DATE RECEIVED: 1/25/80 ANALYZED: 1/25/80

RESULTS:

BOTTOM SLUDGE & WATER: 98.8% Oil, 1% H_2O, 0.2% Sldg

FLASH POINT:

SPECIFIC GRAVITY: 0.916

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26213

WASTE DESCRIPTION: Outgoing Oil

DISCHARGED TO: Tank A+B DATE RECEIVED: 1/21/80 ANALYZED: 1/21/80

RESULTS:

BOTTOM SLUDGE & WATER: 98% OIL; 1.5% H_2O; 0.5% Sldg

FLASH POINT:

SPECIFIC GRAVITY: 0.890

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

CONFIDENTIAL

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26262

WASTE DESCRIPTION: Outgoing Oil

DISCHARGED TO: Tank A+D DATE RECEIVED: 1/22/80 ANALYZED: 1/22/80

RESULTS:

BOTTOM SLUDGE & WATER: 98% Oil; 1.5% H_2O; 0.5% Sldg

FLASH POINT:

SPECIFIC GRAVITY: 0.910

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26337

WASTE DESCRIPTION: Outgoing Oil

DISCHARGED TO: Tank A DATE RECEIVED: 1/25/80 ANALYZED: 1/25/80

RESULTS:

BOTTOM SLUDGE & WATER: 97% 0.1; 2.75% H_2O; 0.25% Sldg

FLASH POINT:

SPECIFIC GRAVITY: 0.898

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

COMMENTS:

CONFIDENTIAL

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26359

WASTE DESCRIPTION: outgoing Oil

DISCHARGED TO: Tank A DATE RECEIVED: 1/26/80 ANALYZED: 1/26/80

RESULTS:

BOTTOM SLUDGE & WATER: 86% Oil; 13% H_2O; 1% Sldg

FLASH POINT:

SPECIFIC GRAVITY: 0.916

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26362

WASTE DESCRIPTION: Outgoing oil

DISCHARGED TO: Tank ABLD DATE RECEIVED: 1/27/80 ANALYZED: 1/27/80

RESULTS:

BOTTOM SLUDGE & WATER: 92% oil; 7.5% H_2O; 0.5% Sldg

FLASH POINT:

SPECIFIC GRAVITY: .920

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26363

WASTE DESCRIPTION: Outgoing Oil

DISCHARGED TO: ABLD DATE RECEIVED: 1/27/80 ANALYZED: 1/27/80

RESULTS:

BOTTOM SLUDGE & WATER: 92% Oil; 7.5% H_2O; 0.5% Sldg

FLASH POINT:

SPECIFIC GRAVITY: 0.916

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26366

WASTE DESCRIPTION: outgoing oil

DISCHARGED TO: tank ABLD DATE RECEIVED: 1/27/80 ANALYZED: 1/27/80

RESULTS:

BOTTOM SLUDGE & WATER: 97% oil; 2.75% H_2O; 0.25% Sldg

FLASH POINT:

SPECIFIC GRAVITY: 0.910

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26390

WASTE DESCRIPTION: Outgoing Oil

DISCHARGED TO: Tank A DATE RECEIVED: 1/29/80 ANALYZED: 1/29/80

RESULTS:

BOTTOM SLUDGE & WATER: 96% Oil, 3.5% H_2O, 0.5% Sldg

FLASH POINT:

SPECIFIC GRAVITY: 0.922

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

COMMENTS:

CONFIDENTIAL

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26439

WASTE DESCRIPTION: Outgoing Oil

DISCHARGED TO: Tank DATE RECEIVED: 1/31/80 ANALYZED: 1/31/80

RESULTS:

BOTTOM SLUDGE & WATER: 97% Oil; 2.5% H_2O; 0.5% Slag

FLASH POINT:

SPECIFIC GRAVITY: 0.910

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

CONFIDENTIAL

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26690

WASTE DESCRIPTION: Cut oil

DISCHARGED TO: AFCD DATE RECEIVED: 2/12/80 ANALYZED:

RESULTS:

% BOTTOM SLUDGE & WATER: 92 oil 5 H_2O 3 Sludge

FLASH POINT:

SPECIFIC GRAVITY:

API GRAVITY: 24.8

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26661

WASTE DESCRIPTION: Cut-oil

DISCHARGED TO: A DATE RECEIVED: 2/10/80 ANALYZED:

RESULTS:

% BOTTOM SLUDGE & WATER: 97 oil

FLASH POINT:

SPECIFIC GRAVITY: 0.916

API GRAVITY: 22.9

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26544

WASTE DESCRIPTION: Out-oil

DISCHARGED TO: DATE RECEIVED: 2/5/80 ANALYZED:

RESULTS:

% BOTTOM SLUDGE & WATER: 99

FLASH POINT:

SPECIFIC GRAVITY: 0.925

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

CONFIDENTIAL

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26508

WASTE DESCRIPTION: Out- oil

DISCHARGED TO: DATE RECEIVED: 2/3/80 ANALYZED:

RESULTS:

% BOTTOM SLUDGE & WATER: 99 oil

FLASH POINT:

SPECIFIC GRAVITY: 0.910

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

CONFIDENTIAL

OIL COMPATABILITY:

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: 26509 (Koppers)

WASTE DESCRIPTION: Cut-oil

DISCHARGED TO: DATE RECEIVED: 2/4/80 ANALYZED:

RESULTS:

% BOTTOM SLUDGE & WATER: 99 oil

FLASH POINT:

SPECIFIC GRAVITY: 0.900

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

COMMENTS:

CONFIDENTIAL

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26500

WASTE DESCRIPTION: Out- oil

DISCHARGED TO: DATE RECEIVED: 2/2/80 ANALYZED:

RESULTS:

% BOTTOM SLUDGE & WATER: 98 oil

FLASH POINT:

SPECIFIC GRAVITY: 0.917

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CONFIDENTIAL

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

COMMENTS:

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Keppers 26503

WASTE DESCRIPTION: Out- oil

DISCHARGED TO: DATE RECEIVED: 2/2 ANALYZED:

RESULTS:

% BOTTOM SLUDGE & WATER: 98 oil

FLASH POINT:

SPECIFIC GRAVITY: 0.910

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CONFIDENTIAL

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26506

WASTE DESCRIPTION: Out- oil

DISCHARGED TO: DATE RECEIVED: 2/3 ANALYZED:

RESULTS:

% BOTTOM SLUDGE & WATER: 99 oil

FLASH POINT:

SPECIFIC GRAVITY: 0.922

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

CONFIDENTIAL

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26473

WASTE DESCRIPTION: Out- oil

DISCHARGED TO: DATE RECEIVED: ANALYZED:

RESULTS:

% BOTTOM SLUDGE & WATER: 99 oil

FLASH POINT:

SPECIFIC GRAVITY: 0.922

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CONFIDENTIAL

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW: 93 CUSTOMER: Koppers 26571

WASTE DESCRIPTION: Out-oil

DISCHARGED TO: DATE RECEIVED: 2/6 ANALYZED:

RESULTS:

% BOTTOM SLUDGE & WATER: 97 oil

FLASH POINT:

SPECIFIC GRAVITY: 0.883

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

1 : 93 CUSTOMER: Koppers 26765

WASTE DESCRIPTION: Out-oil

DISCHARGED TO: ABC DATE RECEIVED: 2/15/80 ANALYZED: Baumer

RESULTS:

% BOTTOM SLUDGE & WATER: 98 oil, 1 H_2O, 1 sludge

FLASH POINT:

SPECIFIC GRAVITY: 0.855

API GRAVITY: 25.7 @ 90°F

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

COMMENTS:

CONFIDENTIAL

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

N . 93 CUSTOMER: Koppers 26748

WASTE DESCRIPTION: Out-oil

DISCHARGED TO: A DATE RECEIVED: 2/14 ANALYZED: Baumer

RESULTS:

% BOTTOM SLUDGE & WATER: 97 oil 2 H_2O 1 sludge

FLASH POINT:

SPECIFIC GRAVITY: 0.899

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26826

WASTE DESCRIPTION: Outgoing oil

DISCHARGED TO: A DATE RECEIVED: 2/18/80 ANALYZED: KA

RESULTS:

BOTTOM SLUDGE & WATER: 97% oil

FLASH POINT:

SPECIFIC GRAVITY: 25.0 API 0.904

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

COMMENTS:

CONFIDENTIAL

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Kappers 26816

WASTE DESCRIPTION: Cut-oil

DISCHARGED TO: A DATE RECEIVED: 2/18/80 ANALYZED: Barner

RESULTS:

% BOTTOM SLUDGE & WATER: 98 0.1

FLASH POINT:

SPECIFIC GRAVITY: 0.860

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

COMMENTS:

CONFIDENTIAL

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26793

WASTE DESCRIPTION: Out oil

DISCHARGED TO: A DATE RECEIVED: 2/16/80 ANALYZED: Fisher

RESULTS:

% BOTTOM SLUDGE & WATER: 84 oil

FLASH POINT:

SPECIFIC GRAVITY: 0.882

API GRAVITY: 22.7 @ 90°F

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

COMMENTS:

CONFIDENTIAL

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Keppers 26797

WASTE DESCRIPTION: Out - oil

DISCHARGED TO: A DATE RECEIVED: 2/16/80 ANALYZED: Fisher

RESULTS:

% BOTTOM SLUDGE & WATER: 70 oil

FLASH POINT:

SPECIFIC GRAVITY: 0.893

API GRAVITY:

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26798

WASTE DESCRIPTION: Out-oil

DISCHARGED TO: A DATE RECEIVED: 2/17/80 ANALYZED: Fisher

RESULTS:

% BOTTOM SLUDGE & WATER: 99.5 oil

FLASH POINT:

SPECIFIC GRAVITY: 0.835

API GRAVITY: 27.5 @ 112°F

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Rappers 26799

WASTE DESCRIPTION: Out-oil

DISCHARGED TO: A DATE RECEIVED: 2/17/80 ANALYZED: 9± mm ?

RESULTS:

% BOTTOM SLUDGE & WATER: 99 oil

FLASH POINT:

SPECIFIC GRAVITY: 0.850

API GRAVITY: 27

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26801

WASTE DESCRIPTION: Out - oil

DISCHARGED TO: AC & D DATE RECEIVED: 2/18/80 ANALYZED: US

RESULTS:

% BOTTOM SLUDGE & WATER: 70 oil

FLASH POINT:

SPECIFIC GRAVITY: 0.887

API GRAVITY: 23.3

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26805

WASTE DESCRIPTION: Out- oil

DISCHARGED TO: A DATE RECEIVED: 2/18/80 ANALYZED: Bauer

RESULTS:

% BOTTOM SLUDGE & WATER: 95 oil 3 H_2O 2 Sludge

FLASH POINT:

SPECIFIC GRAVITY: 0.887

API GRAVITY: 23

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26789

WASTE DESCRIPTION: Out-oil

DISCHARGED TO: A DATE RECEIVED: 2/15/80 ANALYZED: Adams

RESULTS:

% BOTTOM SLUDGE & WATER: 96 oil

FLASH POINT:

SPECIFIC GRAVITY: 0.904

API GRAVITY: 21.5

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

CONFIDENTIAL

OTHER:

COMMENTS:

Form 214

OHIO LIQUID DISPOSAL, INC.
LABORATORY REPORT FORM
FOR OIL

NW#: 93 CUSTOMER: Koppers 26783

WASTE DESCRIPTION: Out- oil

DISCHARGED TO: A DATE RECEIVED: 2/15/80 ANALYZED: Adams

RESULTS:

% BOTTOM SLUDGE & WATER: 99 oil 1 H2O - Sludge

FLASH POINT:

SPECIFIC GRAVITY: 0.870

API GRAVITY: 25- at 90°F

CARBON:

ASH:

SULFUR:

VISCOSITY:

HEATING VALUES:

TOTAL BTU'S/lb.

NET BTU'S/lb.

CONFIDENTIAL

CHLORIDE SCRUB:

ACID SCRUB:

OIL COMPATABILITY:

OTHER:

COMMENTS:

Form 214

Caleb Brett U.S.A., Inc.
P.O. Box 1321
Bridgeview, Il 60455
(312) 430-3313

RECEIVED
APR 14 '83
CWM/Columbus

Caleb Brett

Marine bulk oil surveyors
Cargo superintendents
Analytical and Testing Laboratories
Tank calibrators

(312) 496-0976 - 24 Hr. Emergency No.

December 4,1981
Ref. No. CHI 81-4476

TO: Fluids Engineering
2500 New York Avenue
Whiting, Indiana 46394
Attn: Mr. Lanning

SAMPLE OF: FE-400

DRAWN BY: Caleb Brett U.S.A., Inc.

REPRESENTING: Shore Tank #6 - December 4,1981

HEAD OFFICE:
P.O. Box 12973
Houston Texas 77017
Telephone (713) 946 2420
Telex 775548

EAST COAST CONTROL OFFICE:
1426 E. Elizabeth Avenue
Linden New Jersey 07036
Telephone (201) 925-8282
(212) 267 6088
Telex 138851

BRANCH OFFICES:
Baton Rouge, Louisiana
Boston, Massachusetts
Chicago, Illinois
Corpus Christi, Texas
Honolulu, Hawaii
Ironton, Ohio
Kenova, W. Virginia
Lake Charles, Louisiana
Los Angeles, California
New Orleans, Louisiana
Pascagoula, Mississippi
Philadelphia, Pennsylvania
Pittsburgh, Pennsylvania
Ponce, Puerto Rico
Port Neches, Texas
San Francisco, California
Seattle, Washington
Tampa, Florida
Texas City, Texas
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Yorktown, Virginia

ADDITIONAL OFFICES IN:
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Belgium/Bonaire N.A.
Canada/Cayman
Curaco N.A./Denmark
Ghana/Greece/Holland
Italy/Malaysia/Middle East
Nigeria/Panama/S. Africa
Singapore/Spain/U.K.
West Germany

Correspondents at other principal world ports

REPORT OF ANALYSIS

TESTS	RESULTS
Gravity, API @ 60°F	27.0
Sulfur	1.49%
Viscosity, SSU @ 100°F	83.4 sec.
Pour Point	-35°F
Flash Point P.M.	105°F
BTU Content	143,700/gal
Water by Distillation	0.95%

CONFIDENTIAL

The following is 1 ft. testing of Shore Tank in chronological order: Bottom Sediment & Water

1.	9.0%	13.	0.7%	25.	0.7%
2.	7.8%	14.	0.7%	26.	0.7%
3.	6.0%	15.	0.7%	27.	0.7%
4.	5.8%	16.	0.7%	28.	0.7%
5.	4.0%	17.	0.7%	29.	0.7%
6.	3.0%	18.	0.7%	30.	0.7%
7.	2.0%	19.	0.7%	31.	0.7%
8.	1.4%	20.	0.7%	32.	0.7%
9.	1.0%	21.	0.7%	33.	0.6%
10.	0.8%	22.	0.7%	34.	0.6%
11.	0.8%	23.	0.7%	35.	0.6%
12.	0.8%	24.	0.7%	36.	0.6%

BY: Paul F. Bachman
Paul F. Bachman
Area Manager

OFFICERS J. B. Robinson (President), G. S. Everett Exe. Vice President
A. Flores (Vice President), L. D. Rhinehart (Vice President), G. A. White (Vice President), S. J. Lechanc (Vice President)

Caleb Brett

Marine bulk oil surveyors
Cargo superintendents
Analytical and Testing Laboratories
Tank calibrators

Caleb Brett U.S.A., Inc.
P.O. Box 1321
Bridgeview, Il. 60455
(312) 430-3313

(312) 496-0976 - 24 Hr. Emergency No.

REF. NO. CHI81-4621

TO: Fluid Engineering
2500 New York Ave.
Whiting, Indiana 46394
Attn: Al Lanning

SAMPLE OF: FE-400

DRAWN BY: Retained Sample

REPRESENTING: S/T #6 - December 29,1981

The above sample was examined and the following results obtained:

REPORT OF ANALYSIS

TESTS	RESULTS
Conradson Carbon	1.58%
Lead Content	12 ppm
Vanadium	0.6 ppm
Vacuum Distillation ASTM D1160	
Initial Boiling Point	<400°F
10% Recovered @	<400
20% Recovered @	533
30% Recovered @	634
40% Recovered @	691
50% Recovered @	710
60% Recovered @	750
70% Recovered @	791
80% Recovered @	833
Cracking Temp.	883
% Recovery	90%
Residue	1%
Loss	9%

CONFIDENTIAL

By: Joseph A. Nezgoda
Joseph A. Nezgoda
Chief Chemist

HEAD OFFICE:
P.O. Box 12973
Houston Texas 77017
Telephone (713) 946-2420
Telex 775548

EAST COAST CONTROL OFFICE:
1429 E. Elizabeth Avenue
Linden, New Jersey 07036
Telephone (201) 925-8282
(212) 267-6088
Telex 138851

BRANCH OFFICES:
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Pascagoula, Mississippi
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San Francisco, California
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Tampa, Florida
Texas City, Texas
Valdez, Alaska
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Singapore / Spain / U.K.
West Germany

Correspondents at other principal world ports

OFFICERS. J.B. Robinson (President) G.S. Everett (Snr. Vice President)
A. Flores (Vice President) L.D. Rhinehart (Vice President) G.A. Withell (Vice President)

Caleb Brett

Caleb Brett U.S.A., Inc.

Marine bulk oil surveyors
Cargo superintendents
Analytical and Testing Laboratories
Tank calibrators

REF. NO. CHI81-4506

TO: Fluids Engineering
2500 New York Avenue
Whiting, Indiana 46394
Attn: Al Lanning

SAMPLE OF: FE-400

DRAWN BY: Retain Sample

REPRESENTING: Shore Tank #6- December 7, 1981.

The above sample was examined and the following results obtained:

REPORT OF ANALYSIS

TESTS	RESULTS
Ash %	1.40%
Organic Chloride	22 ppm
Inorganic Chloride	2 ppm
PCB	None Detected (Detection limit is 1 ppm as Arochlor 1260)

CONFIDENTIAL

By: Joseph A. Nezgoda
Joseph A. Nezgoda
Chief Chemist

HEAD OFFICE:
P O Box 12973
Houston Texas 77017
Telephone (713) 946-2420
Telex 775548

EAST COAST CONTROL OFFICE:
1428 E Elizabeth Avenue
Linden New Jersey 07036
Telephone (201) 925-8282
(212) 267-6088
Telex 138851

BRANCH OFFICES:
Baton Rouge, Louisiana
Chicago, Illinois
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nova, W. Virginia
ke Charles, Louisiana
Los Angeles, California
New Orleans, Louisiana
Pascagoula, Mississippi
Philadelphia, Pennsylvania
Ponce, Puerto Rice
Port Neches, Texas
San Francisco, California
Seattle, Washington
Tampa, Florida
Texas City, Texas
Valdez, Alaska
Yorktown, Virginia

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Canada / Cayman
Curacao N A / Denmark
Ghana / Greece / Holland
Italy / Malaysia / Middle East
Nigeria / Panama / S Africa
Singapore / Spain / U.K.
West Germany

Correspondents at other principal world ports

OFFICERS: J.B. Robinson (President) G.S. Everett (Snr. Vice President)
A Flores (Vice President) L.D. Rhinehart (Vice President) G A Withell (Vice President)

ALERT
ANALYTICAL LABORATORIES AND ENVIRONMENTAL RESPONSE TEAM
P.O. Box 208 CANTON, OHIO 44701 ☐ 24-Hour ALERT LINE (216) 454-8304

Chemical Waste Management, Inc.
Vickery, Ohio

Customer Sample Analytical Log

PCB Analysis by
Alert Labs

DATE	CUSTOMER	CODE	RESULT	ANALYST SIGNATURE
4/15	Sandusky Motor Speedway	F-2 (#452)	< 2 ppm	James E Magary, Alert Labs
4/15	Henry Packing	F-2 (#457)	< 7 ppm	James E Magary, Alert Labs
4/21	STACO	St-S1	<10 ppm	James E Magary, Alert Labs
		St-S2	<10 ppm	James E Magary, Alert Labs
5/4	Crescent Chemical	X Crescent	<5 ppm	James E Magary, Alert Labs
5/6	Erie Blacktop	X Erie	<15 ppm	James E Magary, Alert Labs

CONFIDENTIAL

ETC ENVIRONMENTAL TESTING and CERTIFICATION

May 17, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water Inc.	SITE 690	See Below			

ETC Sample Number	Sample Point	Results						QC Spike	
		Aroclor 1242		Aroclor 1254		Aroclor 1260		1260	
		Concen. mg/kg	MDL* mg/kg	Concen. mg/kg	MDL* mg/kg	Concen. mg/kg	MDL* mg/kg	Added mg/kg	% Recov.
C2785S	Matrix Spike	<10	10	<10	10	18	10	20	90
C2784R	Replicate 1	<500	500	<10	10	<10	10	-	-
C2784	XERIE-CS 050683 1735	<500	500	<10	10	<10	10	-	-
C2785	XDELCO-CS 050683 1735	<10	10	<10	10	<10	10	-	-

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* MDL calculated for each sample matrix.

< indicates compound was less than the sample MDL.

ETC 'VIRONMENTAL . ESTING and CERTIFICATION

May 16, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water Inc.	SITE 690	See Below			

ETC Sample Number	Sample Point	Results						QC Spike	
		Aroclor 1242		Aroclor 1254		Aroclor 1260		1260	
		Concen. mg/kg	MDL* mg/kg	Concen. mg/kg	MDL* mg/kg	Concen. mg/kg	MDL* mg/kg	Added mg/kg	% Recov.
C2756S	Matrix Spike	<10	10	<10	10	15	10	20	75
C2748R	Replicate 1	<250	250	176	10	43	10	-	-
C2748	XW-2-COMP 050583 0900	<250	250	260	10	58	10	-	-
C2750	XSOT-COMP 050583 1135	<500	500	525	10	71.5	10	-	-
C2753	BL5-2-1 050583 1635	<250	250	81	10	17	10	-	-
C2756	XCRESCENT 050483 1400	<10	10	<10	10	<10	10	-	-
C2757	BL7-1-1 050383 1750	<250	250	42.3	10	<10	10	-	-
C2766	BL5-3-1 050583 1715	<250	250	98	10	19.8	10	-	-
C2767	BL5-4-2 050583 1845	<250	250	28	10	<10	10	-	-
C2768	BL5-1-1 050583 1425	<250	250	100	10	23	10	-	-
C2771	BL5-4-1 050583 1845	<250	250	195	10	28.5	10	-	-

* MDL calculated for each sample matrix.
< indicates compound was less than the sample MDL.

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ETC ENVIRONMENTAL TESTING and CERTIFICATION

May 27, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water Inc.	SITE 690-C	See Below			

ETC Sample Number	Sample Point	Results						QC Spike	
		Aroclor 1242 Concen. mg/kg	Aroclor 1242 MDL* mg/kg	Aroclor 1254 Concen. mg/kg	Aroclor 1254 MDL* mg/kg	Aroclor 1260 Concen. mg/kg	Aroclor 1260 MDL* mg/kg	1260 Added mg/kg	% Recov.
C3328S	Matrix Spike	<10	10	<10	10	17.5	10	20	88
C3327R	Replicate 1	<10	10	26	10	32.5	10	-	-
C3327	XKoppers Tank	<10	10	26	10	32.5	10	-	-
C3328	Old Inter Lake Pond & Tank XLake	<10	10	<10	10	<10	10	-	-

* MDL calculated for each sample matrix.
< indicates compound was less than the sample MDL.

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ETC ENVIRONMENTAL TESTING and CERTIFICATION

May 27, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water Inc.	SITE 690	See Below			

ETC Sample Number	Sample Point	Results: Aroclor 1242 Concen. mg/kg	Aroclor 1242 MDL* mg/kg	Aroclor 1254 Concen. mg/kg	Aroclor 1254 MDL* mg/kg	Aroclor 1260 Concen. mg/kg	Aroclor 1260 MDL* mg/kg	QC Spike: 1260 Added mg/kg	% Recov.
C1743S	Matrix Spike	<10	10	<10	10	19.4	10	20	97
C2236R	Replicate 1	<10	10	<10	10	<10	10	-	-
C2236	Oil Special ST-51 STACO	<10	10	<10	10	<10	10	-	-
C2237	Oil Special ST-52 STACO	<10	10	<10	6	<10	10	-	-

* MDL calculated for each sample matrix.
< indicates compound was less than the sample MDL.

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ETC ENVIRONMENTAL TESTING and CERTIFICATION

May 27, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water Inc.	SITE 690-C	See Below			

ETC Sample Number	Sample Point	Results: Aroclor 1242 Concen. mg/kg	Aroclor 1242 MDL* mg/kg	Aroclor 1254 Concen. mg/kg	Aroclor 1254 MDL* mg/kg	Aroclor 1260 Concen. mg/kg	Aroclor 1260 MDL* mg/kg	QC Spike: 1260 Added mg/kg	% Recov.
C1743S	Matrix Spike	<10	10	<10	10	19.4	10	20	97
C2236R	Replicate 1	<10	10	<10	10	<10	10	-	-
C1742	#452 F-1 Sandusky Motor	<10	10	<10	10	<10	10	-	-
C1743	#457 F-1 Henry Pickerz	<10	10	<10	10	<10	10	-	-

* MDL calculated for each sample matrix.
< indicates compound was less than the sample MDL.

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ETC ENVIRONMENTAL TESTING and CERTIFICATION

June 17, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water Inc.	SITE690	See Below			

ETC Sample Number	Sample Point	Results: Aroclor 1242 Concen. ug/l	Aroclor 1242 MDL* ug/l	Aroclor 1254 Concen. ug/l	Aroclor 1254 MDL* ug/l	Aroclor 1260 Concen. ug/l	Aroclor 1260 MDL* ug/l	QC Spike: 1260 Added ug/ml	% Recov.
C2702S	Matrix Spike	<10	10	<10	10	46.6	10	20	123
C3408	CL4-2-13 051783	<250	250	<10	10	392	10	-	-
C3408R	Replicate 1	<250	250	<10	10	309	10	-	-
C3991	Kopper-1 052683	37	10	<10	10	50.2	10	-	-

* MDL calculated for each sample matrix.
< indicates compound was less than the sample MDL.

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ETC ENVIRONMENTAL TESTING and CERTIFICATION

June 14, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water Inc.	SITE690	See Below			

ETC Sample Number	Sample Point	Results: Aroclor 1242 Concen. mg/kg	Aroclor 1242 MDL* mg/kg	Aroclor 1254 Concen. mg/kg	Aroclor 1254 MDL* mg/kg	Aroclor 1260 Concen. mg/kg	Aroclor 1260 MDL* mg/kg	QC Spike: 1260 Added mg/kg	% Recov.
C2702S	Matrix Spike	<10	10	<10	10	46.6	10	20	123
C3408R	Replicate 1	<250	250	<10	10	309	10	-	-
C3408	CL4-2-13 051783	<250	250	<10	10	392	10	-	-
C3991	KOPPER-1 052683	37	10	<10	10	50.2	10	-	-

* MDL calculated for each sample matrix.

< indicates compound was less than the sample MDL.

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NAME		DATE	%OIL	%WATER	%SLUDGE	SP.GR.	GALLONS
040	746	5/18/81	96.8	3.0	0.2	0.892	
37044	31	"	58	40	2	0.930	
37049	30-31	"	80 oil 15 grease	4	1	0.892	
37055	42	"	26	73.8	0.2	0.960	
37071	JE Baker	5/19/81	99.5	0.4	0.1		
37076	746	"	96.8	3.0	0.2	0.884	
37081	31	"	85	13	2	0.902	
37086	746	"	97.4	0.9	1.7	0.886	
37100	Mateo	5/20/81	99.5	0.5	0.1	0.898	
37107	878	"	91	7	2	0.898	
37110	746	"	98	1.8	0.2	0.882	
37116	746	"	98.4	1.2	0.4	0.882	
37127	Mateo	5/21/81	99.5	0.4	0.1		
37128	1528	"	30	65	5	0.958	
37134	878	"	72	24	4	0.908	
37138	875	"	98	1.7	0.3	0.880	
37140	42	"	26	73	1	1.000	
37144	746	"	98.5	1.2	0.3	0.880	
37150	746	"	99	0.8	0.2	0.886	
37177	31	5/22/81	52	42	6	0.930	
37180	31	"	76	21	3	0.905	
37237	62	5/26/81	32	67	1	0.970	
37246	42	"	24	75	1	0.968	
37269	746	5/27/81	98.5	1.2	0.3	0.884	
37283	1528	5/28/81	48	42	10	0.984	
37290	8	"	95.6	4.0	0.4	0.940	
37291	Cialm	"	96	3.5	0.5	0.890	
37302	1950 Mateo	"	96	3.5	0.5	0.890	

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NAME	DATE	%OIL	%WATER	%SLUDGE	SP.GR.	GALLONS
trell	4-2	98.5	1.5	0	0.89	
Chevy (17991)	4-2	33	60	7	0.97	
Don's Road Oil	4-2	96	3	1	0.89	
Thompson Oil	4-2	89	3	8	0.914	
Ford (Sandusky)	4-2	48	52	0	0.98	
696/7	4-1	99.8	.2	0	1.13	260°F
Cantrell	4-3	91	8	1	0.895	
Allied Oil	4-2	100	trace	trace	1.135	258°F
Standard (179A)	3-30	62	37	1		
Allied Oil	4-2	99.6	.3	.1	1.130	262°F
Chevy (17958)	4-2	30	57	13		
696/7	4-3	99.5	.5	0	1.135	248°F
N ional Machine	4-3	40	58	2	0.97	
Conrail	4-3	50	40	10	0.9125	
Allied Oil	4-3	99.85	.15	0	1.11	
Chevy (18028)	4-3	26	60	14	0.98	
Allied Oil	4-3	99.5	.4	.1	1.110	
Cantrell	4-4	84	13	3	0.81	
NW 1187 (O.H. Materials)	4-4	99.8	.2	trace	0.85	
696/7	4-4	100	0	0	1.135	256°F
Conrail	4-4	70	28	2	0.922	
PV	4-4	92	7	1	0.908	
Thompson Oil	4-4	89.5	7.5	3	0.910	
Hayes Albion	4-4	78	22	trace	0.908	
Chevy (18073)	4-4	34	50	16	0.99	
Chevy (18067)	4-4	36	60	4	0.98	
Chevy (18097)	4-4	19	78	3	0.99	
Cantrell	4-5	98.5	0.9	.6	0.88	

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NAME	DATE	%OIL	%WATER	%SLUDGE	SP.GR.	GALLONS
las NW 4	4-5	50	49	1	0.93	
Standard Oil	4-5	86	13	1	0.93	
Ecology	4-5	80	18	2	0.926	
PV	4-5	96	3.5	.5	0.910	
PV	4-5	92	7.5	.5	0.914	
Allied Oil	4-5	99	1	trace	1.13	
NW-970 Coastal	4-6	52	45	3		
Koppers	4-7	96	3.5	.5	0.90	
Chevy (18183)	4-6	20	64	16	1.00	
PV	4-6	89	10	1	0.882	
Capitol City	4-6	95	5	0	0.910	
Chevy (18197)	4-6	40	48	12	1.00	
PV	4-6	92	7	1	0.883	
Thompson	4-6	94	5	1	0.885	
696/7	4-8	99	.75	.25	1.130	
PV	4-5	60	39.5	.5	0.990	
696/7	4-7	99.5	.30	.20	1.135	225°F
696/7	4-10	99.9	0.1	trace	1.14	265°F
Lub. Wickliffe	4-9	54	40	6	0.938	
Koppers	4-10	96	3	1	0.910	
Colby Magrum	4-8	94	5	1	0.904	
Allied	4-9	99.8	.2	0	1.145	
Chevy (18248)	4-9	30	62	8	1.00	
696/7	4-10	99.5	0.5	0	1.135	258°F
696/7	4-11	99.	.5	.5	1.14	260°F
Cantrell	4-11	94	2.6	.4	0.89	
Conrail	4-10	49	41	10	0.916	
Chevy (18326)	4-10	93	5	2	0.875	340°F

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NAME	DATE	%OIL	%WATER	%SLUDGE	SP.GR.	GALLONS
›rizol PV	4-10	91	3	6	0.885	
Conrail	4-10	30	60	10	0.934	
Whisky Island	4-10	99.9	.1	trace	1.130	
Cantrell	4-11	88	5	1	0.90	
696/7	4-12	100	trace	trace	1.135	266°F
Lub. PV	4-11	97	3	0	0.88	
Ford, Sandusky	4-11	48	52	0	0.935	
Chevy (18336)	4-11	91	9	0	0.990	
PV	4-11	70	24	6	0.90	
Scott Paper	4-11	30	70	0	1.045	
Allied	4-11	99.9	.1	trace	1.135	
Chevy (18340 &45)	4-11	30	40	30	0.99	
696/7	4-12	99.9	.1	trace	1.125	258°F
Sandusky Foundry	4-12	67	33	trace		
696/7	4-13	99.6	.4	0	1.13	266°F
Cantrell	4-13	98	1	1	0.90	
Standard Oil	4-12	98	1	1	0.88	
PV	4-12	97	2.4	.6	.875	
Sandusky Foundry	4-12	40	60	trace	0.96	
Koppers	4-15	99	1	0	0.87	
Koppers	4-14	99.5	.5	0	0.90	
Koppers	4-13	99	1	0	0.875	
Koppers	4-14	95.5	4.	.5	0.90	
Capitol City	4-14	92	4	4	0.90	
PV	4-13	88	21	1	0.85	
Conrail	4-13	66	34	0	0.85	
696/7	4-16	99.5	.5	0		266°F
Cantrell	4-17	99	1	0	0.89	

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NAME	DATE	%OIL	%WATER	%SLUDGE	SP.GR.	GALLONS
›mpson Oil	4-16	90	9	1	0.927	
Chevy	4-16	18	75	7	0.968	
Don's Road Oil	4-16	93	2	5	0.87	
Cantrell	4-18	94	5	1	0.910	
Bellevue R.R.	4-17	55			0.948	
PV #30&32	4-17	97			0.89	
Thompson Oil	4-17	90	9	1	0.928	
Allied Oil	4-12	99.8	.2	trace	1.125	
Allied Oil	4-16	99.8	.2	trace	1.135	
Allied Oil	4-16	100	trace	trace	1.135	
Allied Oil	4-17	97.2	2	.8	1.075	
Cantrell	4-18	90	9.5	0.5	0.905	
#79 Bently Constr.	4-18	96	3.4	.6	.910	
ıhompson Oil	4-19	97	25	0.5	.900	
Cantrell	4-19	99	.8	.2	.870	
696/7	4-19	99.75	.25	0	1.135	264°F
Chevy (18613)	4-18	26	58	16	0.99	
Allied	4-18	93	6	1	1.075	
Chevy (18597)	4-17	26	60	14	0.98	
696/7	4-20	99.4	.6	0	1.13	266°F
Cantrell	4-20	99	.5	.5	0.89	
Wickliffe	4-18	30	70	trace	0.92	
696/7	4-21	99.8	0.2	trace	1.14	262°F

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NAME	DATE	%OIL	%WATER	%SLUDGE	SP.GR.	GALLONS
Thompson	4-20	90	10	trace	.907	
Koppers	4-22	99			.880	
Capital City Oil	4-21	97	2	1	.900	
Bellevue R.R.	4-20	82	18	0	.913	
Bellevue R.R.	4-20	83	16	1	.910	
Bellevue R.R.	4-20	67	33	trace	.930	
PV	4-20	66			.915	
Cantrell	4-23	98	1½	½	.890	
Conrail	4-18	49	50	1	.950	
Koppers	4-21	93	6	1	.880	
Chevy	4-20	30	65	5	1.005	
Chevy	4-20	38	40	22	.995	
Standard Oil	4-23	99.9	0	.1	.860	
Allied Oil	4-23	99	1	0	.870	
Allied Oil	4-23	99.1	.9	0	.865	
Chevy(NW-6)	4-23	48	40	12	.960	
Conrail	4-23	36	56	8	.890	
Chevy (NW-6)	4-23	36	52	12	.950	
Chevy	4-23	30	65	5	1.00	
Cantrell	4-24	96	3	1	.90	
Cantrell	4-25	96	3.5	.5	.900	
Allied (Detroit)	4-24	99.5	0	.5	.860	
Xylene from Tk #9	4-20	99.9	.08	.02	.870	
Allied Oil	4-25	99	1	0	.880	
Wickliffe	4-25	64	31	5	.915	
Whirlpool	4-25	72	25	3	.910	
Southwest	4-25	100			1.130	
Allied	4-20	99	1	trace	1.135	

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NAME	DATE	%OIL	%WATER	%SLUDGE	SP.GR.	GALLONS
Chevy	4-25	30	56	14	.990	
696/7	4-26	99.5	.5	0	1.135	262°F
Cantrell	4-27	98	1.7	.3	.90	
Chevy	4-26	94	1	5	.925	
W-2	4-27	96.4	2.5	1.1	.880	231°F
W-6	4-27	95	4	1	.890	215°F
W-8	4-27	86	9.6	4.4	.900	214°F
W-9	4-27	94	4.8	1.2	.920	226°F
Cantrell	4-27	97	2	1	.880	
696/7	4-27	68	28	4	.900	
Excello	4-27	44	50	6	.900	
Chevy	4-27	99.7	0	3	.870	
Koppers	4-29	99.5	.5	0	.895	
696/7	4-29	99.9	.1	0	1.14	265°F
Chevy	4-28	99.8	.2	0	.870	
Koppers	4-28	99	1	0	.860	
Thompson Oil	4-30	96	3.5	.5	.900	
Conrail	4-30	60	32	8	.880	
Allied Oil	4-30	99.5	0	.5	.865	
Allied Oil	4-30	99	1	0	.880	
Chevy	4-26	20	72	8	.990	
Chevy	4-26	45	48	7	1.00	
Chevy	4-27	30	66	4	.980	
Chevy	4-30	20	71	9	.990	
R.R. Donnelly	4-28	0	100	0	1.005	

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NAME		DATE	%OIL	%WATER	%SLUDGE	SP.GR.	GALLONS
146	31342	9-16-80	92	7.0	1.0	0.880	
32	31348	9-16-80	84	14	2	0.938	
878	31343	9-16-80	74	22	4	0.888	
1097	31363	9-17-80	98.5	1.3	0.2	0.898	
1097	31370	9-17-80	99.0	0.8	0.2	0.895	
875	31374	9-17-80	90	8.5	0.5	0.865	
746	31375	9-17-80	94	5.5	0.5	0.880	
1097	31385	9-18-80	99.5	0.5	—	0.900	
1097	31387	9-18-80	89	10	1	0.886	
62	31393	9-18-80	60	39	1	0.970	
1097	31394	9-18-80	98	2	—	0.888	
32	31398	9-18-80	70	28	2	0.910	
818	31399	9-18-80	99	0.8	0.2	0.920	
146	31404	9-18-80	98.5	1.3	0.2	0.880	
1322	31408	9-18-80	44	53	3	0.925	
818	31409	9-18-80	98	1.6	0.4	0.898	
1534	31410	9-18-80	26	70	4	0.985	
878	31413	9-19-80	80	9			
1097	31417	9-19-80	92	7.2	0.8	0.890	
818	31419	9-19-80	96	3.5	0.5	0.932	
746	31423	9-19-80	93	6.2	0.8	0.882	
12	31424	9-19-80	93	6.2	0.8	0.874	
871	31425	9-19-80	64	35	1	0.890	Flash @ 149°F
871	31426	9-19-80	88	11	1	0.910	
818	31432	9-19-80	97.5	2.2	0.3	0.895	
818	31435	9-19-80	99	0.8	0.2	0.901	
818	31437	9-19-80	99	0.8	0.2	0.921	
1097	31440	9-21-80	99.75	0.25	0	0.890	

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ATTACHMENT B

CHEMICAL WASTE MANAGEMENT, INC.
PROPOSAL FOR REMEDIAL ACTION AND
ENVIRONMENTAL CONTROL UPGRADING
VICKERY, OHIO FACILITY
July 28, 1983

I. Distribution and Concentration of PCBs.

Analytical data from CWM's analytical consultant, ETC, is summarized in Exhibit I.*/ Levels of PCBs subject to regulatory action are found only in the sludge in Ponds 4 and 5 and the wet well and on riprap on Ponds 5 and 11. Diagrams of PCB levels in Ponds 4 and 5 are included in the Exhibit I.

II. PCB Remedial Action.

A. Oil. Over 500,000 gallons of oil containing PCBs above regulatory action levels have been removed from the site and stored awaiting incineration. Oil removed included both oil in storage tanks at the facility and oil which was skimmed from the surface of the ponds. A small amount of oil continues to rise to the surface of the ponds from which it is skimmed and disposed of in a similar fashion. CWM is proceeding to decontaminate its oil reclamation and storage facilities.

B. Sludge. CWM has examined a number of options for disposal of PCB-contaminated sludge in Ponds 4 and 5 and

*/ Higher values have occasionally been obtained from non-representative samples.

the wet well. It has examined them with respect to feasibility, time required, risk and cost. Feasibility, time and cost have been assessed by CWM's consultant, Weston. Risk analysis has been performed by CWM's consultant, Clement Associates. A summary of the results are contained in Table I. On the basis of these criteria, CWM proposes to close Ponds 4 and 5 and the wet well in the following manner: drain the aqueous material to the remaining ponds for treatment and disposal; treat the sludge by solidification; install recompacted clay liners in Ponds 4 and 5; install a leachate collection system in the bottom of Ponds 4 and 5; replace the solidified sludge in Ponds 4 and 5; cap, grade and seed. Leachate will be analyzed to determine proper disposal. This proposal is detailed in Exhibit II.

Previous analysis performed on this sludge indicates that before treatment by solidification it fails the EP toxicity test only for chromium, as total chromium. For all other parameters it is non-hazardous even before solidification. CWM expects that after solidification and more discrete chromium analysis the sludge will meet the EP toxicity criteria.

Because of the integrity of the ponds, see Exhibit III, this proposal results in no risk of human exposure to PCBs and qualifies for approval under 40 CFR § 761.75. Indeed, the characteristics of the site are superior to those at the CECOS facility already approved for PCB disposal by Ohio

TABLE I

CONFIDENTIAL

CWM REMEDIAL OPTION SUMMARY (1)(5)
VICKERY, OHIO

Option	Total (10) Costs($)	Implementation Time (Weeks) (8)	Technically Feasible	Incremental Risks (11)
1	2,431,300	63	Yes	Very low
1A(6)	2,836,300	65	Yes	Negligible
1B(7)	3,106,300	71	Yes	Negligible
5(4)	4,381,300	71	Yes	Negligible
2	6,234,200	86	?(9)	Low
4A(2)	7,608,300	61	Yes	Moderate
3	9,908,700	94	?(9)	Low/Moderate
4B(3)	10,170,200	61	Yes	Low/Moderate
6(2)	12,943,000	60	Yes	Moderate/High

(1) Disposal of 58,400 cu. yd of sludges from Ponds 4 and 5.
(2) Disposal of fluid sludges.
(3) Disposal of semi-solid sludges.
(4) RCRA landfill capacity of 300,000 cu. yd; remedial action uses 128,400 cu. yd. Only the cost associated with the remedial activity is included.
(5) Maximize use of CWM staff and equipment for remedial action.
(6) Option 1 plus leachate collection system.
(7) Option 1 plus leachate collection system and synthetic liner.
(8) Construction and remedial operation 16 hours/day, 5 days/week.
(9) Require treatability study.
(10) Note that costs are Weston estimates and may not represent internalized costs of work done within CWM. Nevertheless, they are considered accurate on a relative basis.
(11) Additional to on-site risks resulting from accidents and chemical exposures during remedial work. These risks are expected to be similar in all options and to be minimized by a safety plan.

TABLE 1 (cont.)

GENERAL DESCRIPTION
OF REMEDIAL OPTIONS

Option 1

Surface oil from Ponds 4 and 5 will be removed using the existing skim oil truck and pump. Chemical analysis will be performed and the oil disposed of in accordance with its component analyses and applicable regulations. Aqueous phases from these ponds will be pumped through an API-type oil separator, as needed, prior to discharging into active ponds. Floating oils from the separator will be handled similar to the skim oil from the ponds. Sludge from the separator will be pumped to the pug mill for solidification and subsequent refilling into Ponds 4 and 5.

Sludge from Ponds 4 and 5 will be excavated following draining of the aqueous phases and pumped to the pug mill for solidification. The ponds will be cleaned by removing sludges and approximately 6" of clay which forms the side and bottom areas. These materials will be solidified also. All solidified materials will be refilled into Ponds 4 and 5. A cover system will be installed including 3' of compacted clay and 6" of topsoil with seeding. Site grading will minimize surface erosion and precipitation infiltration into the now-closed ponds. PCB-contaminated riprap will be removed from the ponds and disposed of offsite as a solid PCB article.

Ponds 4 and 5 will be handled sequentially, beginning with Pond 4. The method of closure proposed in this option is in accordance with the site Closure Plan regarding use of the pug mill for sludge solidification.

Option 1A

Option 1A is similar to Option 1, except that prior to refilling Ponds 4 and 5 with solidified sludges, the ponds will be equipped with leachate collection systems. Installation of these leachate collection systems involves reworking pond side slopes; recompacting native clay forming the side and bottom areas; and, installing necessary collection pipes, laterals and sumps. Leachate will be

collected, treated if necessary, and disposed of by deep well injection.

Option 1B

Option 1B is similar to Option 1A, except that in addition to the leachate collection systems, synthetic liners will be installed in Ponds 4 and 5. As in Option 1A, leachate will be collected, treated if necessary, and disposed of by deep well injection.

Option 2

Option 2 involves two methods of sludge treatment for Ponds 4 and 5. Sludge with PCB concentrations $\geq$ 50 ppm will be sent to a reactor system to chemically and/or thermally break the sludges into two phases: an oily phase and a solid phase. The oil phase is expected to contain the majority of PCBs due to its greater affinity for PCB materials. Following chemical analysis, this oil will likely require disposal offsite. The reactor solids phase will be pumped to the pug mill for solidification and subsequent refilling into Ponds 4 and 5. It is estimated that approximately 50 percent of pond sludges will undergo reactor treatment.

Pond sludges containing < 50 ppm of PCBs will be removed and pumped to the pug mill for solidification similar to Option 1, followed by refilling into Ponds 4 and 5. The pond skim oils, aqueous phases, API separator oil and sludge materials, and riprap will also be handled similar to Option 1.

Option 3

Option 3 is similar to Option 2, except that all sludges from Ponds 4 and 5 will be sent to the reactor treatment system. The solids phase from this treatment will be pumped to the pug mill for solidification, followed by refilling into the ponds. The pond skim oils, aqueous phases, API separator oil and sludge materials and riprap will also be handled similar to Option 1.

TABLE 1 (cont.)

Options 4A and 4B

Options 4A and 4B also involve two methods of sludge treatment for Ponds 4 and 5. Sludges with PCB concentrations $\geq$ 50 ppm will be disposed of offsite; sludges < 50 ppm PCBs will be sent to the pug mill for solidification, followed by refilling into the ponds. The offsite options are: for Option 4A, sludges will be disposed of as liquid or fluid materials; for Option 4B, sludges will be stabilized onsite and disposed of as semi-solid materials.

The pond skim oils, aqueous phases, API separator oil and sludge materials, and riprap will also be handled similar to Option 1.

Option 5

Option 5 is similar to Option 1, except that Ponds 4 and 5 solidified sludges from the pug mill will be placed into a RCRA-type landfill rather than into Ponds 4 and 5. The location of the RCRA landfill may be Ponds 4 and 5, or other suitable locations within the Vickery, Ohio site.

The pond skim oils, aqueous phases, API separator oil and sludge materials, and riprap will also be handled similar to Option 1.

Option 6

Option 6 is similar to Options 4A and 4B, except that Ponds 4 and 5 sludges will be removed for offsite disposal as liquid or fluid materials. Therefore, no onsite solidification and/or reactor treatment of sludges will be required.

The pond skim oils, API separator oil and sludge materials, and riprap will also be disposed of offsite. Draining of the aqueous phases from Ponds 4 and 5 will be handled as in Option 1.

EPA and U.S. EPA. Because this proposal may be accomplished by closure plan upgrading approval by Ohio EPA and U.S. EPA rather than formal permitting, it can be accomplished faster than options involving new facilities and permitting. More extensive on-site options simply cost more with no reduction in risk. Off-site options both cost more and increase risk.

U.S. EPA is presently developing rules for uncontrolled PCB processes at less than 50 ppm pursuant to court order in EDF v. EPA. These processes are considered to produce primarily mono- and diclorobiphenyls. In reporting to the Court on March 31, 1983, EPA indicated it is developing its regulations based upon risk analyses similar to those done for CWM. The non-EPA parties to that case recommended that regulations permit PCB concentrations below 10 ppm in air emissions, 0.1 ppm in water discharges, and 25 ppm in consumer products. (EDF, NRDC, CMA "Recommendation of the Parties for a Final EPA Rule on Inadvertent Generation of PCBs," April 13, 1983.) EPA is using this recommendation as a framework for the regulations. Indeed, "preliminary assessments completed by EPA indicate that in most instances a 25 part per million (ppm) cut off [in consumer products] will result in acceptable levels of risk." (Letter to Don Clay from David Zoll, June 3, 1983.) This same sort of cost-risk/benefit approach is mandated in determining appropriate measures for Superfund cleanups, 40 CFR § 300.68. In situ containment of PCB-contaminated soil has been included in enforcement settlements agreed to by

U.S. EPA, including but not limited to consent decrees with Cornell Dublier Electronics, Inc., New Bedford, Massachusetts; Aerovox, Inc., New Bedford, Massachusetts; and Union Corporation and Metal Bank of America, Inc., Philadelphia, Pennsylvania.

C. Riprap. Some of the riprap is coated with pond surface oil; this coating having a relatively higher concentration of PCBs than the sludge. Because the contaminated riprap is also of a relatively lower volume compared to the sludge, CWM proposes to dispose of riprap coated with PCB-contaminated oil at an approved off-site PCB landfill.

D. Monitoring. CWM will operate and maintain a groundwater and surface water monitoring system designed to detect the migration, if any, of PCBs from closed ponds. If it detects the migration of PCBs in excess of 0.1 ppm, CWM will, within 90 days, submit a plan to prevent such migration and, upon agreement of Ohio EPA and U.S. EPA to the plan, shall implement it.

III. Facility Conversion and Upgrade

CWM proposes to conduct all future receipt, treatment, storage and disposal of hazardous wastes in an enclosed, tank-based system. Because this is a significant facility upgrading, requiring substantial investment, it cannot let bids for or commence construction of these facilities until it has secured the requisite air, hazardous waste and UIC

permits. Indeed, it cannot legally proceed with such upgrading without those permits. It will submit applications for those permits within four months after agreement is reached. In the meantime it will proceed with design and other non-capital intensive work, and will complete the system within eighteen months after receiving the necessary permits. The future facilities include construction of a RCRA landfill for disposal of solidified sludges.

IV. Pond Closure.

CWM proposes to close Ponds 12, 11 and 7, in that order. It proposes to convert Pond 12 to a RCRA landfill to dispose of solidified sludges from Ponds 12, 11 and 7 and sludges generated in its new, enclosed storage and treatment system. When this capacity is exhausted, it proposes similar RCRA landfills in Ponds 11 and 7. CWM's proposal is detailed in Exhibit IV.

There are several constraints in pond closures. Ponds 11 and 12 must be emptied with some symmetry to protect the integrity of the dividing berm. At least one pond must remain in service until replacement facilities are available. Depletion of aqueous material in the ponds is limited by the number and capacity of injection wells and their operating experience. Operating at 96 percent capacity and increased pressure, existing inventory can be depleted -- while injecting rainwater, a reduced amount of casual water, and current business -- within 42 months. Disposal could be accelerated by installation

and operation of additional wells and possibly by stimulation of existing wells. If the assumptions on which this schedule is based are met and the requisite permits are issued expeditiously, it will be possible to discontinue receipt of hazardous waste into the ponds by September 30, 1985.

V. Form of Agreement.

CWM attaches as Exhibit V a draft consent decree embodying the above proposals. It is willing to enter 'round-the-clock negotiation to reach agreement after Ohio EPA and U.S. EPA have sufficient time to review this proposal.

Exhibit I

POND 12

SLUDGE PCB

ANALYSIS

Total No. of Samples: 12
No. of Sludge: 0
No. of Clay: 12
No. of Sectors: 12
Average Depth of Sludge: 2"
Total Amount of Sludge: 2940 yd^3

E.T.C. Code	1242 mg/kg	1254 mg/kg	1260 mg/kg
BL12-1-1	Less Than 25	Less Than 5	Less Than 5
2-1	Less Than 5	Less Than 5	Less Than 5
3-1	Less Than 25	Less Than 5	Less Than 5
4-1	Less Than 5	Less Than 5	Less Than 5
5-1	Less Than 50	Less Than 5	Less Than 5
6-1	Less Than 25	Less Than 5	Less Than 5
7-1	Less Than 25	Less Than 5	Less Than 5
8-1	Less Than 12.5	Less Than 5	Less Than 5
9-1	Less Than 25	Less Than 5	Less Than 5
10-1	Less Than 12	Less Than 5	Less Than 5
11-1	Less Than 50	Less Than 5	Less Than 5
12-1	Less Than 50	Less Than 5	Less Than 5

Additional Analysis: E.P. Toxicity: BL12-3-1; BL12-8-1
Dioxin: none

All results completed by Environmental Testing and Certification Corporation of Edison, New Jersey

POND 11

SLUDGE PCB

ANALYSIS

Total No. of Samples: 8
No. of Sludge: 0; approx. 1" Sludge
No. of Clay Cores: 8
No. of Sectors: 8
Average Depth of Sludge: 6"
Total Volume of Sludge: 7,326 yd^3

E.T.C. Code	1242 mg/kg	1254 mg/kg	1260 mg/kg
BL11-1-1	Less Than 5	Less Than 5	Less Than 5
2-1	Less Than 5	Less Than 5	Less Than 5
3-1	Less Than 5	Less Than 5	Less Than 5
4-1	Less Than 5	Less Than 5	Less Than 5
5-1	Less Than 5	6.53	Less Than 5
6-1	Less Than 12.5	Less Than 5	Less Than 5
7-1	Less Than 50	Less Than 5	Less Than 5
8-1	Less Than 5	Less Than 5	Less Than 5

Additional Analysis: E.P. Toxicity: BL11-6-1; BL11-1-1

All results completed by Environmental Testing and Certification Corporation of Edison, New Jersey

POND 7

SLUDGE PCB

ANALYSIS

Total No. of Samples: 13
No. of Sludge: 5
No. of Clay Cores: 8
No. of Sectors: 4
Average Depth of Sludge: 2.8'
Total Volume of Sludge: 21,700 yd^3

E.T.C. Code	Arochlor 1242 mg/kg	1254 mg/kg	1260 mg/kg
BL7-1-1 Sludge	Less Than 250*	42.3	Less Than 10
1-2 Sludge	Less Than 50	29	Less Than 10
1-3 Top Clay	Less Than 5	Less Than 5	Less Than 5
1-3 Bottom Clay	Less Than 5	Less Than 5	Less Than 5
7-2-1 Sludge	Less Than 50	Less Than 10	Less Than 10
2-2 Top Clay	Less Than 5	Less Than 5	Less Than 5
2-2 Bottom Clay	Less Than 5	Less Than 5	Less Than 5
7-3-1 Sludge	Less Than 125*	Less Than 5	Less Than 5
3-2 Top Clay	Less Than 50	Less Than 5	Less Than 5
3-2 Bottom Clay	Less Than 50	Less Than 5	Less Than 5
7-4-1 Sludge	Less Than 100*	11	Less Than 10
4-2 Clay	Less Than 25	Less Than 5	Less Than 5

Additional Analysis: E.P. Toxicity: BL7-2-1; BL7-4-1
Dioxin: none
*GC/MS for Arochlor 1242 on BL7-1-1, BL7-3-1, BL7-4-1 was not detected at a detection limit of 5 g/l

All results completed by Environmental Testing and Certification Corporation of Edison, New Jersey

POLICY & PROCEDURE

Attachment C

	TITLE	DIST. CODE	NUMBER
Chemical Waste Management Inc. VICKERY, OH	Truck Spill Prevention Inspection Procedures	3	SC-101
	INITIATED BY Charles O. Reilly, Jr. Safety & Operations Coordinator		Page 1 of 4 EFFECTIVE DATE 6-28-83

APPROVED BY _____ TITLE General Manager	SUPERSEDES
REQUIRED FORMS Problem Truck Report (Spill Prevention) Form SC-201 Incident Report Form (SC-202) List of Hazardous Materials and Reportable Quantities (Table 302.4)	CROSS REFERENCE(S) PT-101

PURPOSE

To identify leaking tankers or those vehicles having the capacity to leak or spill waste materials entering or leaving the Vickery site.

GENERAL

Routine inspections will be made of all incoming trailers for the purpose of detecting leaks, spills or the potential for leaks or spills.

TITLE	
Truck Spill Prevention Inspection Procedures	NUMBER SC-101 DATE 6-28-83 PAGE 2 of 4

PROGRAM CONTENT

1) Security guards are to visually inspect all incoming and outgoing waste trailers for signs of spillage or leaking. This inspection is to be made immediately after truck weigh-in (or weigh-out). The security guard must walk around the perimeter of the vehicle looking for dripping liquid or any liquid accumulation that could indicate a leak.

   When a lugger box arrives at the scale for weighing or transfer, the security guard will insure that the tarp is secure and that there is no accumulation of rainwater on the tarp. This can best be accomplished by having the driver check his own rig in the guard's presence.

   The security guard is not to climb or mount any trailers during the inspection process.

2) If a leak, spill or liquid accumulation is detected, the security guard is to notify the shift supervisor immediately.

   The shift supervisor is to:

   a) escort the trailer to the north storage lot and spot it in a contained and isolated area;

   b) see that any leaking or dripping material is properly directed to a bucket, catch basin, or discrete container;

   c) take corrective action to prevent any further leakage or spills; and,

   d) reference and implement the Spill Prevention Control & Counter Measures Plan for applicable spills (Table 302.4 of List of Hazardous Substances and Reportable Quantities).

3) If there are no obvious signs of leakage, the guard is to collect the necessary paperwork from the driver and direct the trailer to the north storage lot for sampling. Prior to sampling, the plant (sampling) operator is to inspect the following points for possible improprieties:

PROGRAM CONTENT

a) loose or improperly closed hatches,

b) pressure relief valves that are left open or badly worn,

c) improperly closed discharge valves,

d) accumulation of liquid in the hatch well area,

e) obvious signs of leaking or dripping from the tank itself,

f) worn out gaskets,

g) any other safety deficiencies.

Upon notice of any problems, the operator is to immediately contact the shift supervisor for resolution.

4) If any of the above improprieties are verified, the shift supervisor is to immediately:

a) Advise the driver of the problem and offer the driver the opportunity to inspect the trailer himself. If the driver does opt to examine the trailer, the shift supervisor will see that the proper safety protective gear is given to the driver, i.e., acid suit, rubber gloves, goggles, etc. Unless the driver has the proper safety gear, he must remain in his vehicle (or the guard house).

b) Complete a Problem Truck Report (Form SC-201) detailing the occurence of events and the corrective actions taken.

c) If leakage is detected, the shift supervisor is to patrol State Routes 412 and 510 for signs of suspected spillage. If a spill is detected, a sample of the material is to be drawn up in a pipette and placed in a 10 ml test tube. The shift supervisor will forward the sample to the lab for analysis. The chemist on-duty will determine what testing criteria will be used to confirm whether the spilled material came from the suspect truck. Any suspected spills are to be noted on the Problem Truck Report.

d) The shift supervisor will give the driver a copy of the Problem Truck Report.

PROGRAM CONTENT

5) Once the Problem Truck Report has been completely filled out and the leak contained, the shift supervisor will approve the load for sampling and analysis.

6) If spillage was detected, the shift supervisor will initiate a CWM Incident Report Form (Form SC-202) completing all the necessary sections and referencing the Problem Truck Report where possible. Both forms will then be forwarded to the Safety & Operations Coordinator for review. This report should also make reference to any analytical work that might have been performed on spill samples. Lab reports and chromatographs should be included as attachments.

7) The Safety & Operations Coordinator will contact the transporter and see that corrective actions are taken to prevent similar such incidents. After noting any conversations with the transporter, the Problem Truck Report and the incident report form will be forwarded to the Customer Service Coordinator.

8) The Customer Service Coordinator will log the incident on the Truck Inspection Log. The Customer Service Coordinator will then address a cover letter to the transporter referencing the attached Problem Truck Report. A copy of the afore mentioned correspondence will be sent to:

   a) General Manager

   b) Columbus Sales Office

   c) Transporter's file

   d) Transporter

   If an Incident Report Form is also filed, this will be forwarded along with the Problem Truck Report to:

   a) General Manager

   b) Columbus Sales Office

   c) Transporter's file

Chemical Waste Management, Inc.
3956 State Rt. 412
Vickery Ohio 43464
419/547-7791

PROBLEM TRUCK REPORT
(Spill Prevention)

Date of Incident: _____ Time of Incident: _____

Transporter: _____

Trailer: _____ Driver: _____

Manifest: _____ Generator: _____

DOT Shipping Description/DOT Hazard Class: _____

_____

Description of Incident: _____

_____

_____

Stains or potential spill on roadway leading to site: ( ) Yes ( ) No

Corrective Action Taken: _____

_____

_____

_____

Shift Supervisor: _____

Verbal Contact with Transporter: _____

_____

_____

_____

_____

FORM SC-201

COR/dw
6/83

Chemical Waste Management, Inc.

INCIDENT REPORT

(NOT TO BE USED FOR CASES INVOLVING WORKMEN'S COMPENSATION, OTHER PERSONAL INJURY OR DAMAGE TO PROPERTY OF OTHERS)

DIVISION	LOCATION	REPORT NO

TIME OF INCIDENT	DAY OF WEEK	MONTH	DAY	YEAR	HOUR AM PM	DATE AND TIME REPORTED AM PM

REPORTED BY	LOCATION OF INCIDENT

TYPE OF INCIDENT

- ☐ NEAR-MISS
- ☐ FIRE OR EXPLOSION
- ☐ EQUIPMENT DAMAGE
- ☐ SPILL OF MATERIAL (ON SITE)
- ☐ SPILL OF MATERIAL (OFF SITE)
- ☐ OPERATIONAL ERROR
- ☐ POTENTIAL HAZARD (FIRE, INJURY, ETC.)
- ☐ ENVIRONMENTAL POLLUTION (AIRBORN)
- ☐ OTHER (EXPLAIN BELOW)

DESCRIBE INCIDENT (IF NECESSARY, USE SEPARATE SHEET):

RESULTS OF INCIDENT (EXPLAIN FULLY - DAMAGE, LOSSES, ETC.):

BASIC CAUSE(S) (DESIGNATE ONE OR MORE CAUSES AND EXPLAIN FULLY - WHERE APPLICABLE. SELECT FROM LIST SHOWN ON REVERSE SIDE)

CORRECTIVE MEASURES TAKEN:

RECOMMENDATIONS FOR ADDITIONAL CORRECTIVE MEASURES:

COMPLETE THIS SECTION FOR REPORTING FIRES

DISCOVERED BY	TIME	PRIVATE ALARM BY	TIME
PUBLIC ALARM BY	TIME	PLANT BRIGADE RESPOND?	TIME

PUBLIC F.D RESPOND?	TIME	TIME FIRE EXTINGUISHED	DATE SPRINKLER SYSTEM RETURNED TO NORMAL	TIME

JIPMENT USED HOSE LINES	EXTINGUISHERS	SPRINKLER HEADS OPENED

SUPERVISOR'S SIGNATURE	SIGNATURE OF GENERAL MANAGER

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ENFORCEMENT
NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
BUILDING 53, BOX 25227, DENVER FEDERAL CENTER
DENVER, COLORADO 80225

TO Robert B. Schaefer, Esq.
Regional Counsel, Region 5

DATE July 15, 1983

FROM Basil G. Constantelos, Director
Waste Management Division

Carroll G. Wills, Esq., Chief
Enforcement Specialist Office

PRIVILEGED
PREPARED FOR LITIGATION

SUBJECT Results of Compositional Analysis of Wastes from Ohio Liquid Disposal, Vickery, OH

Attached are the analytical results you requested. You may contact Dr. Meiggs or Dr. Lowry at FTS 234-4661 if you or your staff have any questions concerning this analytical support.

Attachment

cc: Tom Gallagher, Director, NEIC

RECEIVED
U.S. EPA, REGION V
WASTE MANAGEMENT DIVISION
OFFICE OF THE DIRECTOR

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ENFORCEMENT
NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
BUILDING 53, BOX 25227, DENVER FEDERAL CENTER
DENVER, COLORADO 80225

TO Dr. Theodore O. Meiggs
Asst. Director, Laboratory Services

DATE July 15, 1983

FROM Dr. Joe H. Lowry, Chief
Inorganic Analytical Section

SUBJECT Analytical Results for Samples Collected from Ohio Liquid Disposal, Vickery, Ohio, Project A07-10

Attached are the analytical results requested by Region V. The samples based on our analyses have generally the compositions the Region thought they would. Three of the four samples contained sulfuric acid at quite high levels while the other was caustic. One of the acidic samples contained levels of chromium and lead which probably would characterize as EP Toxic, however, this test was not requested and not performed. No Aroclors were detected in any of the samples.

Attachments

ANALYTICAL RESULTS FOR HAZARDOUS WASTE SAMPLES COLLECTED FROM CHEMICAL WASTE MANAGEMENT, OHIO LIQUID DISPOSAL, VICKERY, OHIO
PROJECT NO.: A07-10

JULY 14, 1983

PREPARED BY
J.H. LOWRY

INORGANIC ANALYTICAL SECTION
LABORATORY SERVICES DIVISION
NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
U.S. ENVIRONMENTAL PROTECTION AGENCY
DENVER, COLORADO

BACKGROUND

On April 18, 1983 four samples were received at NEIC's Laboratorys. These samples were collected from Ohio Liquid Disposal in Vickery, Ohio which is operated by Chemical Waste Management. The analytical request made by the Director of the Waste Management Division of Region V included the analysis of the samples for elemental constituents, anions, pH and PCB's. The suspected compositions of the samples were provided by the Region. The Region wanted to know if their compositions were accurate. Contained in this report are the results of the analyses NEIC agreed to perform as well as a number of additional analyses that were required to detail the compositions of the samples.

SAMPLE ANALYSIS DATA

Our analyses closely match the suspected compositions provided by the Region. Table 1 identifies the appropriate sample numbers for each sample, describes the samples physically and summarizes the chemical composition of each sample. The chemical compositions are a summary of many analysis reporting only significant findings or major components. As reported in Table 1 no Aroclors (PCB's) were detected in any of the samples. Table 2 and 3 report in detail both the major and minor constituents. The limit of detection for each parameter or constituent reported in the far right hand column of each of these tables was calculated as a 99.6% confidence interval from the preparation blank's contaminate levels.

The data provided by the Region indicated the sample S-62 should be a clean pickle liquor containing 20% sulfuric acid and 80% water. Our composition indicates 11% sulfuric acid and substantial quantities of iron which based on an equivalence balance must be present as 11% ferrous sulfate. The presence of the iron as well as the many other heavy elements (Table 1) including the priority pollutants chromium, copper, lead, nickle and zinc indicate that the pickle liquor probable has been used.

The Regional information indicated that sample S-63 was 92% sulfuric acid from an acid clean out. We found 95% sulfuric acid. Sample S-64 was reported to be a chlorine caustic scrubber waste effluent. This sample was caustic but no oxidant was detected although the chlorine may have been reduced to the chloride ion detected. Sample S-65 was reported to be a dichlorobenzidine spent acid wash containing 25% to 31% sulfuric acid with up to 1% hydrochloric acid. We found 34% sulfuric acid 0.9% hydrochloric acid and 3.9% organic carbon which would be expected in such a wash.

QUALITY CONTROL DATA

In general, two types of quality control data are usually obtained in an analysis; one indicating the accuracy and precision of the measurement process and one for the total analysis (preparation plus measurement). Measurement accuracy and precision data reflect sources of error or variability in the instrumental measuring system and operator technique, and can,

to a certain extent, be affected by the sample matrix. Analysis accuracy and precision data reflect sources of error or variability of measurement accuracy and precision as well as that of the preparation technique and to a much greater extent than measurement is affected by sample matrix. It is widely accepted that both the measurement and analysis sources of error and variability are usually small in comparison to the ability to obtain a representative sample aliquot from the environment.

Table 4 presents the precision and accuracy data gathered concurrently with the anion and general constituents analyses results reported in Table 2. These data indicate an excellent precision and accuracy for these parameters.

Table 5 presents analysis and measurement precision data for the elemental constituents analyses. In reviewing this precision data one must be cognizant of the fact that precision becomes poorer as the constituents concentration approximates the LOD. Generally, at the LOD, measurement precision is 100% relative standard deviation for triplicate analyses. At concentrations ten times the LOD, the precision usually improves by a factor of ten. The analysis precision generally obtained was less than 10% relative standard deviation for major liquid phases of the samples and less than 30% relative standard deviation for the minor solid phases.

Three measures were utilized to evaluate the accuracy of the elemental analyses. Samples were spiked at both the measurement and analysis level and control samples of known elemental composition were prepared and analyzed with the samples. Table 6 presents the measurement and analysis levels spike recovery data and Table 7 presents the control sample data. These data indicate that the results reported are of an acceptable accuracy.

ANALYTICAL METHODOLOGY

Measurement of pH was performed potentiometrically. Alkalinity and acidity were determined by potentiometric titration. Cyanide, oxidant and sulfide were spot tested in accordance with NEIC's standard methodology for hazardous waste samples. A gravimetric procedure was used for density while a coulometric Karl-Fischer titration was used for the determination of water. Fluoride was determined by ion selective potentiometry. The other anions were determined by Ion Chromatography. Combustion with an infrared detector was used for the determination of carbon.

Mercury was determined by Cold Vapor Atomic Absorption Spectroscopy after digestion of the sample with nitric acid, sulfuric acid, permanganate and persulfate. All other elements were determined by Inductively Coupled Argon Plasma Optical Emission Spectroscopy (ICAP-OES) after potassium hydroxide fusion and dissolution for the solid phases of the samples and after dilution and filtration for the aqueous phases of the samples. Antimony, arsenic and selenium were determined by a hydride generation system coupled to the ICAP-OES while the other elements were determined by conventional cross flow nebulization ICAP-OES.

TABLE 1 SAMPLE IDENTIFICATION, DESCRIPTION & ANALYTICAL SUMMARY
CHEMICAL WASTE MANAGEMENT, OHIO LIQUID DISPOSAL, VICKERY, OHIO
NEIC PROJECT A07

TAG NO.	SAMPLE NO.	COLLECTION DATE	COLLECTION TIME	LABORATORY'S DESCRIPTION OF SAMPLE CONTENTS (% WT.)	MAJOR CHEMICAL CONSTITUENTS (% WT.)
5-24827	S-62	03/30/83		99.2% CLEAR GREEN NONVISCOUS WATER MISCIBLE LIQUID	79% WATER; pH = <1; 11% SULFURIC ACID; IRON PROBABLY AS 11% FERROUS SULFATE; 0.35% 21 OTHER ELEMENTS AS SULFATE SALTS INCLUDING 6 PRIORITY POLLUTANT ELEMENTS; AROCLORS NOT DETECTED (1).
				0.8% LIGHT GREEN GRANULES	IRON PROBABLY AS 75% FERROUS SULFATE HEPTAHYDRATE; 9.5% SULFURIC ACID; 0.57% 15 OTHER ELEMENTS AS SULFATE SALTS INCLUDING 5 PRIORITY POLLUTANT ELEMENTS; REMAINDER PROBABLY WATER; AROCLORS NOT DETECTED (1).
5-24828	S-63	03/30/82		99.3% CLEAR YELLOW VISCOUS WATER MISCIBLE LIQUID	95% SULFURIC ACID; pH = <1; 3% WATER; 0.4% ORGANIC CARBON; 0.02% FOUR ELEMENTS AS SULFATE SALTS INCLUDING ONE PRIORITY POLLUTANT ELEMENT; AROCLORS NOT DETECTED (1).
				0.7% WHITE OPAQUE PASTE	67% SULFURIC ACID; IRON PROBABLY AS 7.5% FERRIC SULFATE; 0.14% ELEVEN OTHER ELEMENTS AS SULFATE SALTS INCLUDING TWO PRIORITY POLLUTANT ELEMENTS; AROCLORS NOT DETECTED (1).
5-24829	S-64	03/30/83	18:00	100% CLEAR COLORLESS NONVISCOUS WATER MISCIBLE LIQUID	99% WATER; pH = 12.1; 0.53% SODIUM CHLORIDE; 0.05% SODIUM HYDROXIDE; 0.05% SODIUM CARBONATE; AROCLORS NOT DETECTED (1).
5-24830	S-65	03/30/83	18:10	99.2% CLEAR GREEN NONVISCOUS WATER MISCIBLE LIQUID	65% WATER; pH = <1; 34% SULFURIC ACID; 3.9% ORGANIC CARBON; 0.7% HYDROCHLORIC ACID; 0.11% TEN ELEMENTS AS SULFATE SALTS INCLUDING THREE PRIORITY POLLUTANT ELEMENTS; AROCLORS NOT DETECTED (1).
				0.8% LIGHT GREEN PASTE	36% SULFURIC ACID; 0.8% HYDROCHLORIC ACID; 0.09% SIX ELEMENTS AS SULFATE SALTS INCLUDING TWO PRIORITY POLLUTANT ELEMENTS; AROCLORS NOT DETECTED (2).

(1) = LIMIT OF DETECTION WAS 1 MG/KG
(2) = LIMIT OF DETECTION WAS 10 MG/KG

TABLE 2

GENERAL CONSTITUENT ANALYSIS
CHEMICAL WASTE MANAGEMENT, OHIO LIQUID DISPOSAL, VICKERY, OHIO
PROJECT A07

REGION										
SAMP. NO		S-62		S-63		S-64	S-65			
TAG. NO		5-24827		5-24828		5-24829	5-24830			
PHASE		LIQUID	SOLID	LIQUID	PASTE	LIQUID	LIQUID	PASTE		
PARAMETER	UNITS	VALUE	VALUE	VALUE	VALUE	VALUE	VALUE	VALUE	VALUE	LOD
PH	STD UNITS	<1.	NA	<1.	NA	12.1	<1.	NA		
PH (1:100)	STD UNITS	1.5	2.6	<1.	1.0	9.	1.3	1.5		
ALKALINITY	MEQ/G	NA	NA	NA	NA	.0017	NA	NA		.0002
ACIDITY	MEQ/G	.4	.5	1.88	1.36	NA	.61	.64		.0002
CYANIDE	MG/KG	ND	ND	ND	ND	ND	ND	ND		5.
OXIDANT	MG/KG CL	ND	ND	FNQ	FNQ	ND	FNQ	ND		5.
SULFIDE	MG/KG	ND	ND	ND	ND	ND	ND	ND		5.
DENSITY	G/ML	1.13	NA	1.73	NA	.97	1.21	NA		.1
WATER	%	78.8	NA	2.5	NA	99.	64.7	NA		.2
BROMIDE	MG/KG	ND	ND	ND	ND	ND	ND	ND		300.
CHLORIDE	MG/KG	390.	370.	580.	600.	3600.	9020.	7700.		100.
FLUORIDE	MG/KG	ND	ND	ND	ND	ND	ND	ND		5.
NITRATE	MG/KG NO3-	ND	ND	ND	ND	ND	ND	ND		200.
NITRITE	MG/KG NO2-	ND	ND	ND	ND	ND	ND	ND		100.
PHOSPHATE	MG/KG PO4=-	ND	ND	ND	ND	ND	ND	ND		200.
SULFATE	MG/KG SO4=	246000.	352000.	1010000.	765000.	860.	318000.	356000.		500.
TOC	% C	.03	NA	.43	NA	.04	3.87	NA		.02
TIC	% C	NA	NA	NA	NA	.05	NA	NA		.04

MEQ = MILLI-EQUIVALENTS
FNQ = PRESENT NOT QUANTIFIED
LOD = LIMIT OF DETECTION
ND = LESS THAN LOD
NA = NOT ANALYZED

EPA/NEIC/DENVER

TABLE 3

ELEMENTAL CONSTITUENTS ANALYSIS
CHEMICAL WASTE MANAGEMENT, OHIO LIQUID DISPOSAL, VICKERY, OH
PROJECT A07

CONCENTRATION IN MG/KG WET WEIGHT

REG.NO.	S-62		S-63		S-64	S-65			
TAG NO.	5-24827		5-24828		5-24829	5-24830			
PHASE	LIQUID	SOLID	LIQUID	PASTE	LIQUID	LIQUID	PASTE		
ELEMENT	VALUE	VALUE	VALUE	VALUE	VALUE	VALUE	VALUE	LOD AQUEOUS	LOD SOLID
AL	33.	240.	ND	70.	ND	ND	30.	3.	20.
SB*	ND	ND	ND	ND	ND	ND	ND	1.	4.
AS*	ND	ND	ND	ND	ND	ND	ND	1.	4.
BA	ND	ND	ND	ND	ND	ND	ND	.2	30.
BE*	ND	ND	ND	ND	ND	ND	ND	.3	.9
B	ND	ND	ND	ND	ND	ND	ND	10.	60.
CD*	.4	ND	ND	ND	ND	ND	ND	.3	1.
CA	93.	100.	10.	ND	ND	42.	ND	2.	40.
CR*	84.	31.	4.	11.	ND	9.	3.	2.	2.
CO	3.2	8.	ND	ND	ND	ND	ND	.9	3.
CU*	7.	17.	ND	8.	ND	ND	3.	3.	3.
FE	40700.	151000.	54.	21100.	ND	56.	35.	2.	3.
LA	5.	14.	ND	ND	ND	ND	ND	1.	9.
PB*	7.	20.	ND	ND	ND	ND	ND	3.	8.
MG	48.	160.	ND	40.	ND	10.	ND	3.	20.
MN	312.	367.	4.1	144.	ND	.9	ND	.1	.6
HG*	ND	ND	.3	ND	ND	ND	ND	.3	.3
MO	26.	ND	ND	ND	ND	ND	ND	3.	10.
NI*	75.	130.	ND	60.	ND	4.	ND	2.	10.
K	40.	NA	ND	NA	ND	ND	NA	10.	
SC	ND	ND	ND	ND	ND	ND	ND	.2	.6
SE*	ND	ND	ND	ND	ND	ND	ND	1.	4.
SI	35.	90.	ND	30.	39.	ND	30.	6.	20.
AG*	ND	ND	ND	ND	ND	.4	ND	.4	2.
NA	40.	ND	ND	ND	2870.	220.	200.	10.	100.
SR	.6	ND	ND	ND	ND	.3	ND	.2	4.
TL*	ND	ND	ND	ND	ND	ND	ND	20.	100.
TI	.8	ND	ND	ND	ND	ND	ND	.2	1.
W	30.	76.	ND	15.	ND	ND	ND	20.	8.
V	1.5	3.6	ND	1.1	ND	ND	ND	.4	.8
Y	ND	ND	ND	ND	ND	.4	ND	.3	4.
ZN*	480.	627.	ND	45.1	ND	ND	ND	2.	4.
ZR	15.4	68.	ND	12.	ND	ND	ND	.2	4.

* PRIORITY POLLUTANT
LOD = LIMIT OF DETECTION
ND = LESS THAN LOD
NA = NOT ANALYZED

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TABLE 4 GENERAL CONSTITUENTS PRECISION AND ACCURACY REPORT
CHEMICAL WASTE MANAGEMENT, OHIO LIQUID DISPOSAL, VICKERY, OHIO
PROJECT A07

CONCENTRATIONS IN MG/KG WET WEIGHT UNLESS OTHERWISE NOTED

	PRECISION EVALUATION						ACCURACY EVALUATION								
	MEASUREMENT LEVEL TRIPLICATE DATA			ANALYSIS LEVEL DUPLICATE DATA			MEASUREMENT LEVEL SPIKE RECOVERY DATA			ANALYSIS LEVEL SPIKE RECOVERY DATA			ANALYSIS LEVEL CONTROL SAMPLE DATA		
PARAMETER	SAMPLE NUMBER	AVERAGE	%RSD	SAMPLE NUMBER	AVERAGE	%RD	SAMPLE NUMBER	SPIKE LEVEL	%REC	SAMPLE NUMBER	SPIKE LEVEL	%REC	CONTROL NUMBER	TRUE VALUE	%DEV
PH *				S-63 L	<1.	0.0							882 1	7.8	0.0
ALKALINITY *													882 1	0.147	-0.7
ACIDITY *	S-65 L	.61	0.8	S-63 L	1.91	3.1									
DENSITY *				S-63 L	1.73	5.2									
WATER *				S-63 L	2.51	0.8									
BROMIDE	S-65 L	ND		S-63 L	ND		S-65 L	2000.	100.	S-63 L	10000.	97.8			
CHLORIDE	S-65 L	8990.	4.3	S-63 L	580.	6.9	S-65 L	2000.	98.4	S-63 L	10000.	106.	882-1	8530.	7.6
FLUORIDE	S-65 L	ND		S-63 L	ND		S-65 L	2000.	102.	S-63 L	10000.	97.6	882-1	1340.	-3.8
NITRATE	S-65 L	ND		S-63 L	ND		S-65 L	2000.	104.				481-2	1610.	-2.3
NITRITE	S-65 L	ND		S-63 L	ND		S-65 L	2000.	93.5						
PHOSPHATE	S-65 L	ND		S-63 L	ND		S-65 L	2000.	109.	S-63 L	10000.	97.4	481-2	270.	-7.0
SULFATE	S-65 L	319000.	4.5	S-63 L	1030000.	3.9	S-63 L	1000000.	105.	S-63 L	10000.	SLI	882-1	9360.	-0.6
AROCLORS										S-63 L	50.	62.0			

* = DATA REPORTED IN SAME UNITS AS TABLE 2
L = LIQUID PHASE
SLI = SPIKE LEVEL INSUFFICIENT
%RSD = PERCENT RELATIVE STANDARD DEVIATION
%RD = PERCENT RELATIVE DIFFERENCE
%REC = PERCENT RECOVERY
%DEV = PERCENT DEVIATION

EPA/NEIC/DENVER

TABLE 5 ELEMENTAL CONSTITUENTS ANALYSIS PRECISION REPORT
CHEMICAL WASTE MANAGEMENT, OHIO LIQUID DISPOSAL, VICKERY, OH
PROJECT A07

CONCENTRATION IN MG/KG

	ANALYSIS LEVEL DUPLICATE DATA		MEASUREMENT LEVEL TRIPLICATE DATA		ANALYSIS LEVEL TRIPLICATE DATA					
SAMP NO	S-63 LIQUID		S-63 SOLID		S-63 SOLID					
ELMT	AVERAGE	%RD	AVERAGE	%RSD	AVERAGE	%RSD	AVERAGE	%RSD	AVERAGE	%RSD
AL	ND		1050.	0.41	399.	42.27				
SB	ND		ND		ND					
AS	ND		ND		ND					
BA	ND		ND		ND					
BE	ND		ND		ND					
B	ND		ND		ND					
CD	ND		ND		ND					
CA	9.64	2.62	ND		ND					
CR	3.57	3.39	13.2	0.54	11.9	19.88				
CO	ND		4.12	22.77	ND					
CU	ND		12.	1.25	9.42	25.22				
FE	54.2	0.53	22600.	3.67	22300.	5.5				
LA	ND		ND		ND					
PB	ND		ND		ND					
MG	ND		64.4	16.06	52.7	38.72				
MN	4.16	2.19	169.	4.22	155.	12.39				
HG	.33	29.7								
MO	ND		ND		ND					
NI	ND		66.9	2.74	67.9	4.61				
K	ND		NA		NA					
SC	ND		ND		ND					
SE	ND		ND		ND					
SI	ND		42.2	33.75	39.4	43.38				
AG	ND		ND		ND					
NA	ND		ND		ND					
SR	ND		ND		ND					
TL	ND		ND		ND					
TI	ND		ND		ND					
W	ND		8.55	100.	8.01	96.83				
V	ND		0.718	86.8	ND					
ZN	ND		49.5	10.07	46.9	16.1				
ZR	ND		10.7	7.56	10.7	8.51				

ND = LESS THAN LOD
%RSD = PERCENT RELATIVE STANDARD DEVIATION

TABLE 6 ELEMENTAL SPIKED SAMPLE ACCURACY REPORT
CHEMICAL WASTE MANAGEMENT, OHIO LIQUID DISPOSAL, VICKERY, OH
PROJECT A07

CONCENTRATION IN MG/KG

	LIQUID PHASE: ANALYSIS LEVEL DATA				SOLID PHASE: MEASUREMENT LEVEL DATA				SOLID PHASE: ANALYSIS LEVEL DATA			
	SAMP TAG	SAMPLE VALUE	SPIKE LEVEL	% REC	SAMP TAG	SAMPLE VALUE	SPIKE LEVEL	% REC	SAMP TAG	SAMPLE VALUE	SPIKE LEVEL	% REC
AL	S63L	32.8	885.	93.4	S63S	67.8	3760.	97.9	S63S	67.8	1222.	111.0
SB	S62L	ND	20.0	97.0	S63S	ND	80.	94.0	S63S	ND	1222.	103.1
AS	S62L	ND	20.0	101.0	S63S	ND	80.	98.0	S63S	ND	1222.	110.7
BA	S63L	ND	88.5	82.6	S63S	ND	376.	89.7	S63S	ND	1222.	102.4
BE	S63L	ND	88.5	84.9	S63S	ND	376.	102.1	S63S	ND	1222.	114.1
B	S63L	ND	88.5	75.9	S63S	ND	376.	86.	S63S	ND	1222.	95.1
CD	S63L	0.392	88.5	88.9	S63S	ND	376.	94.6	S63S	ND	1222.	103.2
CA	S63L	93.	8850.	85.1	S63S	ND	37600.	97.4	S63S	ND	1222.	116.5
CR	S63L	84.4	442.5	76.3	S63S	10.7	376.	98.3	S63S	10.7	1222.	105.7
CO	S63L	3.22	88.5	94.9	S63S	ND	376.	100.2	S63S	ND	1222.	81.9
CU	S63L	6.8	88.5	94.7	S63S	7.86	376.	95.6	S63S	7.86	1222.	97.1
FE	S63L	40700.	NS		S63S	21100.	11280.	95.7	S63S	21100.	1222.	SLI
LA	S63L	4.97	88.5	96.4	S63S	ND	376.	97.4	S63S	ND	NS	
PB	S63L	7.25	88.5	87.5	S63S	ND	376.	98.1	S63S	ND	1222.	105.6
MG	S63L	48.	8850.	96.5	S63S	40.	37600.	99.9	S63S	40.	1222.	116.6
MN	S63L	312.	88.5	SLI	S63S	144.	376.	95.5	S63S	144.	1222.	111.8
HG	S63L	.33	250.	97.1								
MO	S63L	25.6	88.5	91.2	S63S	ND	376.	94.9	S63S	ND	1222.	95.7
NI	S63L	75.2	88.5	85.3	S63S	64.3	376.	105.8	S63S	64.3	NS	
K	S63L	39.4	8850.	116.	S63S	NA	NS		S63S	NA	NS	
SC	S63L	ND	88.5	84.5	S63S	ND	376.	92.5	S63S	ND	NS	
SE	S63L	ND	20.0	103.0	S63S	ND	80.	99.0	S63S	ND	1222.	112.4
SI	S63L	34.9	885.	98.8	S63S	25.9	3760.	93.8	S63S	25.9	1222.	103.3
AG	S63L	ND	88.5	90.7	S63S	ND	376.	85.3	S63S	ND	NS	
NA	S63L	42.7	8850.	97.9	S63S	ND	37600.	99.9	S63S	ND	1222.	105.3
SR	S63L	0.636	88.5	89.1	S63S	ND	376.	96.3	S63S	ND	1222.	103.0
TL	S63L	ND	885.	78.4	S63S	ND	3760.	83.3	S63S	ND	1222.	72.6
TI	S63L	0.846	88.5	88.9	S63S	ND	376.	85.4	S63S	ND	1222.	102.2
W	S63L	26.	885.	94.6	S63S	15.5	3760.	110.9	S63S	15.5	1222.	73.5
V	S63L	1.51	88.5	94.6	S63S	1.11	376.	97.1	S63S	1.11	1222.	103.7
ZN	S63L	480.	442.5	79.5	S63S	45.1	376.	97.2	S63S	45.1	1222.	105.7
ZR	S63L	15.4	88.5	107.4	S63S	11.6	376.	97.6	S63S	11.6	1222.	88.3

L = LIQUID PHASE
S = SOLID PHASE
SLI = SPIKE LEVEL INSUFFICIENT
ND = LESS THAN LIMIT OF DETECTION
NS = NOT SPIKED
%REC = PERCENT RECOVERY OF SPIKE

TABLE 7

ELEMENTAL CONTROL SAMPLE ACCURACY REPORT
CHEMICAL WASTE MANAGEMENT, OHIO LIQUID DISPOSAL, VICKERY, OH
PROJECT A07

CONCENTRATION IN MG/KG

	NBS SRM 1645 RIVER SEDIMENT			CONOSTAN S-21 METALLO-ORGANICS IN OIL			EPA SRM 9/76 DIGESTED SLUDGE					
	FOUND	ACTUAL	%D	FOUND	ACTUAL	%D	FOUND	ACTUAL	%D	FOUND	ACTUAL	%D
AL	23300.	22600.	3.1	936.	900.	4.						
SB												
AS	66.7	66.	1.1									
BA	348.	340.	2.3	892.	900.	-0.9						
BE												
B				780.	900.	-13.3						
CD	5.45	10.	-45.5	903.	900.	0.4						
CA	28900.	29000.	-0.3	914.	900.	1.5						
CR	25700.	29600.	-13.3	902.	900.	0.2						
CO												
CU	103.	109.	-5.1	847.	900.	-5.9						
FE	99000.	113000.	-12.4	936.	900.	4.						
LA												
PB	647.	714.	-9.4	901.	900.	0.1						
MG	6990.	7400.	-5.5	927.	900.	3.						
MN	701.	785.	-10.7	938.	900.	4.2						
HG							11.2	16.	-30.0			
MO				849.	900.	-5.7						
NI	43.6	46.	-5.3	911.	900.	1.2						
K												
SC	1.95	2.	-2.3									
SE												
SI	218000.	238000.	-8.3	790.	900.	-12.2						
AG												
NA	5800.	5400.	7.4	920.	900.	2.2						
SR	787.	820.	-4.									
TL												
TI	600.	640.	-6.2	876.	900.	-2.6						
W												
V	27.4	24.	14.	859.	900.	-4.5						
Y												
ZN	1440.	1720.	-16.4	870.	900.	-3.3						
ZR	94.8000	77.0000	23.1									

ND = LESS THAN LOD
%DEV = PERCENT DEVIATION

Chemical Waste Management, Inc.
3956 State Rt. 412
Vickery, Ohio 43464
419/547-7791

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

July 15, 1983

Mr. Rich Shank
Surveillance and Enforcement Section
Division of Hazardous Materials Management
361 East Broad Street
Columbus, Ohio 43216

CONFIDENTIAL

Re: Chemical Waste Management, Inc.
Vickery, Ohio
Consultant Activity

Dear Mr. Shank:

In order to continue to provide the Agency Status Reports of the numerous consultant activity at the Chemical Waste Management, Inc., site in Vickery, Ohio, the following summary and report submittals have been prepared:

I. AIR MONITORING

Transmitted with this letter you will find a report entitled "Air Monitoring for PCB's and Inorganic Acids at CWM, Vickery, Ohio" prepared by Environmental Research and Technology, Inc., of Concord, Massachusetts. This report further addresses the work sampling effort conducted at the site in late May. This sampling effort concluded PCB's were not present at the detection limit. Initially, this sampling effort also included V.O.C. collection. However, due to sampling error results could not be provided. Resampling for V.O.C. will be near July 22, 1983.

II. HYDROGEOLOGICAL INFORMATION

On July 1, 1983, Chemical Waste Management, Inc. transmitted to Mr. Russ Stein and other Agency personnel, a report entitled "Geotechnical and Geohyrologic Data Review" and "Lagoons 12, 11, 7, 5 and 4 Dimensions" prepared by Golder Associates, Inc., of Atlanta, Georgia. Today, this letter is transmitting a report entitled "Assessment of Perimeter Containment Dike Stability, Ponds 5, 7, 11 and 12 Chemical Waste Management, Inc., Liquid Disposal Facility, Vickery, Ohio" also prepared by Golder Associates. These reports further address the hydrogeology and stability of the facility in specific formats.

In addition to the above mentioned reports, Golder Associates is presently preparing for submission to the Agency at the end of July a long term, phased groundwater quality assessment plan which will address future site evaluation efforts. As in the past, Chemical Waste Management will continue to work through the Northwest District Office regarding hydrogeologic assessments and submission of this plan.

III. SITE CHARACTERIZATION and ANALYTICAL RESULTS

Environmental Testing and Certification Corporation (E.T.C.) of Edison, New Jersey, has prepared for transmittal of several reports addressing Phase V, the sludge sampling of both Open and Closed Ponds and the Sludge Farms conducted in April and May of 1983. On June 13, 1983 a Draft Summary Report on Phase Va (Open Ponds) was submitted to the Agency detailing PCB levels and E.P. Toxicity Results in certain Open Ponds. Additional E.P. Toxicity and Dioxin results for the open ponds are being transmitted with this letter. Also, a Draft Summary Report on Phase Vb (Closed Ponds) is being transmitted detailing PCB, E.P. Toxicity and Dioxin results. To assist the Agency in understanding which data points have been transmitted, a summary sheet for all of Phase V has been enclosed. Any remaining data for the Open and Closed Pond sampling is expected within the next few weeks and will be transmitted upon receipt. Results completed for the Private Well sampling conducted with the Sandusky County Board of Health are also being transmitted.

Should you have any questions regarding the above reports transmitted from E.R.T., E.T.C. or Golder Associates, please feel free to contact me at (419)547-7791.

Sincerely,

CHEMICAL WASTE MANAGEMENT, INC.

Kathy Trent

Kathy Trent
Environmental Specialist

KT/dw

cc: Michael Walker, USEPA
Robert Styduhar, OEPA
George Vander Velde
Jeff Miller
Lee Archambeau

POND 5

PCB SLUDGE

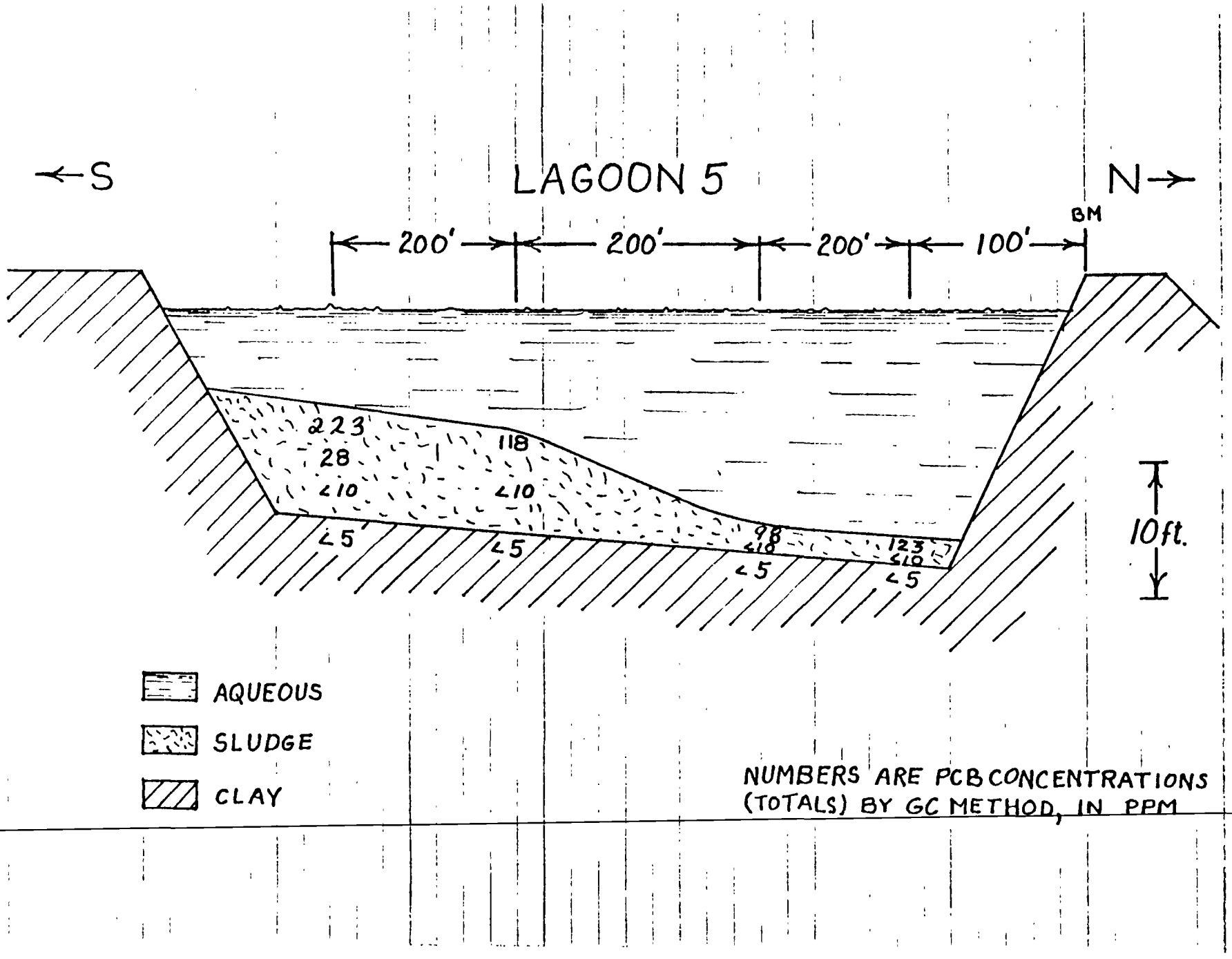
ANALYSIS

Total No. of Samples: 11
No. of Sludge: 7
No. of Clay Cores: 4
No. of Sectors: 4
Average Depth of Sludge: 5.14'
Total Volume of Sludge: 21,900 yd^3

E.T.C. Code	1242 Mg/kg	1254 mg/kg	1260 mg/kg
BL5-1-1 Sludge	Less Than 250	100	23.
1-2 Sludge	Less Than 50	Less Than 10	Less Than 10
1-3 Clay	Less Than 5	Less Than 5	Less Than 5
5-2-1 Sludge	Less Than 250	81	17
2-2 Sludge	Less Than 50	Less Than 5	Less Than 5
2-3 Clay	Less Than 5	Less Than 5	Less Than 5
5-3-1 Sludge	Less Than 250	98	19.8
3-2 Clay	Less Than 5	Less Than 5	Less Than 5
5-4-1 Sludge	Less Than 250	195	28.5
4-2 Sludge	Less Than 250*	28	Less Than 10
4-3 Clay	Less Than 5	Less Than 5	Less Than 5

Additional Analysis: E.P. Toxicity: BL5-1-1; BL5-4-1
Dioxin: BL5-4-1
*GC/MS: BL5-4-2 for Arochlor 1242 was not detected at a detection limit of 5 g/l

All results completed by Environmental Testing and Certification Corporation of Edison, New Jersey



Chemical Waste Management, Inc.
Technical Center
150 W. 137th Street
Riverdale, Illinois 60627
312/841-8360

JOB SLUDGE & PCB LEVELS

SHEET NO. 2 OF 3

CALCULATED BY W. ABEL DATE 6-7-83

CHECKED BY _____ DATE _____

SCALE AS INDICATED

OPEN POND 4

SLUDGE PCB

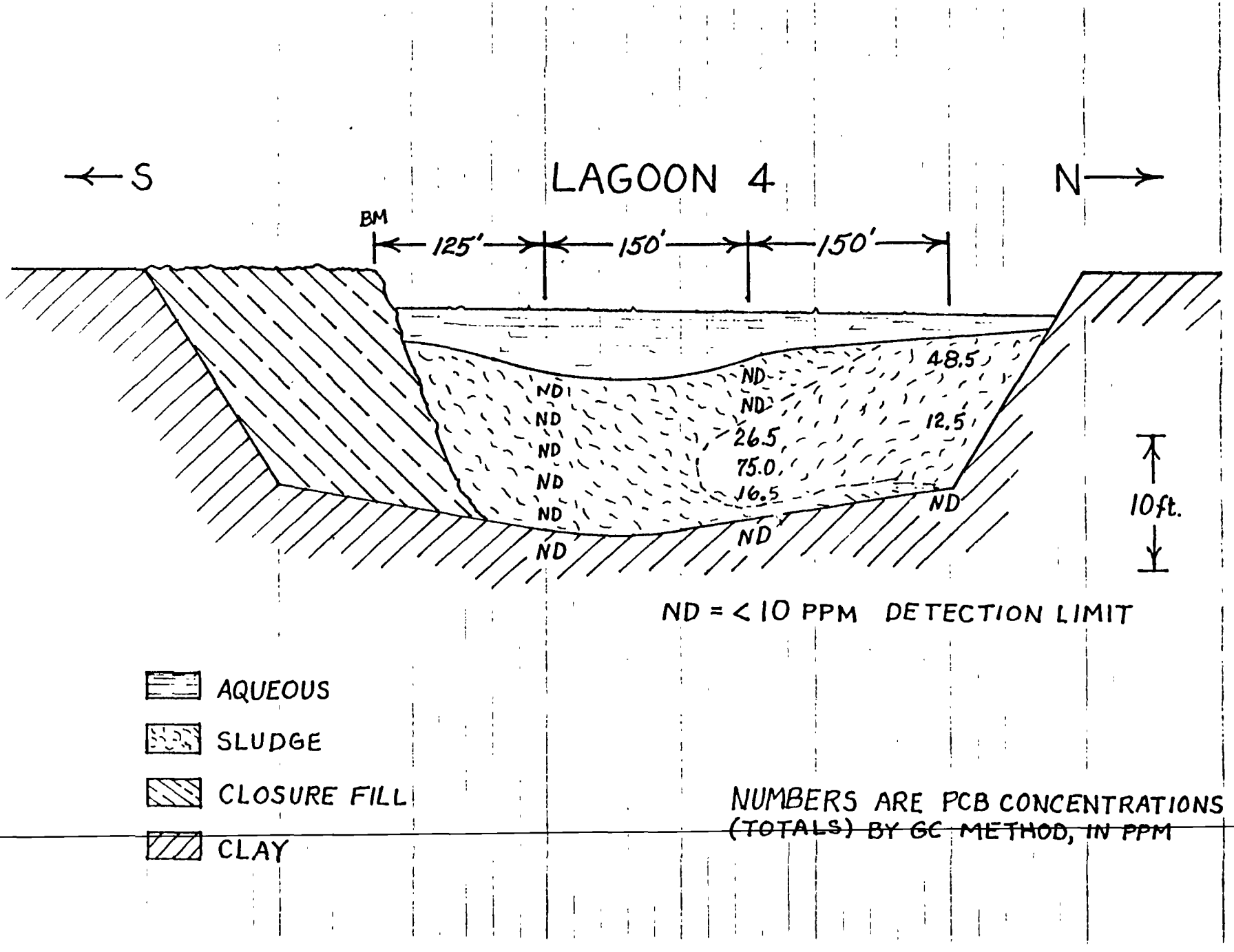
ANALYSIS

Total No. of Samples: 16
No. of Sludge: 13
No. of Clay Cores: 3
No. of Sectors: 3
Average Depth of Sludge: 9'
Total Volume of Sludge: 36,500 yd^3

E.T.C. Code	1242 mg/kg	1254 mg/kg	1260 mg/kg
BL4-1-1 Sludge	Less Than 250	48.5	Less Than 10
1-2 Sludge	Less Than 250	12.5	Less Than 10
1-3 Clay	Less Than 5	Less Than 5	Less Than 5
4-2-1 Sludge	Less Than 10	Less Than 10	Less Than 10
2-2 Sludge	Less Than 10	Less Than 10	Less Than 10
2-3 Sludge	Less Than 50	26.5	Less Than 10
2-4 Sludge	Less Than 250	75	Less Than 10
2-5 Sludge	Less Than 100	16.5	Less Than 10
2-6 Clay	Less Than 5	Less Than 5	Less Than 5
4-3-1 Sludge	Less Than 50	Less Than 10	Less Than 10
3-2 Sludge	Less Than 100	Less Than 10	Less Than 10
3-3 Sludge	Less Than 250	Less Than 10	Less Than 10
3-4 Sludge	Less Than 250	Less Than 10	Less Than 10
3-5 Sludge	Less Than 100	Less Than 10	Less Than 10
3-6 Sludge	Less Than 50	Less Than 5	Less Than 5
3-7 Clay	Less Than 5	Less Than 5	Less Than 5

Additional Analysis: E.P. Toxicity: BL4-2-5; BL4-3-3
Dioxin: BL4-2-2

All results completed by Environmental Testing and Certification Corporation of Edison, New Jersey



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312/841-8360

JOB SLUDGE & PCB LEVELS

SHEET NO. 1 OF 3

CALCULATED BY W. ABEL DATE 6-7-83

CHECKED BY DATE

SCALE AS INDICATED

RIP RAP

OPEN PONDS

PCB ANALYSIS

E.T.C. Code	1242 mg/kg	1254 mg/kg	1260 mg/kg
Pond 4 (Rip-4)	Less than 50	Less than 5	13.7
Pond 5 (Rip-5)	Less than 50	183	28.7
Pond 7 (Rip-7)	Less than 50	Less than 5	42
Pond 11 (Rip-11)	Less than 125	436	140

All results completed by Environmental Testing and Certification Corporation of Edison, New Jersey

EXHIBIT II

SLUDGE REMEDIAL OPERATIONS

1.1 GENERAL DISCUSSION

Ponds 4 and 5 at the Ohio Liquid Disposal (O.L.D.) facility of Chemical Waste Management, Inc. (CWM) located in Vickery, Ohio are proposed to undergo immediate remedial action. Pond 4 dimensions are approximately 20' D x 550' L x 190'W. Pond 5 dimensions are approximately 20' D x 840' L x 165'W. Measurements of sludge depths and chemical compositions in all waste ponds at the O.L.D. site were authorized by CWM during April and May, 1983. From these depth measurements, Pond 4 contains an average of 9 feet of bottom sludges varying in depth from 4 feet to 14 feet; the aqueous layer above these sludges averages 5 feet in depth. Pond 5 contains an average sludge depth of 5 feet, varying between 3 feet to 9 feet; the aqueous layer above these sludges in Pond 5 averages 12 feet. From these data, and considering the geometry of the ponds, it is estimated that Pond 4 contains approximately 36,500 yd^3 of sludge and Pond 5 contains approximately 21,900 yd^3 of sludge.

Remedial actions proposed for Ponds 4 and 5 involve: draining the aqueous phases from these ponds into remaining ponds through an oil separator where necessary; excavation of sludges; pugging sludges to stabilize and solidify these materials; replacing solidified materials into Ponds

4 and 5 after installing leachate collection systems; and finally capping, grading, and seeding of closed Ponds 4 and 5.

The sequence of remedial actions and the modifications to Ponds 4 and 5 are discussed in greater detail in the following sections.

1.2 REMEDIAL ACTION ALTERNATIVES

CWM has evaluated nine alternatives for remedial actions regarding Ponds 4 and 5. Based upon a thorough analysis of environmental impacts, costs, implementation schedules, and risk factors, the alternative selected involves: closure of Ponds 4 and 5 with treatment of sludges by solidification, installing leachate collection systems in Ponds 4 and 5, and refilling solidified materials into these ponds. This alternative represents an improvement to the current site Closure Plan and uses the solidification process for sludges previously accomplished in closing Pond 9 and partially closing Pond 4 (south end).

The following figures will assist the reader in understanding the proposed remedial plan for Ponds 4 and 5:

1. Drawing 1 - partial plan view of O.L.D. facility showing locations of active ponds.
2. Drawing 2 - plan view of typical leachate collection systems for Ponds 4 and 5.
3. Drawing 3 - cross-section of typical leachate collection systems for Ponds 4 and 5.

The existing Closure Plan for O.L.D. does not require leachate collection systems to be installed in closed ponds. Therefore, closure would be accomplished by draining the aqueous phase, solidifying sludges, replacing solidified materials into the pond, installing a compacted cover material, final grading, topsoil and seeding. As an improvement to this Closure Plan for Ponds 4 and 5, CWM proposes to install leachate collection systems prior to refilling these ponds with solidified sludges; final capping, grading, and seeding would be accomplished for pond closure. Figures 2 and 3 show typical leachate collection systems proposed for Ponds 4 and 5 from a conceptual design basis only. It is important to note that installation of the leachate collection systems requires reworking pond side slopes by adding clay from the on-site borrow pit and compacting in place to form a 2:1 slope. Compaction of both the sides and bottom will decrease the permeability of native clay and increase pond integrity. Leachate collected from these systems will be disposed of by deep well injection after appropriate treatment, if necessary.

1.3 REMEDIAL ACTION SEQUENCE

In accordance with the proposed remedial action plan for Ponds 4 and 5, the following sequence of activities will be required to assure timely, environmentally-sound pond closure.

1. Install an API-type oil separator on the southern corner of Pond 7. This unit will process the aqueous portions, as needed, of Ponds 4 and 5 sequentially. Aqueous discharge from the separator will flow to one of the remaining ponds. Floating oils in the separator will be removed, tested and disposed of in accordance with chemical contents of the oil (i.e., PCB-contaminated oils require off-site disposal by approved means, non-contaminated oils may be sold as reclaimed oils). The sludges from the separator will be routed to the pug mill for solidification and refilled into the ponds along with solidified pond sludges at a later time.

2. Concurrent with Item 1, install or mobilize sludge excavation equipment to retrieve pond sludges and route them to the pug mill area for solidified. The pug mill will be refurbished and moved from its current location east of Pond 4 to the processing area south of Pond 5.

3. Beginning with Pond 4, pump the aqueous phase through the oil separator until approximately 1' of aqueous phase remains in Pond 4. This liquid will be retained in the pond to reduce possible odors in later excavation of pond sludges.

4. Surface oils in Ponds 4 and 5 will be removed as required using the existing skim oil truck and pump systems. As with Item 1, skim oil will be disposed of according to chemical analysis.

5. Pond 4 sludges will be excavated by appropriate equipment (dredge, pump, vacuum system, etc.) and routed to a sludge hopper for temporary storage. Pond sludges will be pumped from this hopper to the pug mill.

6. Excavation and pugging will continue until Pond 4 sludges are no longer able to be excavated conveniently. At this time, earthmoving equipment will enter Pond 4 and scrape remaining sludges from the sides and bottom of the pond.

Scraping will continue until approximately 6" of clay is removed from all sides and bottom areas. These materials will be sent to the pug mill for solidification.

7. During the pugging process for Pond 4, solidified materials from the pug mill will be temporarily stored in a contained storage area.

8. When sludges from Pond 4 have been removed (Item 6), the leachate collection system shown schematically in Figures 2 and 3 will be installed. This will involve: reworking pond side slopes from 1:1 to 2:1 using on-site clay from the borrow pit; recompacting the sides and bottom areas; and, installing the necessary drainage, leachate collection, and geotextile fabric systems.

9. When Pond 4 has been made ready for receipt of solidified materials, pugged sludges from the storage area will be trucked, placed, and compacted into Pond 4. This process will continue until approximately 17' of pugged sludges are placed into Pond 4. A cover cap of approximately 3' of compacted clay will be installed with final grading, 6" of topsoil, and seeding. Pond 4 is now closed.

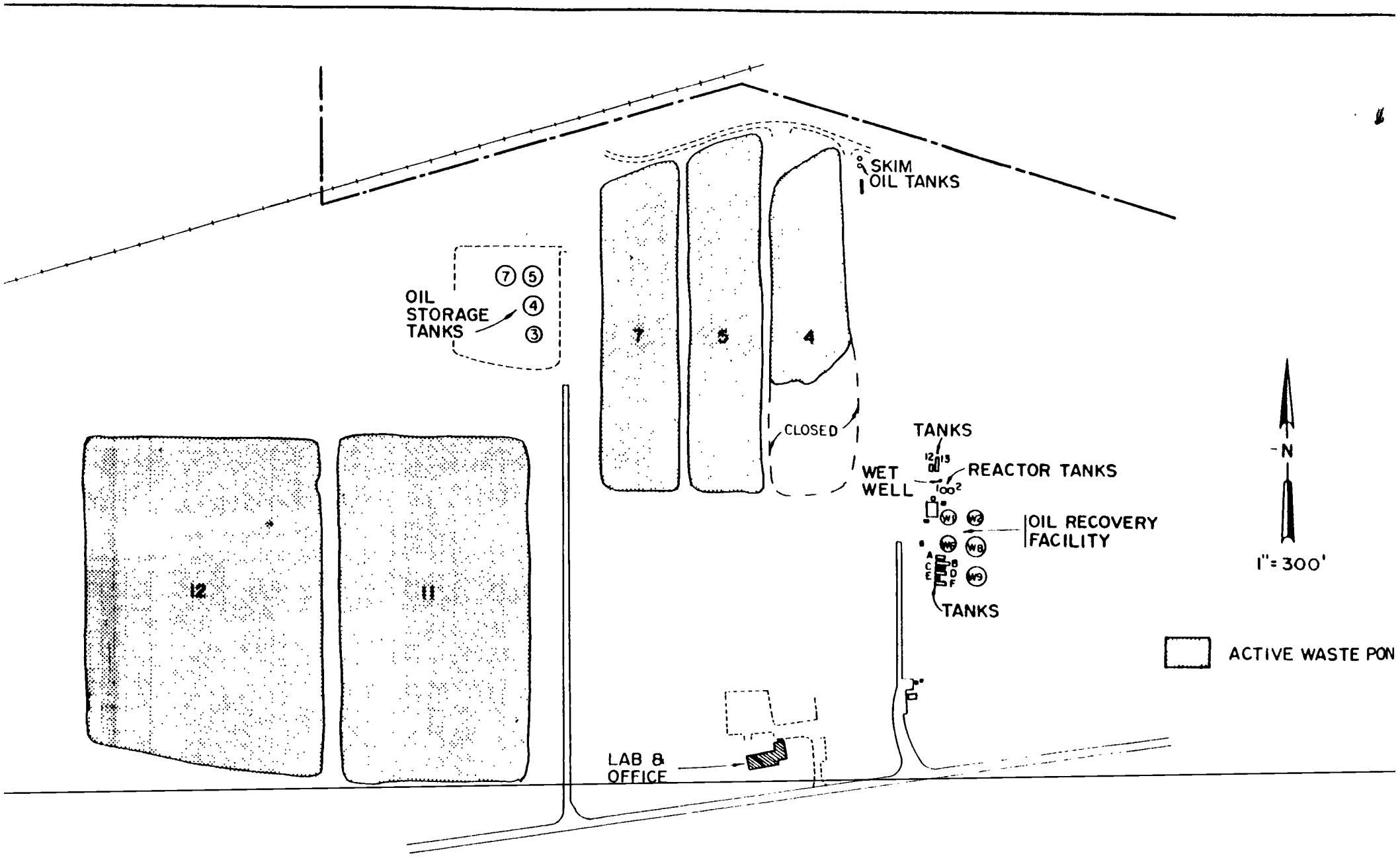
10. Concurrent with Item 6, when Pond 4 is being scraped, the aqueous phase of Pond 5 will be drained to within 1' of the sludge layer using the oil separator where needed as described previously in Item 1.

11. When the sludge excavation equipment, sludge hopper, and pumping system are no longer required for Pond 4 sludges (Item 8), they will be moved to Pond 5. Excavation of Pond 5 sludges and solidification will begin and continue concurrent with the leachate collection system installation, refilling, and closure of Pond 4.

12. When Pond 5 sludges have been excavated and pugged, the pond will be scraped by removing remaining sludges and approximately 6" of clay from the sides and bottom areas. This material will also be pugged.

13. When sludges from Pond 5 have been removed, the leachate collection system will be installed and the pond made ready to receive solidified sludges from temporary storage.

14. Pond 5 will undergo the same processes as Pond 4, previously described in Item 9, for ultimate closure.



CHEMICAL WASTE MANAGEMENT
VICKERY, OHIO

DWG. 1

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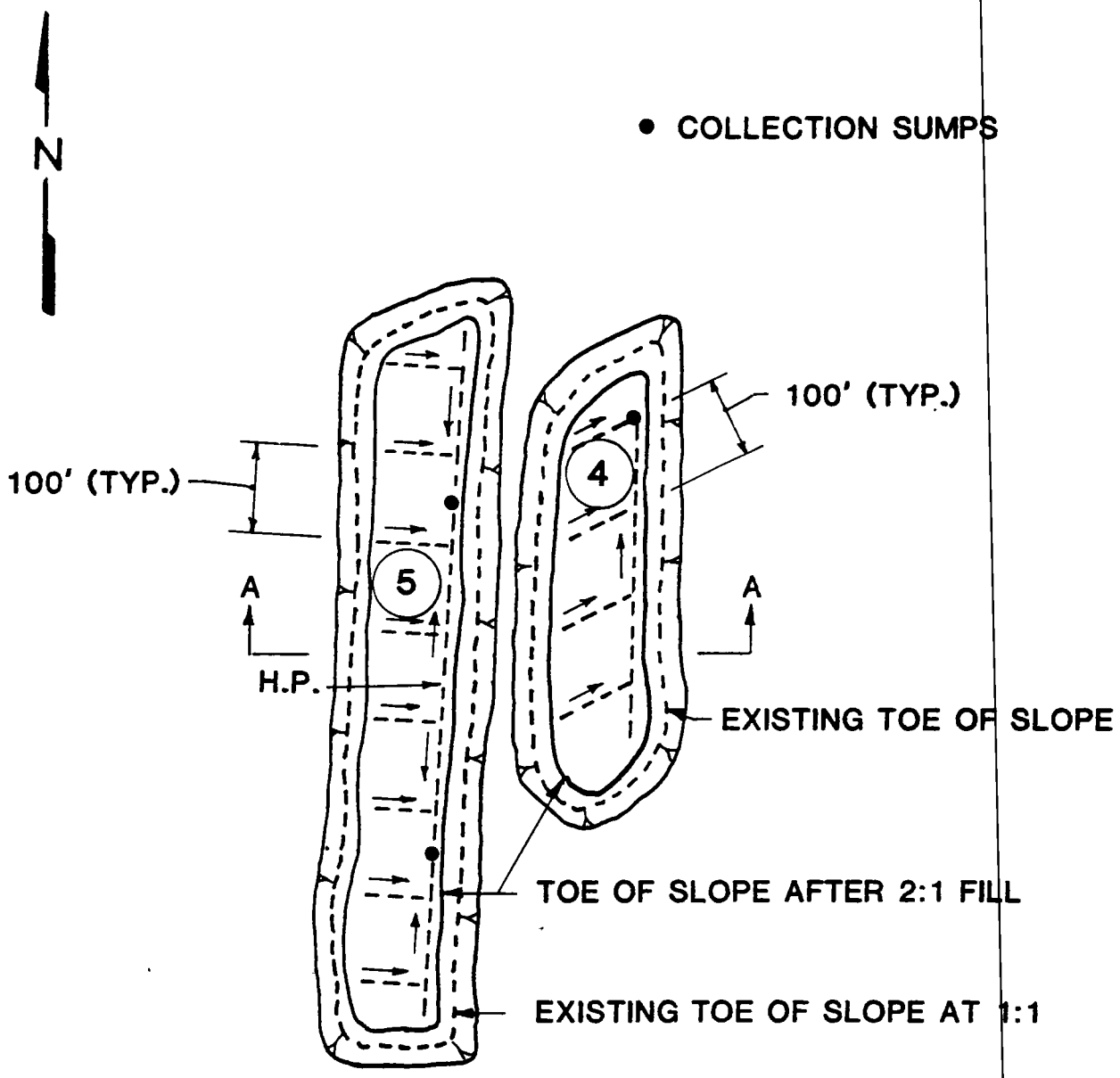


LEACHATE COLLECTION
PLAN VIEW
PONDS #4 & #5

SCALE: 1"-200'

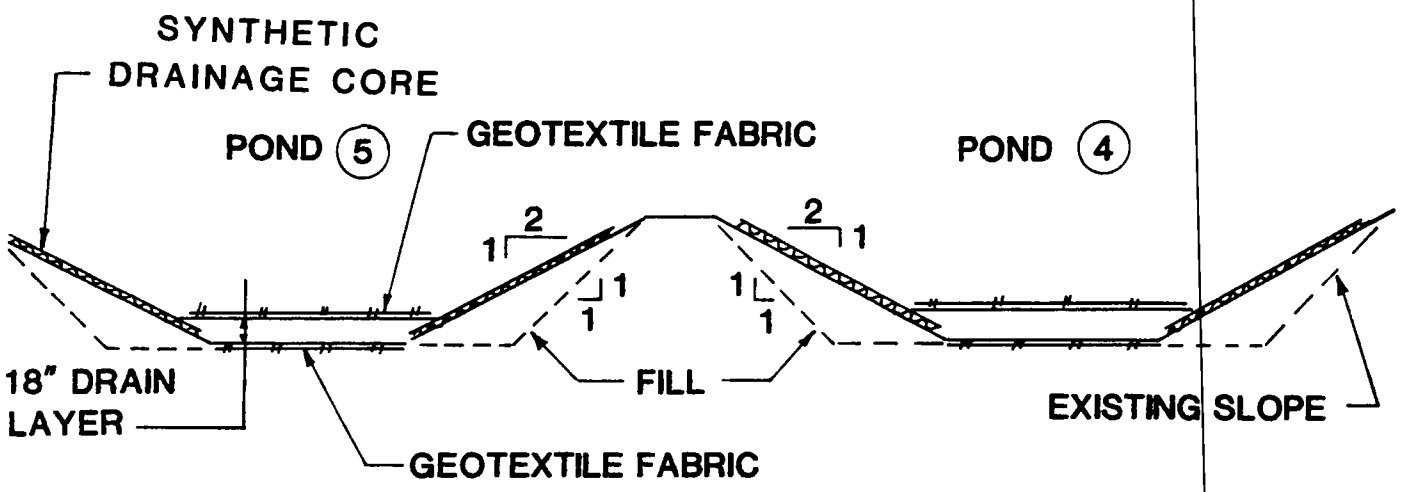
CHEMICAL WASTE MANAGEMENT, INC.

VICKERY OHIO

ROY F WESTON, INC
WESTON
ENVIRONMENTAL CONSULTANTS-DESIGNERS

DRAWN	DATE	DES. ENG	DATE	W O NO 2090-06-01
CHECKED		APPROVED		DWG. NO. 2

K&E 19 1253 3-83 X1232



SECTION A-A

LEACHATE COLLECTION
CROSS-SECTION
PONDS #4 & #5

CHEMICAL WASTE
MANAGEMENT, INC.

VICKERY OHIO

ROY F. WESTON, INC
WESTON
ENVIRONMENTAL CONSULTANTS-DESIGNERS

DRAWN	DATE	DES. ENG	DATE	W. O. NO. 2090-06-01
CHECKED		APPROVED		DWG. NO. 3

1.0 SITE GEOLOGY

1.1 Geologic Setting

Previous investigations by Bowser-Morner, Inc.[1], indicates the site is underlain primarily by glacial till of the Wisconsin period of glaciation covered by lacustrine deposits. A thin, discontinuous deposit of dense till has been encountered above the bedrock. This deposit is believed to be older than the overlying till.

The site is located on the southeast flank of the Findlay Arch which strikes generally northeast-southwest. The bedrock immediately beneath the glacio-lacustrine overburden is the Tymochtee Member of the Bass Island Formation. This rock is generally classified as a dolomite but contains various amounts of shale, gypsum, and anhydrite.

1.2 Site Stratigraphy

Subsurface investigation by Bowser-Morner, Inc.[1], and Golder Associates[2] indicate the glacio-lacustrine overburden to range from about 40 ft. to 50 ft. in thickness across the site. The lacustrine deposits range in thickness from about 5 ft. to 25 ft. and the upper portion frequently contains a trace of organic matter in the form of fine root fibers; probably representative of the 'B' topsoil horizon. The upper glacial till ranges in thickness from about 10 ft. to 45 ft. and appears to be continuous across the site. The lower, dense till is gener-

1. Bowser-Morner Testing Laboratories, Inc. "Hydrogeologic Assessment, Northern Ohio Treatment Facility, Vickery, Ohio", May 3, 1983.
2. Golder Associates, "Geotechnical and Geohydrologic Data Review, Vickery, Ohio Chemical Waste Management Facility", June 1983.

ally less than 5 ft. thick and is discontinuous. For illustration purposes a typical profile of the stratigraphy at the site is presented on Figure 1. Detailed stratigraphic profiles are presented in other reports by Golder Associates[1, 2].

The lacustrine deposits are fairly uniformly graded and classified as silty clay to clayey silt with a little sand. This material exhibits horizontal laminations with occasional sand partings between the laminations. The liquid limit of the material varies from about 30% to 40% and the plastic limit is about 20%. There is a pattern of decreasing penetration resistance (from about 30 to 10 blows/ft.) and increasing water content (from about 20% to 30%) with depth. These factors are typical of desiccation in the geologic past and suggest a historic groundwater level between EL 580 ft. and 590 ft.

The upper glacial till is fairly well-graded and classified as clayey silt to silty clay with some sand and gravel. It has a liquid limit between 25% and 30% and a plastic limit of about 18%. The water content ranges from about 12% to 21%. The penetration resistance of this material ranges from 4 to 15 blows/ft. and tends to increase with depth.

The discontinuous, dense, lower till is a fairly well-graded sand, gravel, and silty clay. The water content is on the order of 8% to 12%. This material exhibits high penetration resistance of greater than 50 blows/ft.

---

1. Ibid.

2. Golder Associates, "Assessment of Perimeter Containment Dike Stability, Ponds 5, 7, 11 and 12, Chemical Waste Management, Inc., Liquid Disposal Facility, Vickery, Ohio", June 1983.

Existing lagoon dike embankments at the site are classified as silty clay with occasional traces of sand and gravel and are fairly uniform in composition at all sampled locations. The penetration resistance of the fills ranges from 6 to 23 blows/ft. and tends to increase with depth. The water content of samples tested ranges from about 17% to 24%. The embankment fills have been constructed from on-site lacustrine and till materials excavated from within the lagoon bottoms and an on-site borrow pit. The fills do not exhibit the horizontal laminations of the lacustrine deposits because they were destroyed during construction. A Standard Proctor Compaction test of a sample of fill material resulted in a maximum density of 111.0 lb./cu. ft. at an optimum moisture content of 17.8%.

The lacustrine, upper till, and embankment fill materials were tested with a field vane shear apparatus and samples of the fill and lacustrine material were tesed in consolidated undrained triaxial shear in the laboratory to determine strength properties. Detailed test results have been reported by Golder Associates[1] and the properties recommended for embankment stability analyses are summarized as follows:

Material	Undrained Shear Strength (lb./sq. ft.)	Effective Stress Properties	
		Shear Strength	Friction Angle
Compacted Clay Fill	1,500	0	31°
Desiccated Lacustrine	1,250	0	33°
Normally Consolidated Lacustrine and Till	700	0	33°

The underlying bedrock has been cored to depths as much as 80 ft., but most data is from the upper 30 ft.to 40 ft. of the formation. Although the formation is considered as a dolomite, the detailed core descriptions indicate the rock is predominantly a gray to black shale with numerous gypsum inclusions and occasional massive dolomite layers. Voids and/or weathered zones were frequently reported in the upper 30 ft. of the rock. While core recovery was generally greater than 90% the Rock Quality Designation (R.Q.D.), which is a measure of the frequency of discontinuities in the core, was consistently less than 60% and often 0% to 20%.

1. Ibid.

2.0 SITE GROUNDWATER HYDROLOGY

2.1 Groundwater Levels

Groundwater level measurements have been made in monitoring wells and piezometers completed in the bedrock and in the overburden. The measurements in the dolomite indicate this unit to be a confined aquifer with potentiometric levels well above the top of rock in the glacio-lacustrine overburden. Measurements in the overburden indicate groundwater levels about 2 ft. to 5 ft. below ground surface; higher levels than measured in the bedrock aquifer. These differences in potentiometric levels are illustrated on Figure 1.

2.2 Hydraulic Conductivity

The hydraulic conductivity (permeability) of the dolomite aquifer has not been directly measured by pump test. However, based on water level measurements at various times at the site, and estimates of the rate of groundwater pumping from a water supply well at the site, the hydraulic conductivity of the dolomite is presently estimated to be in the range of 10^{-4} cm/s to 10^{-3} cm/s (10^2 ft./yr. to 10^3 ft./yr.) with some information suggesting it could be 10^{-2} cm/s (10^4 ft./yr.). In any case, the hydraulic conductivity of the dolomite bedrock aquifer is substantially higher than that of the overburden materials and bedrock is used as a local aquifer. Because of high sulfates in the aquifer it is primarily used for agricultural purposes and not for human consumption.

The hydraulic conductivity of the lacustrine and glacial overburden soils has been measured by constant head laboratory permeability tests and rising head tests in piezometers installed in boreholes. The vertical per-

meability from laboratory samples of till and lacustrine materials ranged from 6.1×10^{-9} cm/s to 3.5×10^{-8} cm/s (6.1×10^{-3} ft./yr. to 3.5×10^{-2} ft./yr.). The permeability values from rising head tests in till ranged from 1.2×10^{-8} cm/s to 2.7×10^{-8} cm/s (1.2×10^{-2} ft./yr. to 2.7×10^{-2} ft./yr.). These data indicate the permeability of the till and vertical permeability of the lacustrine soils to be about 2×10^{-8} cm/s (2×10^{-2} ft./yr.).

The horizontal permeability of a sample of lacustrine soil was directly measured in the laboratory as 8.6×10^{-8} cm/s (8.6×10^{-2} ft./yr.), which is about four times the vertical permeability. One of the piezometers was completed in the lacustrine material and may have intersected the desiccated zone as well as the lower portion of the topsoil. The rising head permeability measured in this piezometer was 1.0×10^{-6} cm/s (1.0×10^{4} ft./yr.). This value may be representative of the in situ horizontal permeability of the desiccated materials. Although this is a limited amount of data, the magnitude of the measured values of the horizontal permeability of the layered lacustrine soil and permeability of the desiccated zone are reasonable. Experience in similar lacustrine soils suggests the horizontal permeability will be at least 10 times greater than the vertical permeability and both horizontal and vertical permeability could be even greater in localized areas where desiccation cracks may be open. The till materials were not deposited as distinct layers and would be expected to have a horizontal permeability only slightly greater than their vertical permeability (probably 3 times greater). However, the rising head tests indicate about the same values as the laboratory values so that 2×10^{-8} cm/s (2×10^{-2} ft./yr.) would be a reasonable value for either direction.

2.3 Groundwater Gradients

Published literature reports northward groundwater flow in the dolomite aquifer, toward Lake Erie, in the northern part of Ohio. The gradient is typically very flat, on the order of 1.6×10^{-3} ft./ft., so that the flow velocity is slow, on the order of tens to a few hundred feet per year. However, pumping at the site from the dolomite aquifer has created a radially inward gradient pattern immediately around the site. This pattern has been confirmed by field measurements as reported by Golder Associates[1].

The difference in potentiometric head levels between the overburden soils and the dolomite aquifer indicate a downward vertical flow gradient on the order of 0.33 ft./ft. in the overburden. Combined with a vertical permeability of 2×10^{-8} cm/s (2×10^{-2} ft./yr.) and an estimated drainable porosity of 0.1, the flow velocity downward through the glacial till overburden is about 0.07 ft./yr. The horizontal flow through the overburden is also estimated to be very low because of the nearly flat gradient across the site. However, the horizontal velocity in the desiccated lacustrine soils may be on the order of a few feet per year because of the higher permeability and probable low secondary porosity (porosity of the cracks).

1. Golder Associates, "Geotechnical and Geohydrologic Data Review, Vickery, Ohio Chemical Waste Management Facility," June 1983.

3.0 GEOHYDROLOGIC CONSTRUCTION CONSIDERATIONS

3.1 Groundwater Influence and Control

Construction of a waste disposal landfill excavated into the existing ground at this site will not be hampered by groundwater inflows. The volume of water which would enter an excavation in the lacustrine or till soils will be low and easily manageable. Runoff or direct precipitation will be the major contributor to water in such an excavation.

The 40 ft. to 50 ft. depth to the dolomite aquifer with the very low permeability of the intervening glaciolacustrine soils will provide a tremendous amount of positive protection against potential leachate seepage to the aquifer. With a low permeability soil cover and seepage control with a leachate collection system, the local gradients in the overburden soils can be directed inward to the waste disposal area; thus nearly eliminating the potential for outward seepage flow.

The presence and parameters of the dolomite aquifer have no direct physical effect on the construction of a waste disposal landfill in the overburden. However, the potential to be able to control the aquifer gradient beneath the site, as evidenced by present practices, provides a positive back-up system for remedial action should it ever be necessary.

3.2 Soil Construction Materials

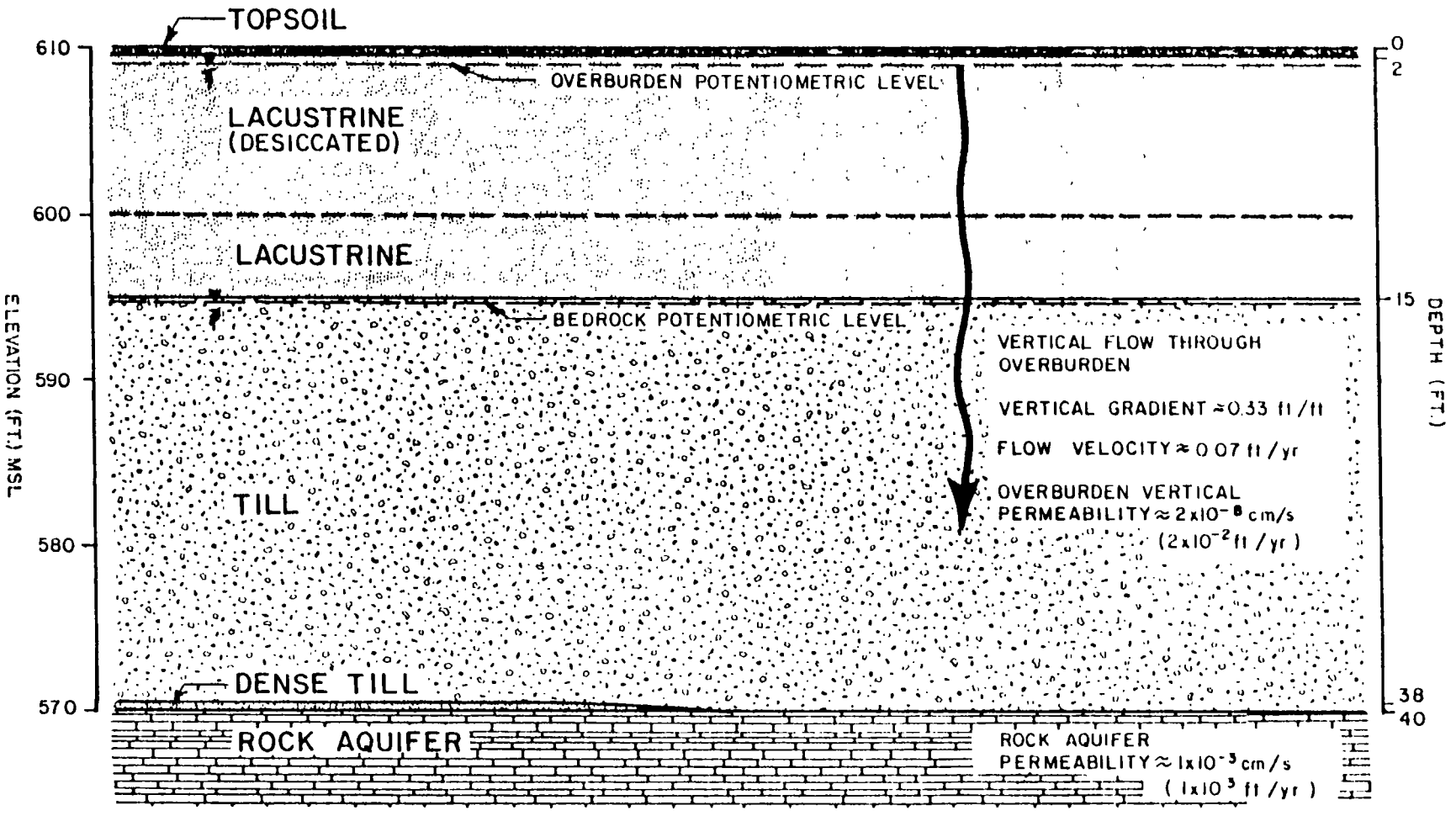
Evaluation of the physical parameters of the existing lagoon embankment materials is indicative of conditions which would be expected in development of a compacted clay liner, cover, or embankments for a waste disposal landfill

at this site. These data indicate that the on-site soils are readily compactable and will have satisfactory strength and handling characteristics for such construction. Although no permeability tests have been performed on compacted samples of the silty clay overburden, their permeability can be expected to be near 10^{-8} cm/s (10^{-2} ft./yr.) with proper compaction and moisture control.

In development of a waste disposal facility incised through the lacustrine materials the potential preferential horizontal flow paths through the layer interfaces, sand partings, or desiccation cracks will need to be destroyed. This can be done by over excavating these materials beyond the limits of the disposal landfill and refilling this area with the same material placed in a properly compacted layer as a liner, or by covering these materials with a compacted liner of in situ soil. The excavation and replacement during construction will destroy the preferential flow paths of these materials. This construction procedure will also destroy these preferential flow paths in the compacted cover.

The natural soils at this site are well suited for development of a hazardous waste landfill. With good construction practices the landfill can be constructed with a very low permeability liner and cover of native soils which will have good integrity over the entire landfill.

DRAFTING MEDIA



JOB NO.	834-1358
DRAWN	SKB
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SCALE	1" = 100'
DATE	7-21-83
DWG NO	28

Golder Associates

CHEMICAL WASTE MANAGEMENT, INC

TYPICAL HYDROGEOLOGIC CONDITIONS

FIGURE 1

AF 20440A-B

EXHIBIT IV

RCRA LANDFILL

2.1 GENERAL DISCUSSION

The conceptual design of the RCRA landfill proposed by CWM for the Vickery, Ohio facility is discussed in this section. The reader is referred to the following drawings:

1. Drawing 109 - leachate collection system for a typical RCRA landfill.

2. Unnumbered Drawing - cross-section of a typical RCRA landfill.

This design includes, from bottom to top, a secondary liner, a monitoring zone, a primary liner, and a leachate collection system.

Note that these drawings were prepared for a RCRA landfill at a location other than Vickery, Ohio; however, the general configuration will be similar with slight modifications given the geological conditions present at Vickery for the proposed site currently known as Pond 12. Construction of the RCRA landfill will proceed after Pond 12 has been phased out of service. The estimated landfill volume usable for waste disposal is approximately 400,000 yd^3.

2.2 SECONDARY LINER

The disposal cell secondary liner will consist of 3' to 4' of native clay, recompacted from clay currently forming the base of Pond 12. Recompaction of this native clay will yield a material with a permeability of

approximately 10^{-7} to 10^{-8} cm/sec. Geological surveys indicate there are 30' of native clays, with very low permeabilities, below this secondary liner.

2.3 MONITORING ZONE

The monitoring zone will consist of a 12" layer of crushed stone atop the secondary liner and will have a permeability of greater than 10^{-4} cm/sec. Perforated high density polyethylene (HDPE) piping will be installed in this layer to form the monitoring zone collection system. The collection piping will feed the monitoring zone sumps located in the corners of the cell. Riser pipes will extend from these sumps to a location outside the cell berm.

2.4 PRIMARY LINER

The primary liner system will consist of a 60 to 80 mil HPDE liner sandwiched between geotextile fabric on the top and bottom. The geotextile fabric serves to protect the HDPE liner from abrasion or puncture during construction of the disposal cell. The primary liner will be anchored in the berm on each side. The entire liner system will extend across the length and breadth of the cell.

2.5 LEACHATE COLLECTION ZONE

Atop the primary liner system will be the leachate collection zone. It will consist of crushed stone to a depth of about 12" and will contain a HDPE leachate collection pipe network. The perforated pipe network will feed multiple collection sumps. These sumps will essentially be depressions in the lower portions of the cell with the HDPE liner system installed continuously beneath it. Riser pipes will extend from these sumps to a location outside the cell berm. A geotextile fabric will be added atop the crushed stone to complete the leachate collection zone. Leachate collected from this system will be disposed of by deep well injection after appropriate treatment, if necessary.

2.6 LANDFILLED WASTES

Wastes to be placed in this landfill will include solidified or stabilized sludges from on-site pond closures and/or from the new waste treatment systems proposed by CWM as the ponds are phased out of service.

2.7 COVER SYSTEM

Following final waste placement, a cover system will be installed. This cover will consist of a 3' layer of compacted native clay from the on-site borrow pit. Above this cap, 6" of topsoil will be added, seeded and fertilized. All grading will be accomplished to minimize erosion and rainwater infiltration into the landfill area.

EXHIBIT V

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF OHIO

UNITED STATES OF AMERICA and STATE OF OHIO, Plaintiffs, v. CHEMICAL WASTE MANAGEMENT, INC., Defendant.	Civ. No. 83 -

CONSENT DECREE

The Complaint in the above-captioned case having been filed herein, and the Plaintiffs, the United States of America for the Administrator of the United States Environmental Protection Agency (hereafter "U.S. EPA"), and the State of Ohio for the Director of the Ohio Environmental Protection Agency (hereafter "Ohio EPA"), and the Defendant, Chemical Waste Management, Inc. (hereafter "CWM"), having consented to entry of this Decree,

NOW, THEREFORE, without trial of any issue of fact or law and without admission by CWM of the facts or violations alleged in the Complaint, and upon consent of the parties hereto, IT IS HEREBY ORDERED, ADJUDGED, AND DECREED as follows:

I.

This Court has jurisdiction over the subject matter herein pursuant to 42 USC §§ 6928, 6972, 7413, 7604 and 9609, and by the Court's pendant jurisdiction over claims derived from a common nucleus of operative fact and has jurisdiction over parties hereto. Venue is proper in this Court.

II.

The provisions of this Consent Decree shall apply to and be binding upon the parties to this action, their agents, assigns and successors in interest.

III.

CWM shall abate air pollution and odor emissions at its facility in Vickery, Ohio (hereafter the "Vickery Facility") by ceasing receipt of wastes into storage and treatment ponds and replacing them with an enclosed storage, treatment and disposal system from which emissions are vented through air pollution control devices, by September 30, 1985, all in accordance with the schedules and specifications contained in the plan attached to this Consent Decree and made a part hereof (hereafter the "Plan").

IV.

CWM shall commence immediately to close Ponds 4 and 5 and the wet well at the Vickery Facility by draining all

aqueous material from them into the remaining ponds; removing and treating all sludge from Ponds 4 and 5 and the wet well by solidification; installing recompacted clay liners; installing leachate collection systems to serve such Ponds; replacing the solidified sludge in the Ponds; installing clay caps over the Ponds; grading and seeding the caps; performing post closure maintenance; and disposing of leachate, all in accordance with the schedules and specifications contained in the Plan.

V.

CWM shall close Ponds 7, 11 and 12 at the Vickery Facility by discharging all aqueous material from them into injection wells located at the facility; removing and treating the sludge in Ponds 7, 11 and 12 by solidification; installing a RCRA landfill in Pond 12; replacing the solidified sludge in the Pond 12 RCRA landfill; installing a clay cap on the Pond 12 RCRA landfill incrementally as it is filled; grading and seeding the cap; performing post closure maintenance; and disposal of leachate, all in accordance with the schedules and specifications contained in the Plan; provided, however, that upon receiving the necessary permits, CWM will utilize the remaining capacity of the Pond 12 RCRA landfill for disposal of sludges generated in on-site treatment and storage. Ponds 7 and 11, after being completely excavated, will be filled with clean fill and closed, but may be considered as sites for RCRA land-

fills when the capacity of the Pond 12 RCRA landfill is exhausted.

VI.

CWM shall establish and maintain a monitoring system to determine if PCBs are escaping into groundwater or surface water from closed Ponds 4 and 5 or other parts of the Vickery Facility, such system to be established and operated as specified in the Plan. Should such system detect the escape of PCBs in concentrations in groundwater or surface water in excess of 0.1 ppm, CWM shall, within 90 days, submit to the Plaintiffs a plan to prevent such escape and shall implement remedial measures agreed to by the Plaintiffs and CWM in accordance to a schedule agreed to by them.

VII.

CWM shall not reclaim at or sell waste oil from the Vickery Facility without analyzing each incoming load of waste oil and analyzing each tank from which oil is sold, prior to any sales from such tank, for the concentration of PCBs. No waste oil shall be accepted at the Vickery Facility and no recycled oil shall be sold from the Vickery Facility with concentrations of PCBs greater than those allowed in regulations promulgated by U.S. EPA or Ohio EPA.

VIII.

Various of the requirements of Articles III, IV, V and VI, as more particularly specified in the Plan, require the

issuance of permits, licenses or permission (hereafter "permits") by U.S. EPA, Ohio EPA or other regulatory bodies. CWM shall promptly apply for the permits identified in the Plan by the dates specified therein. The parties are aware of no other permits necessary for the actions required herein. The Plaintiffs shall promptly thereafter propose the issuance of such permits, with terms and conditions consistent with the Plan, as are within their authority to propose and shall support the proposal of such other permits by regulatory bodies having such authority. Subject to the presentation of new adverse evidence, the Plaintiffs shall promptly thereafter issue such permits as they have authority to issue, consistently with their proposed actions and their established procedures and shall support the prompt issuance thereafter of such other permits by regulatory bodies having such authority.

The compliance schedules and dates in this Consent Decree and specified in the Plan are predicated upon the prompt application for, proposal of and issuance of such permits. If such applications, proposals or issuances are not made by the times projected in the Plan, for reasons beyond the control of WMI, those schedules and dates shall be extended by an amount of time equal to the delay. If a dispute as to the extension of such schedules or dates cannot be resolved by the parties within 30 days after an extension is proposed by CWM, any party may petition the Court for appropriate relief.

IX.

The Findings and Orders of the Director of Ohio EPA dated June 30, 1983 in the matter of Chemical Waste Management, Inc., are withdrawn and replaced by this Consent Decree. The parties shall so notify the Ohio Environmental Board of Review and withdraw from the Board the proceeding before it regarding such Findings and Orders.

X.

In lieu of any penalties for alleged violations of federal and state law, CWM agrees to establish a fund of $100,000 to be administered by the Plaintiffs, to monitor compliance with federal and state hazardous waste laws in Ohio, no more than one third of which may be expended to monitor compliance by CWM with such laws.

XI.

CWM shall allow Plaintiffs access to the Vickery Facility to monitor compliance with this Consent Decree and all parties shall provide the other parties, upon request, with splits of any sample taken in the implementation of or to determine compliance with the requirements of this Consent Decree.

XII.

Nothing in this Consent Decree shall relieve CWM of its obligations to comply with applicable federal, state or local statutes, regulations or ordinances or shall constitute a waiver or release of any right, remedy, defense or claim of CWM with regard to any person not party to this Consent Decree.

XIII.

This Consent Decree shall terminate upon filing of a certification by the parties that the requirements of the Consent Decree have been satisfied. If a dispute as to the satisfaction of such requirements cannot be resolved by the parties within thirty days after a certification is proposed by CWM, any party may petition the Court for appropriate relief. This Consent Decree shall terminate, in whole or in part, prior to such satisfaction, upon and to the extent that the Plaintiffs, or either of them, issues a permit embodying all or part of the requirements of this Consent Decree.

XIV.

The Court shall retain jursidiction of this matter for the purpose of enabling any party to apply to the Court for any further orders necessary to construe, carry out, modify, or enforce compliance with the term of this Consent Decree until its termination.

XV.

All reports, requests, or information submitted to Plaintiffs by CWM pursuant to this Consent Decree, shall be submitted to:

U.S. EPA

Michael J. Walker, Esq.
Assistant Regional Counsel
United States Environmental
Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

Ohio EPA

Robert Styduhar, Esq.
Legal Advisor
Ohio Environmental Protection
Agency
361 East Broad Street
Columbus, Ohio 43216

or to such persons and addresses as may be otherwise specified, in writing, by Plaintiffs to CWM. All reports, requests of information submitted to CWM by Plaintiffs pursuant to this Consent Decree, shall be submitted to:

Jeffrey G. Miller
Bergson, Borkland,
Margolis & Adler
11 Dupont Circle, N.W.
Washington, D.C. 20036

or to such persons and addresses as may be otherwise specified, in writing, by WMI to Plaintiffs.

CHEMICAL WASTE MANAGEMENT, INC.

By: _____
Jeffrey G. Miller
Bergson, Borkland,
Margolis & Adler

UNITED STATES OF AMERICA

By: _____
Assistant Attorney
General
Land and Natural
Resources Division

_____
Assistant U.S. Attorney
Northern District of
Illinois

_____
Michael J. Walker
Assistant Regional
Counsel
U.S. Environmental
Protection Agency

STATE OF OHIO

By: _____
Jack A. Van Kley
Assistant Attorney
General

_____
Robert J. Styduhar
Legal Counsel
Ohio Environmental
Protection Agency

APPROVED AND ENTERED
as an Order of the Court
this ___ day of _____,
1983.

_____
United States District Court
Judge

PLAN FOR REMEDIAL WORK AND FUTURE OPERATION OF CHEMICAL WASTE MANAGEMENT, INC., VICKERY, OHIO FACILITY

I. Pond 4

CWM shall recommence the closure of Pond 4 in conformity with CWM's site closure plan, which has been filed with Plaintiffs (the "Closure Plan"), by pumping aqueous waste into the remaining ponds. The Closure Plan is hereby upgraded to include a recompacted clay liner and a leachate collection system with appropriate post-closure operation and maintenance thereof and/or treatment and disposal of leachate, and, as so amended, is approved by the Plaintiffs. CWM shall recommence closure seven (7) days after receiving approval of U.S. EPA pursuant to 40 CFR § 761.75, or at such other time as agreed to by the parties. The parties agree that the requirements of 40 CFR § 761.75(b)(3) - (5) are satisfied at the Vickery Facility. CWM shall complete closure within six (6) months after recommencement of closure. CWM shall perform post closure maintenance in conformity with the Closure Plan. No further permits are necessary for the closure of Pond 4.

II. Pond 5

CWM shall commence the closure of Pond 5 in conformity with the Closure Plan by pumping aqueous material into the remaining ponds. The Closure Plan is hereby upgraded to include a recompacted clay liner and a leachate collection system with appropriate post-closure operation and maintenance

thereof and treatment and/or disposal of leachate, and, as so amended, is approved by the Plaintiffs. CWM shall commence closure seven (7) days after receiving approval of U.S. EPA pursuant to 40 CFR § 761.75, or at such other time as agreed to by the parties. The parties agree that the requirements of 40 CFR § 761.75(b)(3) - (5) are satisfied at the Vickery Facility. CWM shall complete closure within six (6) months after commencement of closure. CWM shall perform post-closure maintenance in conformity with CWM's Closure Plan. No further permits are necessary for the closure of Pond 5.

III. Pond 7

Pond 7 will be the last pond to remain in service at the Vickery Facility. WMI shall commence closure of Pond 7 in conformity with the Closure Plan by ceasing to accept new aqueous material into Pond 7 and beginning to pump the existing inventory of aqueous material from Pond 7 into injection wells on or before September 30, 1985. The Closure Plan is hereby upgraded to include disposal of sludges into a RCRA landfill in Pond 12 and, as so amended, is approved by the Plaintiffs. CWM shall complete closure within seven (7) months after commencement of closure. CWM shall perform post-closure maintenance in conformity with the Closure Plan. No further government permits are necessary for closure of Pond 7, except as set forth in Article VI.

IV. Pond 11

CWM shall commence closure of Pond 11 in conformity with the Closure Plan by ceasing to accept new aqueous material into Pond 11 beginning to pump the existing inventory of aqueous material from Pond 11 into injection wells on or before September 30, 1985. The Closure Plan is hereby upgraded to include disposal of sludges from Pond 11 into a RCRA landfill in Pond 12 and, as so amended, is approved by the Plaintiffs. CWM shall complete closure of Pond 11 within seven (7) months after commencement of closure. CWM shall perform post closure maintenance in conformity with the Closure Plan. No further government permits are necessary for closure of Pond 11, except as set forth in Article VII.

V. Pond 12

CWM shall commence closure of Pond 12 in conformity with the Closure Plan by ceasing to accept new aqueous material into Pond 12 and beginning to pump the existing inventory of aqueous material from Pond 12 into injection wells on or before September 30, 1985. The Closure Plan is hereby upgraded to include disposal of sludges into a RCRA landfill in Pond 12 and, as so amended, is approved by the Plaintiffs. CWM shall complete closure of Pond 12 within eight (8) months after commencement of closure. CWM shall perform post closure maintenance in conformity with the Closure Plan. No further government permits are necessary for closure of Pond 12.

VI. Treatment and Storage Tanks

CWM will replace all ponds at the Vickery Facility with a tank based, enclosed treatment and storage system of up to 10 million gallon capacity, with emissions controlled and vented through air pollution control devices, and with a landfill in that part of Pond 12 remaining after disposal of sludge from those Ponds, in accordance with paragraphs IV and V. The landfill will be used for the disposal of solidified sludges from Ponds 7, 11 and 12 and the tank-based system. To construct and operate the system, CWM must obtain a RCRA permit from U.S. EPA, a hazardous waste permit from the Ohio Board, an air emissions permit from Ohio EPA, and an Underground Injection Control permit (hereafter "UIC permit") by either U.S. EPA or Ohio EPA, as provided in paragraph VII. CWM will submit applications for such permits within four (4) months after entry of this decree and will complete the system (with the exception of the RCRA landfill) not more than eighteen (18) months after such permits are issued. In the event that such permits are not issued by April 1, 1984, the dates for closure of Ponds 7 and 11 will be deferred by a number of days equal to the number of days after April 1, 1984 that such permits are issued. Closure schedules for Ponds 7, 11 and 12 are predicated upon the operation of CWM's injection wells at full capacity 96 percent of the time. To the extent that such operation cannot be achieved, the dates for closure of those ponds will be deferred accordingly.

VII. Injection Wells

To continue operation of the injection wells at the Vickery Facility, CWM must obtain an Underground Injection Control permit (hereafter a "UIC permit") from either U.S. EPA or Ohio EPA and/or a new NPDES permit from Ohio EPA. The appropriate permit issuer for the UIC permit cannot be identified until the first of (1) the approval of Ohio EPA's primacy application by U.S. EPA or (2) promulgation of a federal UIC program applicable in Ohio by U.S. EPA. Within 60 days after the occurrence of either of those events, CWM will submit a UIC permit application to the appropriate permit issuance authority and/or an application for renewal of the Ohio NPDES permit for well injection to Ohio EPA.

VIII. Spill Response

CWM will inspect trucks entering and leaving the Vickery Facility for leaks. CWM will check the routes of trucks which, based on such inspection, CWM suspects of leaking, for a radius of three miles from the Vickery Facility and will remove liquids spilled from CWM trucks within that radius and maintain the capacity to respond to other spill incidents on a volunteer basis.

IX. Monitoring Plan

CWM will operate and maintain the groundwater and surface water monitoring stations indicated on the map attached

CHEMICAL WASTE MANAGEMENT, INC.

VICKERY, OHIO

JULY 13, 1983

DRAFT

PHASE Vb CLOSED PONDS

Submitted to:

Richard Shank - O.E.P.A.
Robert Styduhar - O.E.P.A.
Michael Walker - U.S.E.P.A.

cc: George Vander Velde
Jeff Miller
Lee Archambeau

ETC ENVIRONMENTAL TESTING and CERTIFICATION

CLOSED FILES

CLEAN WATER, INC.

ANALYSIS OF PCB'S AT THE CLEAN WATER, INC. SITE 690

PHASE Vb
DRAFT REPORT

JUNE 1983

Environmental Testing and Certification Corporation
284 Raritan Center Parkway
Edison, New Jersey 08837

Closed Ponds

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1.0 PURPOSE

The purpose of the phase 5b project was to determine if PCB's were present in the area of the closed lagoons at Site 690. Included in these objectives were determinations of PCB levels at three foot depth intervals in the fill material and one sample of the underlying clay.

As part of this project, the U. S. Environmental Protection Agency (USEPA) and the Ohio Environmental Protection Agency (OEPA) were invited to take split samples. It was the intent of the USEPA to analyze certain samples for EP Toxicity and/or dioxin. ETC's objectives included analyzing the split samples for these parameters.

2.0 FIELD METHODOLOGY

Sampling was conducted by ETC and its subcontractor, Dames & Moore (D&M) from May 9, 1983 through May 18, 1983. Samples were collected from closed lagoons 1, 2, 3, 4, 6, 9, 10; the Abandoned Sludge Farm; and areas east of the facility (East Area) and south of the facility (South Area). A backhoe was used to open test pits at the closed lagoons, and samples were collected at three foot depth intervals from the backhoe bucket. Samples of the underlying clay were taken with a thin wall piston tube. Soil samples at the other three areas were taken using the Piston Tube Sampler.

2.1 Sample Point Locations

Approximately two to three sample locations per acre were designated for each closed lagoon. A site map is presented in Figure 1 denoting these sample points. Samples were collected from each location at a minimum of three foot depth intervals. Samples were taken of different layers of the fill material. Occasionally this required taking samples at a greater frequency than one per three feet.

The coding convention for these samples, agreed to by CWI, USEPA, and ETC, was as follows:

CL	-	10	-	3	-	9
(Closed Lagoon)	-	(Lagoon #)	-	(Sector #)	-	(Depth in Feet)

Samples were collected from the Abandoned Sludge Farm, East Area and South Area at the sample points designated on the site map (Figure 1). The coding convention for these samples was as follows:

Abandoned Sludge Farm:	ASF
East Area:	EA
South Area:	SA

ASF	-	2	-	0
(Site Code)	-	(Sample Point #)	-	(Depth)

2.2 Sample Collection

Samples from the closed lagoons were collected by excavating the fill material and opening a test pit. Samples were collected from the backhoe bucket. The bucket was steam cleaned between each test pit and all samples were collected from the center of the bucket to avoid possible contamination from the bucket itself. A new piston tube was used to collect a sample of the underlying clay.

Samples from the Abandoned Sludge Farm, East Area, and South Area were also collected using a piston tube. Detailed procedures and a description of the apparatus is provided in Attachment 1.

2.3 Field Data Records

ETC Chain-of-Custody forms (CC1 and CC2) were used to document sampling events. Field information recorded included the sample point ID code, date, time person who had custody of sample, person who physically collected sample, sample depth (inches), depth to bottom, sampling method, weather and general sample description.

Completed copies of these field records (CC1 and CC2) are presented in the analytical reports for each sample. The CC1 data is also maintained on magnetic tape as part of the data file.

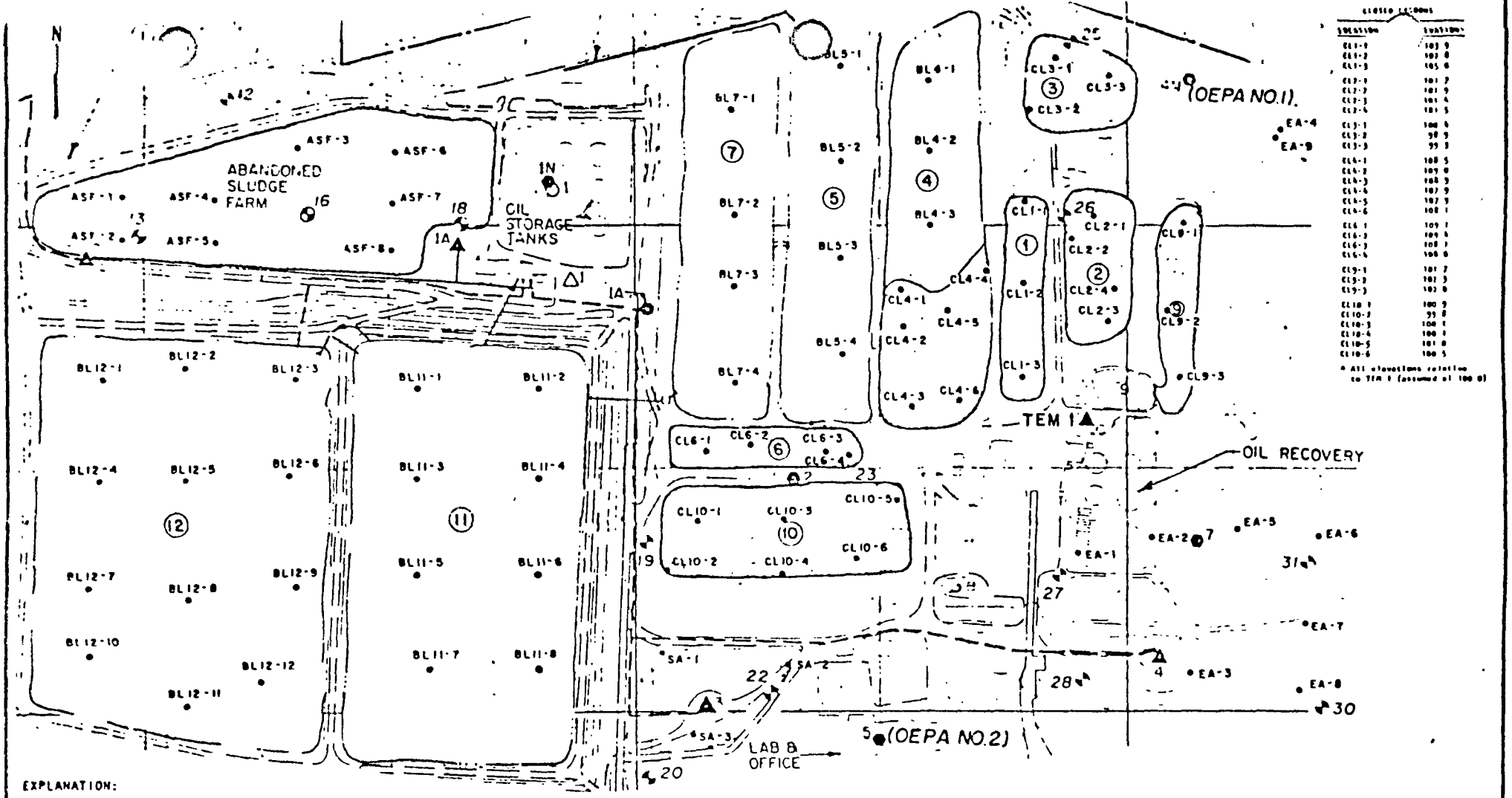
3.0 CHAIN-OF-CUSTODY DOCUMENTATION

Chain-of-Custody and the associated documentation was maintained for each sample. Blank copies of the chain-of-custody form (CC1) and field information form (CC2) are presented as attachments. ETC Sample Shuttles were used to maintain custody from the time the containers left the ETC laboratory in Edison, New Jersey until they were returned to the same location. Shuttles were sealed at the laboratory with a numbered ETC seal and the seal was broken at the Vickery site prior to sample collection. Use of this seal guarantees the integrity of the Shuttle contents during shipment.

Once a person had the sample or sample bottles under custody, they were at all times

- in his/her actual possession; or
- in his/her view, after being in actual possession; or
- in his/her actual possession and then placed in a locked or otherwise secure place to which any access by others was fully recorded.

Before leaving the site, the Shuttles were sealed with a numbered ETC seal and the seal number recorded on the chain-of-custody form. These seals were broken upon receipt at ETC, the seal number verified, and internal chain-of-custody maintained. All chain-of-custody records are presented in the data reports for each sample.



ACTUAL SAMPLING LOCATIONS

REFERENCE: Base map taken from Facility Location Plan, Project No. 33767, 2/16/83

FIGURE 3

TABLE 1
SAMPLE POINT SUMMARY

PHASE VB - CLOSED LAGOONS (CL)

SAMPLE POINT CODE	PARAMETERS
CL1-1-0	PCB
CL1-1-3	PCB
CL1-1-6	PCB
CL1-1-9	PCB
CL1-1-12	PCB, EP TOX
CL1-1-12.5C(clay)	PCB
CL1-2-0	PCB
CL1-2-3	PCB
CL1-2-6	PCB
CL1-2-10	PCB, EP TOX
CL1-2-11C(clay)	PCB
CL1-3-3	PCB
CL1-3-6.5	PCB
CL1-3-9	PCB, DIOXIN
CL1-3-11C(clay)	PCB
CL2-1-0	PCB
CL2-1-3	PCB
CL2-1-6	PCB
CL2-1-9	PCB
CL2-1-12	PCB
CL2-1-12C(clay)	PCB
CL2-2-0	PCB
CL2-2-3.5	PCB
CL2-2-6	PCB
CL2-2-9	PCB
CL2-2-12	PCB, EP TOX
CL2-2-12C(clay)	PCB
CL2-3-0	PCB
CL2-3-3	PCB
CL2-3-4	PCB, EP TOX
CL2-3-6	PCB, EP TOX, DIOXIN
CL2-3-10	PCB, EP TOX
CL2-3-11C(clay)	PCB
CL2-4-0	PCB
CL2-4-3	PCB
CL2-4-7	PCB
CL2-4-10	PCB
CL2-4-12	PCB, EP TOX
CL2-4-12C(clay)	PCB

CL3-1-0	PCB
CL3-1-3	PCB
CL3-1-4C(clay)	PCB
CL3-2-0	PCB
CL3-2-3	PCB
CL3-2-4C(clay)	PCB
CL3-3-0	PCB
CL3-3-3	PCB, EP TOX
CL3-3-3.5(clay)	PCB
CL3-3-6C(clay)	PCB
CL4-1-0	PCB
CL4-1-3	PCB
CL4-1-6	PCB, EP TOX
CL4-1-10	PCB
CL4-1-12	PCB
(no clay)	
CL4-2-0	PCB
CL4-2-3	PCB
CL4-2-6	PCB
CL4-2-9	PCB
CL4-2-13	PCB, EP TOX
CL4-2-17C(clay)	PCB
CL4-3-3	PCB
CL4-3-6	PCB
CL4-3-9	PCB
CL4-3-13C(clay)	PCB
CL4-4-1	PCB
CL4-4-3	PCB
CL4-4-6	PCB
CL4-4-9	PCB
CL4-4-12C(clay)	PCB
CL4-5-0	PCB
CL4-5-3	PCB
CL4-5-6	PCB
CL4-5-10	PCB
CL4-5-12	PCB
CL4-5-16	PCB
(no clay)	
CL4-6-3	PCB
CL4-6-4	PCB
CL4-6-6	PCB
CL4-6-9	PCB
CL4-6-12	PCB
CL4-6-15C(clay)	PCB
CL6-1-4	PCB
CL6-1-6	PCB
CL6-1-9	PCB

CL6-1-12	PCB
CL6-1-13C(clay)	PCB
CL6-2-3.5	PCB
CL6-2-6.5	PCB
CL6-2-9.5	PCB
CL6-2-12	PCB
CL6-2-15C(clay)	PCB
CL6-3-4	PCB
CL6-3-6	PCB
CL6-3-9	PCB, EP TOX
CL6-3-12C(clay)	PCB
CL6-4-3	PCB
CL6-4-6	PCB
CL6-4-9	PCB
CL6-4-11	PCB
CL6-4-12C(clay)	PCB, DIOXIN
CL9-1-0	PCB
CL9-1-2	PCB
CL9-1-3	PCB
CL9-1-4	PCB
CL9-1-6	PCB, DIOXIN
CL9-1-8	PCB, EP TOX
CL9-1-10C(clay)	PCB
CL9-2-0	PCB
CL9-2-3	PCB
CL9-2-7	PCB
CL9-2-9	PCB
CL9-2-9(aqueous)	PCB
CL9-3-0	PCB
CL9-3-3	PCB
CL9-3-6	PCB
CL9-3-9	PCB, EP TOX
CL9-3-11C(clay)	PCB
CL10-1-0	PCB
CL10-1-3	PCB
CL10-1-5	PCB
CL10-1-6	PCB
(no clay)	
CL10-2-0	PCB
CL10-2-3	PCB
CL10-2-6	PCB
CL10-2-9	PCB
CL10-2-12	PCB
CL10-2-12.5C(clay)	PCB
CL10-3-0	PCB
CL10-3-3	PCB
CL10-3-6	PCB

CL10-3-8.5	PCB, EP TOX
CL10-3-11	PCB
(no clay)	
CL10-4-0	PCB
CL10-4-3	PCB
CL10-4-6	PCB
CL10-4-6.5C(clay)	PCB
CL10-5-0	PCB
CL10-5-3	PCB, DIOXIN
CL10-5-5.5	PCB
CL10-5-7.5	PCB
CL10-5-11C(clay)	PCB
CL10-6-0	PCB
CL10-6-3	PCB
CL10-6-6	PCB
CL10-6-10	PCB
CL10-6-11C(clay)	PCB

Attachment 1

Dames & Moore Field Procedures

CLOSED LAGOONS: GENERAL SAMPLING PROCEDURES

Dames & Moore was retained by Environmental Testing and Certification (ETC) to perform on site sampling of sludge from the open lagoons at the Chemical Waste Management Incorporation (CWMI) Vickery, Ohio disposal facility. The scope of work was expanded to include subsurface characterization of the closed waste lagoons and landfarm areas, according to the sampling plan outlined in our letter of April 13, 1983. The purpose of the characterization was to establish any spatial distribution of PCBs in materials used to close several waste lagoons.

The sampling plan was formulated on the basis of obtaining samples from at least two locations per acre in the closed lagoon areas, and at least one location per acre in the landfarm areas. It was assumed that for the closed lagoons a backhoe could be used to recover samples down to just below the lagoon bottoms. Samples were to be taken at 3-foot intervals and at significant changes in stratigraphy. A sample of the native bottom clays was also to be taken at each location. Samples in the landfarm area were to be taken at 1- or 2-foot intervals to a depth of approximately 3 feet.

Each of closed lagoons 1, 2, 3, and 9 were broken up into three relatively equal sectors, with one sampling location in each, as shown in Figure 1. Lagoon 6 was actually split in half by a low dike, and was therefore divided into four sectors, two on each side of the middle dike. Lagoons 4 and 10 were each divided into six sectors. Figure 1 illustrates the planned locations of the sampling locations, however, some alterations in location became necessary due to the logistics of moving in excavation equipment,

and in view of the fill material anticipated. Discussions with CWMI employees identified potential problem areas where large boulders or concrete slabs had been buried. The sampling locations were adjusted to maximize the chances of extending the trench down to native clay.

Sampling Equipment

Sampling was performed by a backhoe or a deep trenching hoe having a deeper reach than the backhoe. The backhoe was used to dig the trenches in closed lagoons 1, 2, 3, and 9. The deep trenching hoe was used for closed lagoons 4 and 6 since the bottom of the lagoon was beyond the reach of the backhoe. It was also used for lagoon 10 as a matter of convenience.

The samples were taken from the middle of the hoe bucket with a steel trowel. Material was sampled which had not contacted the bucket itself, and placed in a stainless bowl. Care was taken not to cross-contaminate the sample by handling with unwashed tools or gloves. The bottles were filled from the bowl utilizing the same trowel and a funnel.

Piston tube cores were taken of the native clays beneath the bottom level of the lagoon. The piston tube sampler is illustrated in Figure 2. In cases where groundwater filled the trench, a prepared brass piston tube was used to preclude the possibility of contamination of the clay core by the groundwater. The prepared tube was made by pouring molten parafin into a plastic end cap, inserting the bit end of the tube and taping the cap to the tube with electrical tape. The drive head is fitted with an O-ring which keeps water from contaminating the inside of

the tube. All pipe threads were sealed with teflon tape when a prepared tube was used.

General Procedure

Sampling locations for each closed lagoon were staked out using a site location map provided by CWMI. First, the lagoon boundaries were staked out by scaling from prominant landmarks on the map. These boundaries were located from the landmarks using a surveying wheel to measure horizontal distances and small orange flags to mark the corners. Once the lagoon boundaries were located, the sector lines were established and sampling locations marked. The boundary marks were subsequently removed to avoid confusion. Once the locations were established according to the plan illustrated in Figure 1, the locations were reviewed in the field with CWMI employees to identify potential problems reaching the bottom of the fill material. Shifts in location were made accordingly.

The backhoe bucket was initially prepared by steam cleaning, using a steam jenny and municipal water from the Town of Clyde, trucked onto the site in a 500-gallon tank mounted on a pick-up truck. Employees of CWMI operated and cleaned the backhoe bucket between each sampling location.

To start each sampling location, typically the hoe was used to scrape the top of the ground surface, and a grab sample was taken directly with a steel trowel, and transferred to a stainless steel bowl. In locations where the surface was comprised of coarse gravel, no sample was taken. The sample was mixed and split between ETC and USEPA, using the trowel and a funnel to

fill the sample jars. Between each sample the trowel, bowl, and funnel were scraped clean and final rinsed with hexane followed by methanol and finally offsite potable rinse water, so as to prevent cross contamination of the samples.

As the digging progressed, the trench was logged descriptively by a Dames & Moore engineer. The logs included detailed descriptions and depths of each sample taken, general observations of the trench, and depth and recovery of the clay core taken in the native clays. Any problems incurred during the sampling were also noted.

Samples were taken at 3-foot intervals or at significant changes in stratigraphy as directed by a Dames & Moore engineer. The samples were taken from the backhoe bucket with the trowel, using care to take portions of material which had not contacted the bucket. The sample was collected on the stainless steel bowl so that digging could proceed while the sample jars were being filled. All samples were taken and handled by Dames & Moore personnel only.

The excavation continued until native clay materials were encountered. A piston tube core was taken using the piston tube sampler shown in Figure 2. At locations where groundwater was seeping into the trench, a prepared tube was used. The cores were taken while standing at the side or back of the trench when the sidewalls were stable. In locations where there was danger of caving, a long aluminum grate was placed across the trench using the backhoe. The sampler was lowered into the trench attached to sections of 1-inch pipe which were preassembled. A drive hammer sliding on a section of pipe was attached and the

tube was driven 12 to 18 inches into the clay. The core was sheared off at the base by twisting the pipe clockwise with a pipe wrench. Two persons using pipe wrenches to grab the pipe were required to withdraw the clay core where the sidewall conditions were stable. In most unstable situations, a pipe wrench was wedged against the backhoe bucket which was used to withdraw clay core. The tube was removed from the drive head, and 1/4 inch of clay was shaved off the lower end to remove any material which may have been contaminated by groundwater, and to allow room for a wax seal. Molten parafin was poured into both ends, and allowed to harden. The location identification and core depth were scratched into the tube with a knife, and the core tube stored in Dames & Moore custody until extrusion.

Upon completing the hole, the backhoe bucket was thoroughly cleaned with a steam jenny, soap, and water. Each trench was immediately backfilled by CWMI employees using a small dozer or a front end loader.

Problems/Deviations from General Procedure

The closed lagoons were samples in the following order: CL2, CL9, CL3, CL1, CL6, CL10, and CL4. The alterations from the general procedure, and problems encountered are highlighted for each lagoon in numerical order below. Sampling chain of custody records were maintained by Mr. John Snodgrass of ETC for closed lagoons 1, 2, 3, and 9. A Dames & Moore technician assumed responsibility for maintaining sample records for the remaining lagoons. A summary of the sample data is shown in Table 1. Several gaps in the data remain which could not be reconstructed with records provided by ETC.

- Closed Lagoon 1: This closed lagoon was flooded in the central eastern part, with water. This water was pumped out in anticipation of sampling, however, the sample locations were slightly altered to enable the backhoe to work on stable ground. No surface sample was taken at CL1-3 due to the presence of coarse limestone gravel.

- Closed Lagoon 2: The piston tube sampler was pushed into the clay with the backhoe bucket and withdrawn with the bucket at locations CL-1 and CL-2. One of the pipe sections buckled and broke under the pressure of the backhoe bucket during sampling with the piston tube sampler. All other clay cores were taken using the hammer. Groundwater was encountered at locations CL2-2, CL2-3, and CL2-4. The hole at CL2-3 constantly caved in from the sides, therefore, no attempt was made to obtain a clay core. Mr. John Snodgrass of ETC requested that an additional location be sampled, designated CL2-4.

- Closed Lagoon 3: This lagoon proved to be very shallow with only samples taken at the surface and 3 feet. At location CL3-3 two clay cores were taken, the first just beneath the sludge line at 3.5 feet. The second core was taken at 5.5 feet at the request of Mr. Lester Franks of CWMI to insure native clays were sampled.

- Closed Lagoon 4: Location CL4-1 was dug in a very loose sludge clay matrix which constantly flowed back into the hole. Due to the instability of the trench, native clay was not reached before the excavation was terminated. Groundwater was encountered at locations CL4-2, CL4-3, CL4-5, and CL4-6. Groundwater at

location CL4-6 left a yellow stain, and contained black oil globules. A dike was built around the borrow pit using the front end loader to contain groundwater carried along in the bucket. The dammed water was siphoned off into a CWMI tank truck. A water sample was taken at location CL4-6 using a bottle to take water from the center of the hoe bucket. Caving became a problem. Caving at location CL4-5 prevented successful recovery of a native clay core.

- Closed Lagoon 6: This lagoon was originally split in two by a berm, whereby two excavations in each half were made. No surface samples were taken since the top foot consisted of coarse angular limestone gravel. Groundwater was encountered at locations CL6-1, CL6-2, and CL6-3. Construction debris and gravel were encountered at location 2, causing caving of the sidewalls. The hole was too big to use the grating for taking the clay core, consequently the clay core was attempted by a Dames & Moore engineer and a CWMI employee suspended above the hole in the hoe bucket. A cave-in midway through obtaining the core broke off the pipe down in the hole. A Dames & Moore engineer was lowered into the hole and retrieved the pipe and clay core by wedging a pipe wrench with the pipe against the bucket, thus allowing the bucket to withdraw the tube.

- Closed Lagoon 9: In this lagoon we encountered extensive construction debris, reportedly the remains of a local county courthouse. At location CL9-1, further penetration was impossible after the first 3 feet. The hole was relocated approximately 25 feet to the east, and sampling resumed at 3 feet. Groundwater seepage was abundant from around huge concrete slabs, carrying with it oil and a purple fluid. The clay core

was taken using a prepared piston tube. Groundwater was also encountered in locations CL9-2 and CL9-3. Caving and the presence of concrete slabs too large to move prevented obtaining a clay core from location 2.

- Closed Lagoon 10: Closed lagoon 10 was a shallow lagoon but sampled with the deep trenching backhoe as a matter of convenience. At location CL10-1, a clay core was attempted with no recovery. The sidewalls became increasingly unstable, threatening the machine, therefore, no further attempts at obtaining a core were made. A 3-foot sludge layer was encountered at location CL10-3 at 8.5 feet. This layer became very unstable and the hoe began to sink into the pit. The hole was abandoned without reaching native clay. Three attempts were made in obtaining a clay sample at location CL10-6 before a successful core was withdrawn.

Abandoned Sludge Farm and Landfarm Areas

Three landfarm areas were to be sampled at 1 or 2 foot intervals down to a depth of 3 feet in locations shown in Figure 3. This plan was modified in the course of conversations with an ETC representative to only include one sample core at each location.

The landfarm areas were sampled using the piston tube sampler and one section of 1-inch pipe, plus the hammer section. The core tube was hammered into the ground from the surface, and the core sheared off at the bottom by rotating the pipe shaft clockwise with a wrench. Two people were typically required to extract the full tube from the ground. A new clean tube was used at each location. After extraction, the sample location code was

scratched on the tube, and the drive head cleaned with hexane, methanol, and potable offsite water. Where water covered the surface, a prepared tube was used.

- East Area Landfarm: At location EA-1, the piston tube had to be dug out of the ground with a shovel. One additional sample (EA-9) was added by the Dames & Moore engineer in a marshy section of the north end of the east area. Samples were taken both on the berms and in the landfarm itself, since the berms were made of material gleaned from the landfarm itself. Locations EA-5 and EA-9 were submerged.

- South Area Landfarm: Three samples were taken at representative locations within the landfarm area. Location SA-1 was submerged.

- Abandoned Sludge Farm: The entire abandoned sludge farm was submerged under runoff water. In the area of ASF-6 (see Figure 3), the water was as much as 3 to 4 feet deep. This landfarm was sampled using the piston tube sampler and prepared tubes. The prepared tubes and all tools were placed in a fiberglass boat. Two Dames & Moore engineers in hip waders performed the sampling as described above, pulling the boat along with them. Coordinate flags were set out on the berms by a Dames & Moore technician and USEPA representatives. A sampling location was obtained by lining up at the intersection of imaginary lines drawn between the flags. The actual locations of the samples are shown in Figure 3.

Horizontal and Vertical Control

Following the excavation at each location, the excavation site was located using a tape or surveying wheel to measure horizontal distances from nearby landmarks. The actual locations of each excavation are plotted in Figure 3. Vertical control was run using a contractors level provided by CWMI. Each elevation circuit was closed, such that the error of each closure could be evaluated. An arbitrary datum was assigned to the northwest corner of the concrete tank slab shown in Figure 3. The resulting elevations of each sampling location of the closed lagoons are listed in Figure 3. Only horizontal control was measured for the landfarm areas.

Clay Core and Landfarm Sample Extrusion

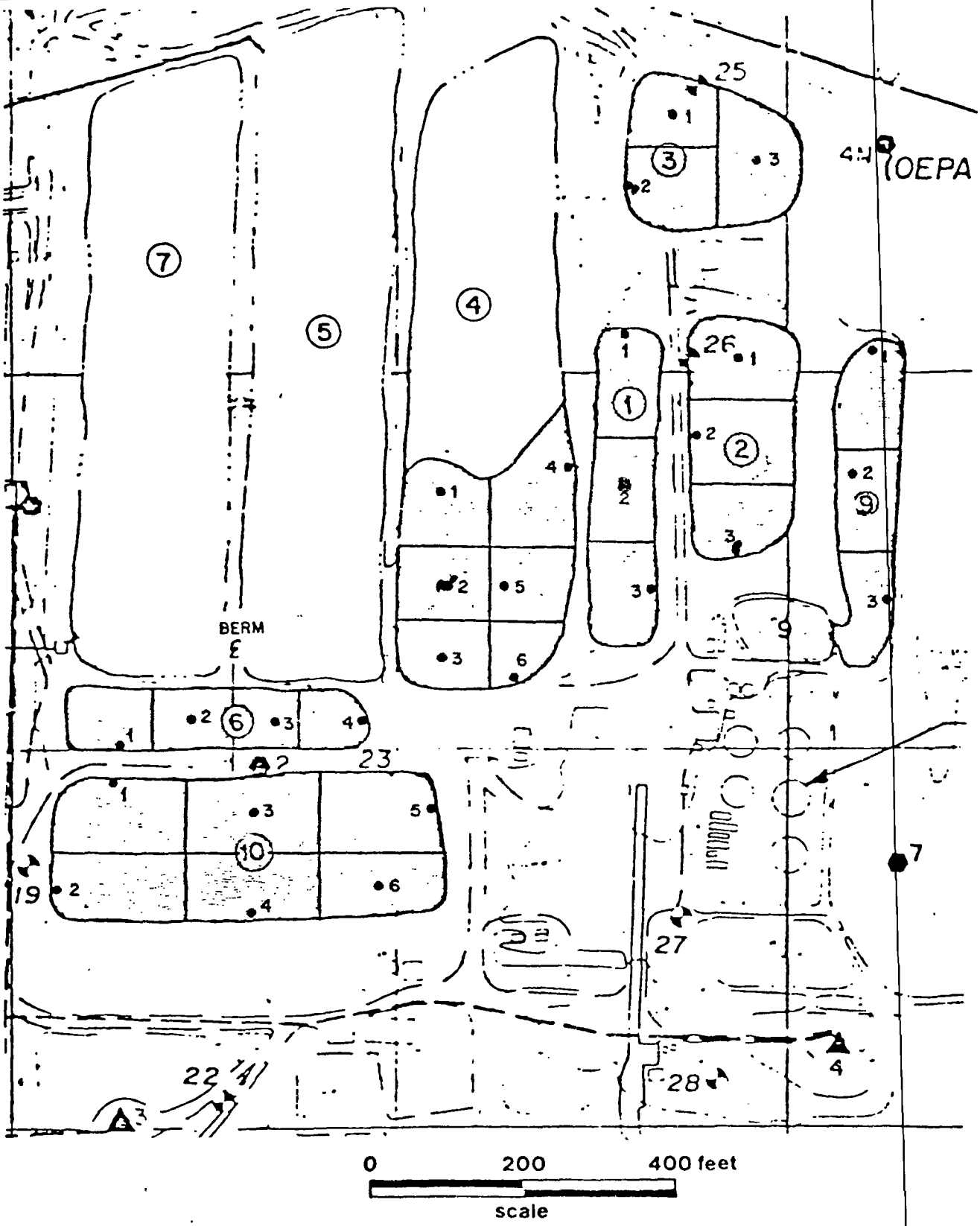
Each clay core from the closed lagoon was sealed with parafin in both ends, and were stored in a trailer on site until they were extruded. The landfarm samples were locked in the same trailer overnight before being extruded. The landfarm samples were not sealed with wax.

The clay cores and landfarm samples were all extruded utilizing a hydraulic ram specifically designed for extruding samples from the Dames & Moore sampling equipment. The core was extruded onto a fresh piece of aluminum foil. A spatula was used to shave the outside of the core, leaving virgin material untouched by the piston tube. Both ends were cut off with a soil knife, and the samples split longitudinally into quarters. Two quarters went to ETC and two quarters went to USEPA, for a replicate split. The soil tools were cleaned between cores with hexane followed by

methanol and potable water. Even the gloves of the engineer handling the cores were cleaned between cores to minimize the chance for cross contamination. All records for ETC were maintained by a Dames & Moore technician.

TABLE 1
CLOSED LAGOON SAMPLING DATA

LOCATION CODE	TOTAL EXCAVATION DEPTH	# SAMPLES (NOT CLAY)	CLAY CORES TAKEN	CLAY CORES DEPTH	CLAY CORES ETC ID #	SAMPLES: ETC ID # (DEPTH)	COMMENTS
CL-1-1	12.5	5	Yes	12.5	708	619(0'); 621(3'); 620(6'); 622(9'); 741(12')	741 - EP TOX
CL-1-2	11.0	4	Yes	11.0	791	(0'); (3'); (6'); (10')	(10') - EP TOX
CL-1-3	11.0	3	Yes	11.0		(3'); (6'); (10')	(10') - Dioxin
CL-2-1	12.0	5	Yes	12.0	709	758(0'); 759(3'); 760(6'); 761(9'); 762(12')	
CL-2-2	12.0	5	Yes	12.0	1023	755(0'); 756(3'); 757(6'); 753(9'); 754(12')	754 - EP TOX
CL-2-3	11.0	5	Yes	11.0	790	750(0'); 751(3'); 748(4'); 749(6'); 752(10')	752 - EP TOX 749-Dioxin, 751-Water sample
CL-2-4	12.0	5	Yes	12.0	1025	774(0'); 773(3'); 777(7'); 775(10'); 776(12')	776 - EP TOX
CL-3-1	3.5	2	Yes	3.5	1024	794(0'); 796(3')	
CL-3-2	6.5	2	Yes	6.5		793(0'); 795(3')	
CL-3-3	5.5	2	Yes	3.5		797(0'); 618(3')	618 - EP TOX
			Yes	5.5			
CL-4-1	11.5	5	No	-	-	1051(0'); 1052(3'); 1053(6'); 1054(10'); 1055(12')	1053 - EP TOX
CL-4-2	17.0	6	Yes	17.0	645	1006(0'); 1007(3'); 1008(6'); 1009(9'); 1010(13'); 1001(16')	1010,1001 - EP TOX 1008 - Dioxin
CL-4-3	15.0	4	Yes	15.0	646	1020(3'); 1019(6'); 1018(9'); 644(13')	644 - EP TOX
CL-4-4	12.0	4	Yes	12.0	647	1031(1'); 1032(3'); 1033(6'); 1034(9')	
CL-4-5	17.0	6	No	-	-	1002(0'); 1003(3'); 1004(6'); 1005(10'); 1016(12'); 1017(16')	
CL-4-6	15.0	5	Yes	15.0	643	1026(3'), 1027(4'); 1028(6'); 1029(9'); 1030(12')	1027-Water sample
CL-6-1	13.0	5	Yes	13.0	1015	778(4'), 642(6'); 641(9'); 640(12'); 639(13')	
CL-6-1	15.0	5	Yes	15.0	1014	630(3'); 617(6'); 616(9'); 615(12'); 614(14')	
CL-6-3	12.0	3	Yes	12.0	1013	613(4'); 607(6'); 606(9')	606 - EP TOX
CL-6-4	12.0	4	Yes	12.0	1012	605(3'); 604(6'); 603(9'); 612(11')	612 - Dioxin
CL-9-1	10.0	6	Yes	10.0	1022	772(0'), 771(2'); 770(3'); 769(4'); 768(6'); 766(8')	766 - EP TOX; 768 - Dioxin; 771, 769-Water sample
CL-9-2	9.0	5	No	-	-	764(0'); 767(3'); 765(7'); 763(9'); 782(9')	782-Water sample
CL-9-3	11.0	4	Yes	11.0	1021	674(0'); 673(3'); 675(6'); 676(9')	676 - EP TOX
CL-10-1	6.0	4	No	-	-	636(0'); 635(3'); 634(5'); 633(6')	
CL-10-2	12.0	5	Yes	12.0	1011	611(0'); 610(3'); 609(6'); 608(9'); 637(12')	
CL-10-3	11.0	5	No	-	-	746(1'); 747(3'); 623(6'); 624(8'); 625(11')	- EP TOX
CL-10-4	6.5	3	Yes	6.5		743(0'); 744(3'); 745(6')	
CL-10-5	11.0	4	Yes	11.0		626(0'); 627(3'); 798(5'); 799(7')	799-Water sample 627 - Dioxin
CL-10-6	11.0	4	Yes	11.0		800(1'); 801(3'); 802(6'); 628 (10')	



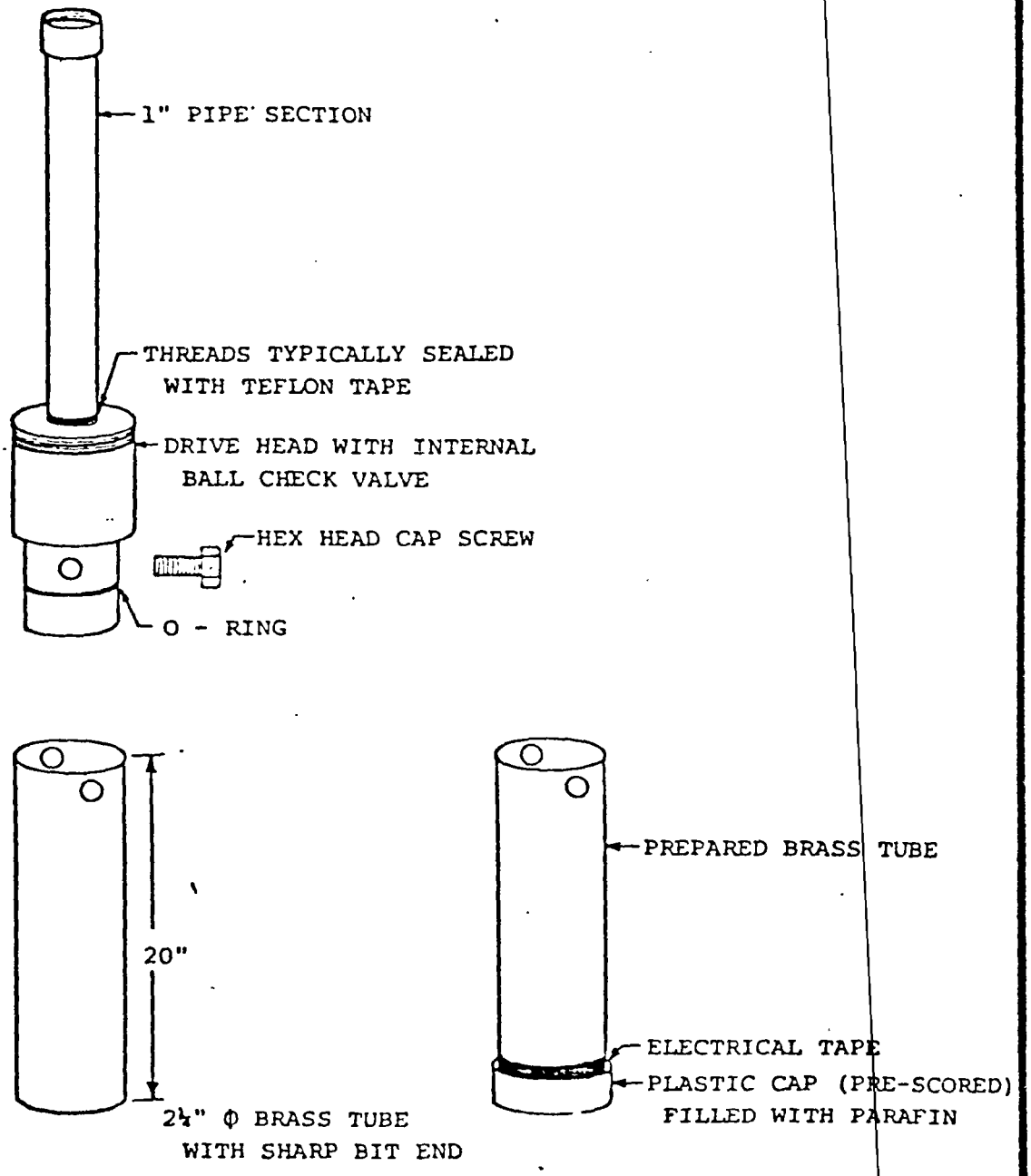
EXPLANATION:

- PROPOSED SAMPLING LOCATION

PROPOSED SAMPLING LOCATIONS

Reference: Base map taken from Facility Location Plan, Project No. 33767, 2/16/83

DAMES & MOORE



PISTON TUBE SAMPLER

Attachment 2

Chain-of-Custody and Field Forms

ETC ENVIRONMENTAL TESTING and CERTIFICATION

CHAIN OF CUSTODY FORM (CC1)

ETC Sample #: _____
Seal Date: _____
Sealed By: _____

SHIP TO:

Company: _____ Attn.: _____
Facility/Site: _____
Address: _____ Phone: ( ) -

SAMPLE IDENTIFICATION

Facility/Site Code: | | | | | | | | | | |

Source Codes:

Well — (W)	River/Stream — (R)	Surface Impoundment — (I)	Lake/Ocean — (L)
Soil — (S)	Bottom Sediment — (B)	Pretreatment Facility — (P)	Treatment Facility — (T)
Outfall — (O)	Generation Point — (G)	Leachate Collection Sys. — (C)	Other — (X)

	Source Code (from above)	Your Sample Point ID (left justify)	Start Date (mo/day/yr)	Start Time (2400 hr. clock)	Elapsed Hours (composite)
Example:	W	1101J2613P	051581	0930	13

SHUTTLE CONTENTS

Sample Bottle	Condition	Sample Bottle	Condition

CHAIN OF CUSTODY CHRONICLE

1. Shuttle Opened By: (print) _____ Date: _____ Time: _____
   Signature: _____ Seal #: _____ Intact: _____

2. I have received these materials in good condition from the above person.
   Name: _____ Signature: _____
   Date: _____ Time: _____ Remarks: _____

3. I have received these materials in good condition from the above person.
   Name: _____ Signature: _____
   Date: _____ Time: _____ Remarks: _____

4. I have received these materials in good condition from the above person.
   Name: _____ Signature: _____
   Date: _____ Time: _____ Remarks: _____

Shuttle Sealed By: (print) _____ Date: _____ Time: _____
ature: _____ Seal #: _____

ETC USE ONLY Opened By: _____ Date: _____ Time: _____
Seal #: _____ Condition: _____

ETC ENVIRONMENTAL TESTING and CERTIFICATION

ETC Sample No.: _____

SAMPLE POINT INFORMATION FORM (CC2)

FIELD MEASUREMENT DATA

Select up to 3 parameters to be recorded by entering the appropriate code letter in the first space for each of the 3 data entry fields provided. Enter the actual measurement data (in the units specified) for the three parameters you have selected.

PARAMETERS		ACTUAL (left justify)	EXAMPLE
Flow (CFS)	A		C 2 5
Volume (Gal)	B		
Sample Depth (Ft)	C		
Depth to Water (Ft)	D		F 5 0
Discharge Rate (GPM)	E		
Depth to Bottom (Ft)	F		
Event Time (2400-Hr Clock)	G		G 1 1 0 3
Depth to Screen (Ft)	H		

FIELD TEST DATA

DO (Mg/L) _____ Sample Temp. (°C) _____

pH _____ Single Measurement — _____ 2nd of Quadruplicate — _____ 3rd of Quadruplicate — _____ 4th of Quadruplicate

Specific Conductance (uMHOS/CM) _____ Single Measurement — _____ 2nd of Quadruplicate — _____ 3rd of Quadruplicate — _____ 4th of Quadruplicate

THE FOLLOWING DATA IS FOR YOUR RECORDS ONLY

SAMPLING METHOD (choose one)

AIR-LIFT PUMP ( )
AUGER.....( )
BAILER.....( )
BOTTLE.....( )
COLIWASA.....( )
DIPPER.....( )
KEMMERER.....( )
NISKIN.....( )

PERISTALTIC PUMP....( )
PETERSEN.....( )
PISTON PUMP.....( )
SCOOP/SHOVEL.....( )
SQUEEZE PUMP.....( )
SUBMERSIBLE PUMP.( )
SUCTION LIFT PUMP ( )
SURBER.....( )

THIEF.....( )
TRIER.....( )
VEHMEYER..( )
OTHER _____

SAMPLE TYPE (choose one)

GRAB ( ) COMPOSITE ( ) OTHER ( )

_____ _____
_____ _____
(describe) (describe)

WEATHER

_____
_____
_____
(describe)

SAMPLE DESCRIPTION (e.g., color, odor)

_____
_____
_____
(describe)

Form Prepared By: _____ Employer: _____
name (print)

ETC Form CC2 6/1/82

Attachment 3

Methodology

METHODOLOGY

The methods employed in the analysis of your soil samples are established EPA methods taken from the "Manual of Analytical Methods for the Analysis of Pesticide Residues in Human and Environmental Samples", May 1979. The soil method can be summarized as follows: A weighed amount of air dried sample, approximately 2 grams, is soxhlet extracted for 5 hours with 1:1 acetone/hexane solution. The extract is dried and concentrated to approximately 3 ml. The concentrated extract is transferred to a silica gel column and eluted with hexane. The eluate is concentrated to a final volume of 1 ml and injected into a gas chromatograph equipped with a ^{63}Ni electron capture detector.

The GC operating parameters were as follows:

COLUMN

6' x 4mm glass 1.5% SP-2250 & 1.95% SP-2401
Supelcoport 100/120 mesh

CARRIER FLOW

60ml/min. Argon/Methane

SEPTUM PURGE

5ml/min. Argon/Methane

COLUMN OVEN

200° C

INJECTOR TEMPERATURE

225° C

DETECTOR TEMPERATURE

300° C

METHODOLOGY

The methods employed in the analysis of your water sample are established EPA methods taken from the "Manual of Analytical Methods for the Analysis of Pesticide Residues in Humans and Environmental Samples," June 1980. The water method can be summarized as follows: A measured volume of sample, approximately 500 ml, to which sodium sulfate has been added, is extracted with methylene chloride. The methylene chloride extract is dried and concentrated to approximately 1 ml. The concentrated extract is transferred to a silica gel column and eluted with hexane. The eluate is concentrated to a final volume of 1 ml and injected into a gas chromatograph equipped with a ^{63}Ni electron capture detector.

The GC operating parameters were as follows:

COLUMN

6' x 4mm glass 1.5% SP-2250 & 1.95% SP-2401
Supelcoport 100/120 mesh

CARRIER FLOW

60ml/min. Argon/Methane

SEPTUM PURGE

5ml/min. Argon/Methane

COLUMN OVEN

200° C

INJECTOR TEMPERATURE

225° C

DETECTOR TEMPERATURE

300° C

Attachment 4

Analytical Results

ENVIRONMENTAL TESTING and CERTIFICATION

May 27, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water Inc.	SITE 690	See Below			

ETC Sample Number	Sample Point	Results: Aroclor 1242 Concen. mg/kg	Aroclor 1242 MDL* mg/kg	Aroclor 1254 Concen. mg/kg	Aroclor 1254 MDL* mg/kg	Aroclor 1260 Concen. mg/kg	Aroclor 1260 MDL* mg/kg	QC Spike: 1260 Added mg/kg	% Recov.
QC676	Reagent Blank	<5	5	<5	5	<5	5	-	-
C3041S	Matrix Spike	<5	5	<5	5	9.75	5	10	98
C3012R	Replicate 1	<5	5	<5	5	<5	5	-	-
C3007	BCL-1-1-0 051183	<5	5	<5	5	<5	5	-	-
C3008	BCL-1-1-6 051183	<5	5	<5	5	<5	5	-	-
C3009	BCL-1-1-3 051183	<5	5	<5	5	<5	5	-	-
C3010	BCL-1-1-9 051183	<5	5	<5	5	<5	5	-	-
C3011	BCL-9-3-3 051183	<12.5	12.5	<5	5	<5	5	-	-
C3012	BCL-9-3-0 051083	<5	5	<5	5	<5	5	-	-
C3013	BCL-9-3-6 051083	<25	25	<5	5	<5	5	-	-
C3014	BCL-2-3-0 051183	<5	5	<5	5	<5	5	-	-
C3016	BCL-2-2-9 050983	<5	5	<5	5	<5	5	-	-
C3017	BCL-2-2-0	<5	5	<5	5	<5	5	-	-
C3018	BCL-2-2-35 050983	<5	5	<5	5	<5	5	-	-
C3019	BCL-2-2-6 050983	<5	5	<5	5	<5	5	-	-
C3020	BCL-2-1-0 050983	<5	5	<5	5	<5	5	-	-
C3021	BCL-2-1-3 050983	<5	5	<5	5	<5	5	-	-
C3022	BCL-2-1-6 050983	<5	5	<5	5	<5	5	-	-
C3023	BCL-2-1-9 050983	<5	5	<5	5	<5	5	-	-
C3024	BCL-2-1-12 050983	<50	50	8.89	5	6.28	5	-	-

* MDL calculated for each sample matrix.

< indicates compound was less than the sample MDL.

ETC ENVIRONMENTAL TESTING and CERTIFICATION

May 25, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water Inc.	SITE 690	See Below			

ETC Sample Number	Sample Point	Results: Aroclor 1242 Concen. mg/kg	Aroclor 1242 MDL* mg/kg	Aroclor 1254 Concen. mg/kg	Aroclor 1254 MDL* mg/kg	Aroclor 1260 Concen. mg/kg	Aroclor 1260 MDL* mg/kg	QC Spike: 1260 Added mg/kg	% Recov.
QC677	Reagent Blank	<5	5	<5	5	<5	5	-	-
C3041S	Matrix Spike	<5	5	<5	5	9.4	5	10	94
C3041R	Replicate 1	<5	5	<5	5	<5	5	-	-
C3032R	Replicate 2	<5	5	<5	5	<5	5	-	-
C3025	BCL-9-2-9 051083	<12.5	12.5	<5	5	<5	5	-	-
C3026	BCL-9-2-0 051083	<5	5	<5	5	<5	5	-	-
C3027	BCL-9-2-7 051083	<25	25	<5	5	<5	5	-	-
C3028	BCL-9-2-3 051083	<5	5	<5	5	<5	5	-	-
C3030	BCL-9-1-3 051083	<5	5	<5	5	<5	5	-	-
C3032	BCL-9-1-0 051083	<5	5	<5	5	<5	5	-	-
C3033	BCL-2-4-3 051083	<25	25	<5	5	<5	5	-	-
C3034	BCL-2-4-0 051083	<5	5	<5	5	<5	5	-	-
C3035	BCL-2-4-10 051183	<5	5	<5	5	<5	5	-	-
C3036	BCL-2-4-7 051083	<5	5	<5	5	<5	5	-	-
C3037	BCL-3-2-0 051183	<5	5	<5	5	<5	5	-	-
C3038	BCL-3-1-0 051183	<5	5	<5	5	<5	5	-	-
C3039	BCL-3-2-3 051183	<125	125	124	5	31.8	5	-	-
C3040	BCL-3-1-3 051183	<25	25	12.2	5	<5	5	-	-
C3041	BCL-3-3-0 051183	<5	5	<5	5	<5	5	-	-
C3042	BCL-3-3-3 051183	<5	5	9.7	5	<5	5	-	-
C3045	BCL-9-1-8 051083	<50	50	<5	5	<5	5	-	-
C3046	BCL-2-2-12 050983	<5	5	<5	5	<5	5	-	-

* MDL calculated for each sample matrix.

< indicates compound was less than the sample MDL.

ETC ENVIRONMENTAL TESTING and CERTIFICATION

May 31, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Volatile Compounds – GC/MS Analysis Data (QR01)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
C3042	Clean Water Inc.	SITE 690	BCL-3-3-3	051183	1030	

NPDES Number	Compound	Results		QC Replicate		QC Blank and Spiked Blank			QC Matrix Spike		
		Sample Concen, ug/kg	MDL ug/kg*	First ug/kg	Second ug/kg	Blank Data ug/kg	Amount Added ug	% Recov	Unspiked Sample ug	Amount Added ug	% Recov
1V	Acrolein	ND	500	ND	ND	ND	2.400	45	0.300	8.000	75
2V	Acrylonitrile	ND	500	ND	ND	ND	0.240	82	ND	0.800	95
3V	Benzene	BMDL	50	ND	ND	ND	0.054	96	ND	0.180	118
4V	bis(Chloromethyl)ether	ND	50	ND	ND	ND	0	-	ND	0	-
5V	Bromoform	ND	50	ND	ND	ND	0.054	105	ND	0.180	102
6V	Carbon tetrachloride	ND	50	ND	ND	ND	0.054	97	ND	0.180	128
7V	Chlorobenzene	ND	50	ND	ND	ND	0.054	98	ND	0.180	113
8V	Chlorodibromomethane	ND	50	ND	ND	ND	0.054	96	ND	0.180	111
9V	Chloroethane	ND	50	ND	ND	ND	0.054	129	ND	0.180	128
10V	2-Chloroethylvinyl ether	ND	50	ND	ND	ND	0.054	129	ND	0.180	100
11V	Chloroform	ND	50	ND	ND	ND	0.054	92	ND	0.180	117
12V	Dichlorobromomethane	ND	50	ND	ND	ND	0.054	94	ND	0.180	117
13V	Dichlorodifluoromethane	ND	50	ND	ND	ND	0	-	ND	0	-
14V	1,1-Dichloroethane	BMDL	50	ND	ND	ND	0.054	74	ND	0.180	118
15V	1,2-Dichloroethane	ND	50	ND	ND	ND	0.054	94	ND	0.180	108
16V	1,1-Dichloroethylene	ND	50	ND	ND	ND	0.054	96	ND	0.180	117
17V	1,2-Dichloropropane	ND	50	ND	ND	ND	0.054	87	ND	0.180	116
18V	1,3-Dichloropropylene	ND	50	ND	ND	ND	0.054	91	ND	0.180	116
19V	Ethylbenzene	63	50	ND	ND	ND	0.054	100	ND	0.180	113
20V	Methyl bromide	ND	50	ND	ND	ND	0.054	152	ND	0.180	173
21V	Methyl chloride	ND	50	ND	ND	ND	0.054	94	ND	0.180	137
22V	Methylene chloride	133	50	245	154	BMDL	0.054	62	0.488	0.180	74**
23V	1,1,2,2-Tetrachloroethane	ND	50	ND	ND	ND	0.054	89	ND	0.180	101
24V	Tetrachloroethylene	82	50	ND	ND	ND	0.054	97	ND	0.180	115
25V	Toluene	BMDL	50	11	5	ND	0.054	109	0.013	0.180	120
26V	1,2-Trans-dichloroethylene	ND	50	ND	ND	ND	0.054	86	ND	0.180	112
27V	1,1,1-Trichloroethane	BMDL	50	4	2	ND	0.054	103	0.004	0.180	121
28V	1,1,2-Trichloroethane	ND	50	ND	ND	ND	0.054	71	ND	0.180	84
29V	Trichloroethylene	BMDL	50	3	ND	ND	0.054	95	0.003	0.180	112
30V	Trichlorofluoromethane	BMDL	50	11	3	ND	0.054	105	0.011	0.180	121
31V	Vinyl chloride	ND	50	ND	ND	ND	0.054	104	ND	0.180	130

* ETC established Method Detection Limit for this particular sample.

**Spiked samples that contain compounds present at high levels do not provide valid spike recovery data.

ENVIRONMENTAL TESTING and CERTIFICATION

May 25, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water Inc.	SITE 690	See Below			

ETC Sample Number	Sample Point	Results: Aroclor 1242 Concen. mg/kg	Aroclor 1242 MDL* mg/kg	Aroclor 1254 Concen. mg/kg	Aroclor 1254 MDL* mg/kg	Aroclor 1260 Concen. mg/kg	Aroclor 1260 MDL* mg/kg	QC Spike: 1260 Added mg/kg	% Recov.
QC679	Reagent Blank	<5	5	<5	5	<5	5	-	-
C2370S	Matrix Spike	<5	5	<5	5	10.0	5	10	100
C3047R	Replicate 1	<5	5	<5	5	<5	5	-	-
C2348	BL11-1-1 042783	<5	5	<5	5	<5	5	-	-
C2349	BL12-8-1 042783	<12.5	12.5	<5	5	<5	5	-	-
C2353	BL11-2-1 042783	<5	5	<5	5	<5	5	-	-
C2354	BL11-3-1 042783	<5	5	<5	5	<5	5	-	-
C2360	BL12-4-1 042683	<5	5	<5	5	<5	5	-	-
C2361	BL12-9-1 042783	<25	25	<5	5	<5	5	-	-
C2362	BL12-7-1 042783	<25	25	<5	5	<5	5	-	-
C2363	BL12-12-1 042783	<25	25	<5	5	<5	5	-	-
C2364	BL11-4-1 042783	<5	5	<5	5	<5	5	-	-
C2365	BL11-5-1 042983	<5	5	6.53	5	<5	5	-	-
C2370	BL12-2-1 042683	<5	5	<5	5	<5	5	-	-
C2371	BL12-3-1 042683	<25	25	<5	5	<5	5	-	-
C2372	BL11-8-1 042983	<5	5	<5	5	<5	5	-	-
C3047	BCL-2-3-4 051083	<5	5	<5	5	<5	5	-	-
C3049	BCL-2-4-12 051083	<125	125	37.3	5	22.6	5	-	-
C3050	BCL-9-3-9 051183	<125	125	34.4	5	<5	5	-	-

* MDL calculated for each sample matrix.

< indicates compound was less than the sample MDL.

ETC ENVIRONMENTAL TESTING and CERTIFICATION

May 20, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water Inc.	SITE 690	See Below			

ETC Sample Number	Sample Point	Results						QC Spike	
		Aroclor 1242 Concen. mg/kg	Aroclor 1242 MDL* mg/kg	Aroclor 1254 Concen. mg/kg	Aroclor 1254 MDL* mg/kg	Aroclor 1260 Concen. mg/kg	Aroclor 1260 MDL* mg/kg	1260 Added mg/kg	% Recov.
C3029S	Matrix Spike	<10	10	<10	10	16.5	10	20	83
C3015R	Replicate 1	<10	10	24	10	<10	10	-	-
C3015	BCL-2-3-3 051083	<10	10	16	10	<10	10	-	-
C3029	BCL-9-1-4 051083	<10	10	<10	10	<10	10	-	-
C3031	BCL-9-1-2 051083	<10	10	<10	10	<10	10	-	-
C3048	BCL-2-3-10 051083	<10	10	146	10	<10	10	-	-

* MDL calculated for each sample matrix.
< indicates compound was less than the sample MDL.

ETC ENVIRONMENTAL TESTING and CERTIFICATION

June 16, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water	SITE690	See Below			

ETC Sample Number	Sample Point	Results: Aroclor 1242 Concen. mg/kg	Aroclor 1242 MDL* mg/kg	Aroclor 1254 Concen. mg/kg	Aroclor 1254 MDL* mg/kg	Aroclor 1260 Concen. mg/kg	Aroclor 1260 MDL* mg/kg	QC Spike: 1260 Added mg/kg	% Recov.
QC699	Reagent Blank	<5	5	<5	5	<5	5	-	-
C3146S	Matrix Spike	<25	25	<5	5	9.4	5	10	94
C3138R	Replicate 1	<5	5	<5	5	<5	5	-	-
C3140R	Replicate 2	<5	5	<5	5	<5	5	-	-
C3135	CL1-2-3' 051183	<5	5	<5	5	<5	5	-	-
C3136	CL1-2-6 051183	<50	50	18.5	5	13.7	5	-	-
C3137	CL1-2-0' 051183	<5	5	<5	5	<5	5	-	-
C3138	CL6-1-4' 051283	<5	5	<5	5	<5	5	-	-
C3139	CL1-3-6.5	<5	5	<5	5	<5	5	-	-
C3140	CL1-3-3' 051283	<5	5	<5	5	<5	5	-	-
C3143	CL1-1-12' 051183	<25	25	<5	5	<5	5	-	-
C3144	CL6-3-9 051283	<5	5	<5	5	<5	5	-	-
C3146	CL6-4-9' 051283	<25	25	<5	5	<5	5	-	-
C3147	CL6-4-6' 051283	<5	5	<5	5	<5	5	-	-
C3148	CL6-4-3' 051283	<5	5	<5	5	<5	5	-	-
C3149	CL6-3-6' 051283	<25	25	<5	5	<5	5	-	-
C3150	CL6-3-4' 051283	<5	5	<5	5	<5	5	-	-
C3151	CL6-2-14.5 051283	<25	25	<5	5	<5	5	-	-
C3152	CL6-2-12' 051283	<5	5	<5	5	<5	5	-	-
C3153	CL6-2-9.5' 051283	<5	5	<5	5	<5	5	-	-
C3154	CL6-2-6.5 051283	<5	5	<5	5	<5	5	-	-

* MDL calculated for each sample matrix.

< indicates compound was less than the sample MDL.

ETC ENVIRONMENTAL TESTING and CERTIFICATION

June 8, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water Inc.	SITE 690	See Below			

ETC Sample Number	Sample Point	Results: Aroclor 1242 Concen. mg/kg	Aroclor 1242 MDL* mg/kg	Aroclor 1254 Concen. mg/kg	Aroclor 1254 MDL* mg/kg	Aroclor 1260 Concen. mg/kg	Aroclor 1260 MDL* mg/kg	QC Spike: 1260 Added mg/kg	% Recov.
QC719	Reagent Blank	<5	5	<5	5	<5	5	-	-
C3145S	Matrix Spike	<125	125	391	125	37.5	125	10	60**
C3145R	Replicate 1	<125	125	350	125	38.2	125	-	-
C3145	CL1-2-10' 051183	<125	125	310	125	24.7	125	-	-

* MDL calculated for each sample matrix.

< indicates compound was less than the sample MDL.

** Recovery affected by high level in sample matrix.

ETC ENVIRONMENTAL TESTING and CERTIFICATION

June 8, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water Inc.	SITE690	See Below			

ETC Sample Number	Sample Point	Results: Aroclor 1242 Concen. ug/l	Aroclor 1242 MDL* ug/l	Aroclor 1254 Concen. ug/l	Aroclor 1254 MDL* ug/l	Aroclor 1260 Concen. ug/l	Aroclor 1260 MDL* ug/l	QC Spike: 1260 Added ug/l	% Recov.
QC703	Blank	<1	1	<1	1	<1	1	-	-
QC703S	Spiked Blank	<1	1	<1	1	1.9	1	2	95
C3141S	Matrix Spike	<10	10	<1	1	2.82	1	2	141
C3141	BCI-9-2-9 051083	<10	10	<1	1	<1	1	-	-

* MDL calculated for each sample matrix.

< indicates compound was less than the sample MDL.

ETC RONMENTAL STING and CERTIFICATION

June 6, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water Inc.	SITE 690	See Below			

ETC Sample Number	Sample Point	Results: Aroclor 1242 Concen. mg/kg	Aroclor 1242 MDL* mg/kg	Aroclor 1254 Concen. mg/kg	Aroclor 1254 MDL* mg/kg	Aroclor 1260 Concen. mg/kg	Aroclor 1260 MDL* mg/kg	QC Spike: 1260 Added mg/kg	% Recov.
CC700	Reagent Blank	<5	5	<5	5	<5	5	-	-
C2677S	Matrix Spike	<5	5	<5	5	9.3	5	10	93
C2789R	Replicate 1	<5	5	<5	5	<5	5	-	-
C2792R	Replicate 2	<5	5	<5	5	10.2	5	-	-
C3155	CL6-2-3.5 051283	<5	5	<5	5	<5	5	-	-
C3156	CL6-1-13' 051183	<25	25	<5	5	<5	5	-	-
C3157	CL6-1-12' 051283	<25	25	<5	5	<5	5	-	-
C3158	CL6-1-9 051283	<5	5	<5	5	<5	5	-	-
C3159	CL6-1-6' 051283	<5	5	<5	5	<5	5	-	-

* MDL calculated for each sample matrix.
< indicates compound was less than the sample MDL.

ETC ENVIRONMENTAL TESTING and CERTIFICATION

May 27, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water Inc.	SITE 690	See Below			

ETC Sample Number	Sample Point	Results: Aroclor 1242 Concen. mg/kg	Aroclor 1242 MDL* mg/kg	Aroclor 1254 Concen. mg/kg	Aroclor 1254 MDL* mg/kg	Aroclor 1260 Concen. mg/kg	Aroclor 1260 MDL* mg/kg	QC Spike: 1260 Added mg/kg	% Recov.
QC686	Reagent Blank	<5	5	<5	5	<5	5	-	-
C3175S	Matrix Spike	<5	5	<5	5	12.2	5	10	122
C3174R	Replicate 1	<5	5	<5	5	<5	5	-	-
C2368R	Replicate 2	<25	25	<5	5	<5	5	-	-
C2366	B11-7-1 042983	<50	50	<5	5	<5	5	-	-
C2368	BL12-6-0 042683	<25	25	<5	5	<5	5	-	-
C2369	BL12-1-1 042683	<25	25	<5	5	<5	5	-	-
C3167	CL10-2-9 051283	<5	5	<5	5	<5	5	-	-
C3168	CL10-2-6 051283	<5	5	<5	5	<5	5	-	-
C3169	CL10-2-3 051283	<5	5	<5	5	<5	5	-	-
C3170	CL10-2-0 051283	<5	5	<5	5	<5	5	-	-
C3171	CL6-4-11.5 051283	<25	25	<5	5	<5	5	-	-
C3172	CL10-3-6 051383	<5	5	<5	5	<5	5	-	-
C3173	CL10-3-11 051383	<125	125	<5	5	<5	5	-	-
C3174	CL10-5-0 051383	<5	5	<5	5	<5	5	-	-
C3175	CL10-5-3 051383	<5	5	<5	5	<5	5	-	-
C3176	CL10-6-10 051383	<25	25	<5	5	<5	5	-	-
C3177	CL3-3-3 051383	<5	5	5.7	5	<5	5	-	-
C3178	CL10-6-11C 051383	<5	5	<5	5	<5	5	-	-
C3179	CL3-3-6C 051183	<25	25	24.6	5	7.05	5	-	-
C3180	CL2-3-11C 051083	<5	5	<5	5	<5	5	-	-
C3181	CL10-1-6 051283	<50	50	<5	5	<5	5	-	-

* MDL calculated for each sample matrix.

< indicates compound was less than the sample MDL.

ETC ENVIRONMENTAL TESTING and CERTIFICATION

June 3, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water Inc.	SITE 690	See Below			

ETC Sample Number	Sample Point	Results: Aroclor 1242 Concen. mg/kg	Aroclor 1242 MDL* mg/kg	Aroclor 1254 Concen. mg/kg	Aroclor 1254 MDL* mg/kg	Aroclor 1260 Concen. mg/kg	Aroclor 1260 MDL* mg/kg	QC Spike: 1260 Added mg/kg	% Recov.
QC684	Reagent Blank	<5	5	<5	5	<5	5	-	-
C3187S	Matrix Spike	<5	5	<5	5	7.74	5	10	77
C3185R	Replicate 1	<5	5	<5	5	<5	5	-	-
C3186R	Replicate 2	<5	5	<5	5	<5	5	-	-
C3182	CL10-1-5' 051283	<25	25	<5	5	<5	5	-	-
C3183	CL10-1-3' 051283	<5	5	<5	5	<5	5	-	-
C3184	CL10-1-0' 051283	<5	5	<5	5	<5	5	-	-
C3185	CL10-2-12 051283	<5	5	<5	5	<5	5	-	-
C3186	CL10-4-6C 051383	<5	5	<5	5	<5	5	-	-
C3187	CL10-5-11C 051383	<5	5	<5	5	<5	5	-	-
C3188	CL10-4-0' 051383	<5	5	<5	5	<5	5	-	-
C3189	CL10-4-3' 051383	<5	5	<5	5	<5	5	-	-
C3190	CL10-4-6' 051383	<5	5	<5	5	<5	5	-	-
C3191	CL10-3-0' 051383	<5	5	<5	5	<5	5	-	-
C3192	CL10-3-3' 051383	<5	5	<5	5	<5	5	-	-
C3193	CL10-3-11C	<5	5	<5	5	<5	5	-	-
C3194	CL10-5-5.5 051383	<25	25	<5	5	<5	5	-	-
C3196	CL10-6-0 051383	<5	5	<5	5	<5	5	-	-
C3197	CL10-6-3' 051383	<5	5	<5	5	<5	5	-	-
C3198	CL10-6-6' 051383	<5	5	<5	5	<5	5	-	-
C3199	CL10-3-8.5 051383	<50	50	<5	5	<5	5	-	-

* MDL calculated for each sample matrix.

< indicates compound was less than the sample MDL.

ETC ENVIRONMENTAL, TESTING and CERTIFICATION

June 3, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water Inc.	SITE 690	See Below			

ETC Sample Number	Sample Point	Results: Aroclor 1242 Concen. mg/kg	Aroclor 1242 MDL* mg/kg	Aroclor 1254 Concen. mg/kg	Aroclor 1254 MDL* mg/kg	Aroclor 1260 Concen. mg/kg	Aroclor 1260 MDL* mg/kg	QC Spike: 1260 Added mg/kg	% Recov.
QC684	Reagent Blank	<5	5	<5	5	<5	5	-	-
03187S	Matrix Spike	<5	5	<5	5	7.74	5	10	77
03185R	Replicate 1	<5	5	<5	5	<5	5	-	-
03186R	Replicate 2	<5	5	<5	5	<5	5	-	-
03182	CL10-1-5' 051283	<25	25	<5	5	<5	5	-	-
03183	CL10-1-3' 051283	<5	5	<5	5	<5	5	-	-
03184	CL10-1-0' 051283	<5	5	<5	5	<5	5	-	-
03185	CL10-2-12 051283	<5	5	<5	5	<5	5	-	-
03186	CL10-4-6C 051383	<5	5	<5	5	<5	5	-	-
03187	CL10-5-11C 051383	<5	5	<5	5	<5	5	-	-
03188	CL10-4-0' 051383	<5	5	<5	5	<5	5	-	-
03189	CL10-4-3' 051383	<5	5	<5	5	<5	5	-	-
03190	CL10-4-6' 051383	<5	5	<5	5	<5	5	-	-
03191	CL10-3-0' 051383	<5	5	<5	5	<5	5	-	-
03192	CL10-3-3' 051383	<5	5	<5	5	<5	5	-	-
03193	CL10-3-11C	<5	5	<5	5	<5	5	-	-
03194	CL10-5-5.5 051383	<25	25	<5	5	<5	5	-	-
03196	CL10-6-0 051383	<5	5	<5	5	<5	5	-	-
03197	CL10-6-3' 051383	<5	5	<5	5	<5	5	-	-
03198	CL10-6-6' 051383	<5	5	<5	5	<5	5	-	-
03199	CL10-3-8.5 051383	<50	50	<5	5	<5	5	-	-

*MDL calculated for each sample matrix.
<indicates compound was less than the sample MDL.

ENVIRONMENTAL TESTING and CERTIFICATION

May 31, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
C3195	Clean Water Inc.	SITE 690	CL10-5-7.5	051383		

ETC Sample Number	Sample Point	Results: Aroclor 12 Concen. ug/l	Aroclor 12 MDL* ug/l	Aroclor 1254 Concen. ug/l	Aroclor 1254 MDL* ug/l	Aroclor 1260 Concen. ug/l	Aroclor 1260 MDL* ug/l	QC Spike: 1260 Added ug/ml	% Recov.
QC682	Blank	<1	1	<1	1	<1	1	-	-
QC682S	Spiked Blank	<1	1	<1	1	0.89	1	2	45
C3195S	Matrix Spike	<5.2	5.2	<1.04	1.04	0.69	1.04	2	35
	Replicate 1**	-	-	-	-	-	-	-	-
C3195	CL10-5-7.5 051383	<5.2	5.2	<1.04	1.04	<1.04	1.04	-	-

* MDL calculated for each sample matrix.

< indicates compound was less than the sample MDL.

** Insufficient sample furnished for replication.

ET ENVIRONMENTAL TESTING and CERTIFICATION

June 16, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water	SITE690	See Below			

ETC Sample Number	Sample Point	Results: Aroclor 1242 Concen. mg/kg	Aroclor 1242 MDL* mg/kg	Aroclor 1254 Concen. mg/kg	Aroclor 1254 MDL* mg/kg	Aroclor 1260 Concen. mg/kg	Aroclor 1260 MDL* mg/kg	QC Spike: 1260 Added mg/kg	% Recov.
QC704	Reagent Blank	<5	5	<5	5	<5	5	-	-
C2407S	Matrix Spike	<5	5	<5	5	8.4	5	10	84
C2408R	Replicate 1	<5	5	<5	5	<5	5	-	-
C2409R	Replicate 2	<5	5	<5	5	<5	5	-	-
C3400	CL4-5-0 051783	<5	5	<5	5	<5	5	-	-
C3401	CL4-5-3 051783	<5	5	<5	5	<5	5	-	-
C3402	CL-5-6 051783	<25	25	<5	5	<5	5	-	-
C3403	CL4-5-10' 051783	<125	125	<5	5	<5	5	-	-
C3404	CL4-2-0 051783	<5	5	<5	5	<5	5	-	-
C3405	CL4-2- 051783	<5	5	<5	5	<5	5	-	-
C3406	CL10-2-12' 051283	<5	5	<5	5	<5	5	-	-
C3407	CL4-2-9 051783	<125	125	125	125	<125	125	-	-
C3409	XL6-3-12 051283	<5	5	<5	5	<5	5	-	-

* MDL calculated for each sample matrix.
< indicates compound was less than the sample MDL.

ETC ENVIRONMENTAL TESTING and CERTIFICATION

June 16, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water Inc.	SITE690	See Below			

ETC Sample Number	Sample Point	Results: Aroclor 1242 Concen. mg/kg	Aroclor 1242 MDL* mg/kg	Aroclor 1254 Concen. mg/kg	Aroclor 1254 MDL* mg/kg	Aroclor 1260 Concen. mg/kg	Aroclor 1260 MDL* mg/kg	QC Spike: 1260 Added mg/kg	% Recov.
C2702S	Matrix Spike	<10	10	<10	10	46.6	10	20	123
C3408R	Replicate 1	<250	250	<10	10	309	10	-	-
C3408	CL4-2-13 051783	<250	250	<10	10	392	10	-	-
C3991	KOPPER-1 052683	37	10	<10	10	50.2	10	-	-

* MDL calculated for each sample matrix.

< indicates compound was less than the sample MDL.

ETC ENVIRONMENTAL TESTING and CERTIFICATION

June 16, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water Inc.	SITE690	See Below			

ETC Sample Number	Sample Point	Results: Aroclor 1242 Concen. mg/kg	Aroclor 1242 MDL* mg/kg	Aroclor 1254 Concen. mg/kg	Aroclor 1254 MDL* mg/kg	Aroclor 1260 Concen. mg/kg	Aroclor 1260 MDL* mg/kg	QC Spike: 1260 Added mg/kg	% Recov.
QC707	Reagent Blank	<5	5	<5	5	<5	5	-	-
C3413S	Matrix Spike	<25	25	<5	5	12.9	5	10	129
C3415R	Replicate 1	<5	5	<5	5	<5	5	-	-
C2636R	Replicate 2	<5	5	<5	5	<5	5	-	-
C3410	CL6-2-15 051283	<5	5	<5	5	<5	5	-	-
C3411	CL6-1-13 051283	<5	5	<5	5	<5	5	-	-
C3412	CL4-5-12 051783	<25	25	<5	5	<5	5	-	-
C3413	CL4-5-16 051783	<25	25	<5	5	<5	5	-	-
C3414	CL4-3-9 051783	<5	5	<5	5	<5	5	-	-
C3415	CL4-3-6 051783	<5	5	<5	5	<5	5	-	-
C3416	CL4-3-3 051783	<5	5	<5	5	<5	5	-	-
C3417	CL9-3-11 051083	<5	5	<5	5	<5	5	-	-
C3418	CL9-1-10 051083	<5	5	<5	5	<5	5	-	-
C3419	CL3-1-4 051183	<5	5	7.9	5	<5	5	-	-
C3420	CL4-6-3 051683	<25	25	<5	5	<5	5	-	-
C3422	CL4-6-06 051683	<125	125	<5	5	22.8	5	-	-
C3423	CL4-6-9 051683	<25	25	<5	5	<5	5	-	-
C3424	CL4-6-12 051683	<5	5	<5	5	<5	5	-	-
C3425	CL4-2-16 051783	<25	25	<5	5	<5	5	-	-
C3426	CL2-2-12 050983	<5	5	<5	5	<5	5	-	-
C3427	CL2-4-12 051083	<5	5	<5	5	<5	5	-	-

* MDL calculated for each sample matrix.

< indicates compound was less than the sample MDL.

ENVIRONMENTAL TESTING and CERTIFICATION

June 6, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
C3421	Clean Water Inc.	SITE 690	See Below			

ETC Sample Number	Sample Point	Results: Aroclor 1242 Concen. ug/l	Aroclor 1242 MDL* ug/l	Aroclor 1254 Concen. ug/l	Aroclor 1254 MDL* ug/l	Aroclor 1260 Concen. ug/l	Aroclor 1260 MDL* ug/l	QC Spike: 1260 Added ug/l	% Recov.
QC695	Blank	<1	1	<1	1	<1	1	-	-
QC695S	Spiked Blank	<1	1	<1	1	1.76	1	2	88
C2779S	Matrix Spike	<1	1	<1	1	1.8	1	2	90
C3206R	Replicate 1	<1	1	<1	1	<1	1	-	-
C3421	CL4-6-4 051583	<10	10	<10	10	<1	1	-	-

* MDL calculated for each sample matrix.

< indicates compound was less than the sample MDL.

ETC ENVIRONMENTAL TESTING and CERTIFICATION

June 16, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water Inc.	SITE 690	See Below			

ETC Sample Number	Sample Point	Results: Aroclor 1242 Concen. mg/kg	Aroclor 1242 MDL* mg/kg	Aroclor 1254 Concen. mg/kg	Aroclor 1254 MDL* mg/kg	Aroclor 1260 Concen. mg/kg	Aroclor 1260 MDL* mg/kg	QC Spike: 1260 Added mg/kg	% Recov.
QC712	Reagent Blank	<5	5	<5	5	<5	5	-	-
C3463S	Matrix Spike	<5	5	<5	5	7.82	5	10	78
C3458R	Replicate 1	<5	5	<5	5	<5	5	-	-
C3458	EA1-0' 051883	<5	5	<5	5	<5	5	-	-
C3463	SA2-0' 051883	<5	5	<5	5	<5	5	-	-
C3465	SA1-0' 051883	<5	5	<5	5	<5	5	-	-
C3466	EAS-0' 051883	<5	5	<5	5	<5	5	-	-
C3470	ASF6-0' 051883	<5	5	<5	5	<5	5	-	-
C3471	ASF2-0 051883	<12.5	12.5	<5	5	<5	5	-	-
C3987	RIP-4 052583	<50	50	<5	5	13.7	5	-	-
C3988	RIP-7 052583	<50	50	<5	5	42	5	-	-
C3990	RIP-11 052583	<125	125	436	125	140	125	-	-

* MDL calculated for each sample matrix.

< indicates compound was less than the sample MDL.

ENVIRONMENTAL TESTING and CERTIFICATION

June 8, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Aroclors – GC Analysis Data (QR14)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
See Below	Clean Water	SITE690	See Below			

ETC Sample Number	Sample Point	Results: Aroclor 1242 Concen. mg/kg	Aroclor 1242 MDL* mg/kg	Aroclor 1254 Concen. mg/kg	Aroclor 1254 MDL* mg/kg	Aroclor 1260 Concen. mg/kg	Aroclor 1260 MDL* mg/kg	QC Spike: 1260 Added mg/kg	% Recov.
QC709	Reagent Blank	<5	5	<5	5	<5	5	-	-
C3459S	Matrix Spike	<5	5	<5	5	9.2	5	10	92
C3445R	Replicate 1	<5	5	<5	5	<5	5	-	-
C3453R	Replicate 2	<5	5	6.8	5	<5	5	-	-
C3445	C14-4-9 051883	<5	5	<5	5	<5	5	-	-
C3447	C14-1-0 051883	<50	50	8.3	5	<5	5	-	-
C3448	C14-1-3' 051883	<50	50	19.2	5	<5	5	-	-
C3449	C14-1-10' 051883	<25	25	<5	5	<5	5	-	-
C3450	C14-1-12 051883	<5	5	<5	5	<5	5	-	-
C3451	ASF5-0 051883	<25	25	<5	5	<5	5	-	-
C3452	ASF7-0' 051883	<5	5	<5	5	<5	5	-	-
C3453	ASF8-0' 051883	<5	5	7.7	5	<5	5	-	-
C3454	EA8-0' 051883	<5	5	<5	5	<5	5	-	-
C3455	EA7-0' 051883	<5	5	<5	5	<5	5	-	-
C3456	EA4-0' 051883	<5	5	<5	5	<5	5	-	-
C3457	EA9-0' 051883	<5	5	<5	5	<5	5	-	-
C3459	EA3-0' 051883	<5	5	<5	5	<5	5	-	-
C3460	ASF1-0' 051883	<50	50	<5	5	<5	5	-	-
C3461	ASF3-0' 051883	<5	5	<5	5	<5	5	-	-
C3462	ASF4-0 051883	<5	5	<5	5	<5	5	-	-
C3464	SA3-0' 051883	<5	5	<5	5	<5	5	-	-
C3467	EA2-0' 051883	<5	5	<5	5	<5	5	-	-

* MDL calculated for each sample matrix.

< indicates compound was less than the sample MDL.

ETC ENVIRONMENTAL TESTING and CERTIFICATION

June 15, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

RCRA EP Toxicity Contaminants (QR11)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
C3468	Clean Water Inc.	SITE 690	CL1-1-12.5	051183	1245	

EPA Hazardous Waste Number	Parameter	Sample Concen. mg/l	RCRA Alert Level mg/l	QC Replicate First mg/l	QC Replicate Second mg/l	QC Blank and Spiked Blank: Blank Data ug/ml	QC Blank and Spiked Blank: Concen. Added ug/ml	QC Blank and Spiked Blank: % Recov	QC Matrix Spike: Unspiked Extract ug/ml	QC Matrix Spike: Concen. Added ug/ml	QC Matrix Spike: % Recov
D004	Arsenic	<0.2	5								
D005	Barium	<5	100								
D006	Cadmium	<0.8	1								
D007	Chromium	<1	5								
D008	Lead	<2	5								
D009	Mercury	<0.002	0.2								
D010	Selenium	<0.2	1								
D011	Silver	<0.5	5								
D012	Endrin (GC)	<0.02	0.02	<0.02	<0.02	<0.02	0.02	130	<0.02	0.02	166
D013	Lindane (GC)	<0.4	0.4	<0.4	<0.4	<0.4	0.4	113	<0.4	0.4	116
D014	Methoxychlor (GC)	<10	10	<10	<10	<10	10	120	<10	10	115
D015	Toxaphene (GC)	<0.5	0.5	<0.5	<0.5	<0.5	0.5	128	<0.5	0.5	137
D016	2,4-D	<10	10	<10	<10	<10	10	86	<10	10	119
D017	2,4,5-TP (Silvex)	<1	1	<1	<1	<1	1	105	<1	1	113

ENVIRONMENTAL TESTING and CERTIFICATION

June 10, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

RCRA EP Toxicity Contaminants (QR11)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
C3050	Clean Water Inc.	SITE 690	BCL-9-3-9	051183	1815	

EPA Hazardous Waste Number	Parameter	Sample Concen, mg/l	RCRA Alert Level mg/l	QC Replicate First mg/l	QC Replicate Second mg/l	QC Blank and Spiked Blank: Blank Data ug/ml	QC Blank and Spiked Blank: Concen. Added ug/ml	QC Blank and Spiked Blank: % Recov	QC Matrix Spike: Unspiked Extract ug/ml	QC Matrix Spike: Concen. Added ug/ml	QC Matrix Spike: % Recov
D004	Arsenic	<0.5	5								
D005	Barium	<5.0	100								
D006	Cadmium	<0.8	1								
D007	Chromium	<1.0	5								
D008	Lead	<2.0	5								
D009	Mercury	<0.002	0.2								
D010	Selenium	<0.5	1								
D011	Silver	<0.2	5								
D012	Endrin (GC)	<0.02	0.02	<0.02	<0.02	<0.02	0.02	104	<0.02	0.02	163
D013	Lindane (GC)	<0.4	0.4	<0.4	<0.4	<0.4	0.4	108	<0.4	0.4	105
D014	Methoxychlor (GC)	<10	10	<10	<10	<10	10	110	<10	10	113
D015	Toxaphene (GC)	<0.5	0.5	<0.5	<0.5	<0.5	0.5	96	<0.5	0.5	100
D016	2,4-D	<10	10	<10	<10	<10	10	143	<10	10	103
D017	2,4,5-TP (Silvex)	<1	1	<1	<1	<1	1	115	<1	1	120

ETC ENVIRONMENTAL TESTING and CERTIFICATION

June 10, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

RCRA EP Toxicity Contaminants (QR11)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
C3049	Clean Water Inc.	SITE 690	BCL-2-4-12	051083	1155	

EPA Hazardous Waste Number	Parameter	Sample Concen. mg/l	RCRA Alert Level mg/l	QC Replicate First mg/l	QC Replicate Second mg/l	QC Blank and Spiked Blank: Blank Data ug/ml	QC Blank and Spiked Blank: Concen. Added ug/ml	QC Blank and Spiked Blank: % Recov	QC Matrix Spike: Unspiked Extract ug/ml	QC Matrix Spike: Concen. Added ug/ml	QC Matrix Spike: % Recov
D004	Arsenic	<0.5	5								
D005	Barium	<5.0	100								
D006	Cadmium	<0.8	1								
D007	Chromium	<1.0	5								
D008	Lead	<2.0	5								
D009	Mercury	<0.002	0.2								
D010	Selenium	<0.5	1								
D011	Silver	<0.2	5								
D012	Endrin (GC)	<0.02	0.02	<0.02	<0.02	<0.02	0.02	104	<0.02	0.02	163
D013	Lindane (GC)	<0.4	0.4	<0.4	<0.4	<0.4	0.4	108	<0.4	0.4	105
D014	Methoxychlor (GC)	<10	10	<10	<10	<10	10	110	<10	10	113
D015	Toxaphene (GC)	<0.5	0.5	<0.5	<0.5	<0.5	0.5	96	<0.5	0.5	100
D016	2,4-D	<10	10	<10	<10	<10	10	143	<10	10	103
D017	2,4,5-TP (Silvex)	<1	1	<1	<1	<1	1	115	<1	1	120

E. ENVIRONMENTAL TESTING and CERTIFICATION

June 10, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

RCRA EP Toxicity Contaminants (QR11)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
C3047	Clean Water Inc.	SITE 690	BCL-2-3-4	051083	0935	

EPA Hazardous Waste Number:	Parameter	Sample Concen. mg/l	RCRA Alert Level mg/l	QC Replicate First mg/l	QC Replicate Second mg/l	QC Blank and Spiked Blank: Blank Data ug/ml	QC Blank and Spiked Blank: Concen. Added ug/ml	QC Blank and Spiked Blank: % Recov	QC Matrix Spike: Unspiked Extract ug/ml	QC Matrix Spike: Concen. Added ug/ml	QC Matrix Spike: % Recov
D004	Arsenic	<0.5	5								
D005	Barium	<5.0	100								
D006	Cadmium	<0.8	1								
D007	Chromium	<1.0	5								
D008	Lead	<2.0	5								
D009	Mercury	<0.002	0.2								
D010	Selenium	<0.5	1								
D011	Silver	<0.2	5								
D012	Endrin (GC)	<0.02	0.02	<0.02	<0.02	<0.02	0.02	104	<0.02	0.02	163
D013	Lindane (GC)	<0.4	0.4	<0.4	<0.4	<0.4	0.4	108	<0.4	0.4	105
D014	Methoxychlor (GC)	<10	10	<10	<10	<10	10	110	<10	10	113
D015	Toxaphene (GC)	<0.5	0.5	<0.5	<0.5	<0.5	0.5	96	<0.5	0.5	100
D016	2,4-D	<10	10	<10	<10	<10	10	143	<10	10	103
D017	2,4,5-TP (Silvex)	<1	1	<1	<1	<1	1	115	<1	1	120

ETC ENVIRONMENTAL TESTING and CERTIFICATION

June 10, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

RCRA EP Toxicity Contaminants (QR11)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
C3046	Clean Water Inc.	SITE 690	BCL-2-2-12	050983	1745	

EPA Hazardous Waste Number	Parameter	Sample Concen. mg/l	RCRA Alert Level mg/l	QC Replicate First mg/l	QC Replicate Second mg/l	QC Blank and Spiked Blank: Blank Data ug/ml	QC Blank and Spiked Blank: Concen. Added ug/ml	QC Blank and Spiked Blank: % Recov	QC Matrix Spike: Unspiked Extract ug/ml	QC Matrix Spike: Concen. Added ug/ml	QC Matrix Spike: % Recov
D004	Arsenic	<0.5	5								
D005	Barium	<5.0	100								
D006	Cadmium	<0.8	1								
D007	Chromium	<1.0	5								
D008	Lead	<2.0	5								
D009	Mercury	<0.002	0.2								
D010	Selenium	<0.5	1								
D011	Silver	<0.2	5								
D012	Endrin (GC)	<0.02	0.02	<0.02	<0.02	<0.02	0.02	104	<0.02	0.02	163
D013	Lindane (GC)	<0.4	0.4	<0.4	<0.4	<0.4	0.4	108	<0.4	0.4	105
D014	Methoxychlor (GC)	<10	10	<10	<10	<10	10	110	<10	10	113
D015	Toxaphene (GC)	<0.5	0.5	<0.5	<0.5	<0.5	0.5	96	<0.5	0.5	100
D016	2,4-D	<10	10	<10	<10	<10	10	143	<10	10	103
D017	2,4,5-TP (Silvex)	<1	1	<1	<1	<1	1	115	<1	1	120

ENVIRONMENTAL TESTING and CERTIFICATION

June 14, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

RCRA EP Toxicity Contaminants (QR11)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
C3045	Clean Water Inc.	SITE 690	BCL-9-1-8	051083	1510	

EPA Hazardous Waste Number	Parameter	Sample Concen. mg/l	RCRA Alert Level mg/l	QC Replicate First mg/l	QC Replicate Second mg/l	QC Blank and Spiked Blank: Blank Data ug/ml	Concen. Added ug/ml	% Recov	QC Matrix Spike: Unspiked Extract ug/ml	Concen. Added ug/ml	% Reco
D004	Arsenic	<0.5	5								
D005	Barium	<5.0	100								
D006	Cadmium	<0.8	1								
D007	Chromium	<1.0	5								
D008	Lead	<2.0	5								
D009	Mercury	<0.002	0.2								
D010	Selenium	<0.5	1								
D011	Silver	<0.2	5								
D012	Endrin (GC)	<0.02	0.02	<0.02	<0.02	<0.02	0.02	104	<0.02	0.02	163
D013	Lindane (GC)	<0.4	0.4	<0.4	<0.4	<0.4	0.4	108	<0.4	0.4	105
D014	Methoxychlor (GC)	<10	10	<10	<10	<10	10	110	<10	10	113
D015	Toxaphene (GC)	<0.5	0.5	<0.5	<0.5	<0.5	0.5	96	<0.5	0.5	100
D016	2,4-D	<10	10	<10	<10	<10	10	143	<10	10	103
D017	2,4,5-TP (Silvex)	<1	1	<1	<1	<1	1	115	<1	1	120

ENVIRONMENTAL TESTING and CERTIFICATION

June 13, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

RCRA EP Toxicity Contaminants (QR11)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
C3425	Clean Water Inc.	SITE 690	CL4-2-16	051783	0950	

EPA Hazardous Waste Number	Parameter	Sample Concen. mg/l	RCRA Alert Level mg/l	QC Replicate First mg/l	QC Replicate Second mg/l	QC Blank and Spiked Blank: Blank Data ug/ml	QC Blank and Spiked Blank: Concen. Added ug/ml	QC Blank and Spiked Blank: % Recov	QC Matrix Spike: Unspiked Extract ug/ml	QC Matrix Spike: Concen. Added ug/ml	QC Matrix Spike: % Recov
004	Arsenic	0.3	5								
D005	Barium	<5	100								
D006	Cadmium	<0.8	1								
007	Chromium	2	5								
D008	Lead	<2	5								
D009	Mercury	<0.002	0.2								
D010	Selenium	<0.2	1								
D011	Silver	<0.5	5								
D012	Endrin (GC)	<0.02	0.02	<0.02	<0.02	<0.02	0.02	104	<0.02	0.02	163
D013	Lindane (GC)	<0.4	0.4	<0.4	<0.4	<0.4	0.4	108	<0.4	0.4	105
D014	Methoxychlor (GC)	<10	10	<10	<10	<10	10	110	<10	10	113
D015	Toxaphene (GC)	<0.5	0.5	<0.5	<0.5	<0.5	0.5	96	<0.5	0.5	100
D016	2,4-D	<10	10	<10	<10	<10	10	143	<10	10	103
D017	2,4,5-TP (Silvex)	<1	1	<1	<1	<1	1	115	<1	1	120

ENVIRONMENTAL TESTING and CERTIFICATION

June 15, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

RCRA EP Toxicity Contaminants (QR11)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
C3144	Clean Water Inc.	SITE 690	CL6-3-9	051283	1435	

EPA Hazardous Waste Number	Parameter	Sample Concen. mg/l	RCRA Alert Level mg/l	QC Replicate		QC Blank and Spiked Blank			QC Matrix Spike		
				First mg/l	Second mg/l	Blank Data ug/ml	Concen. Added ug/ml	% Recov	Unspiked Extract ug/ml	Concen. Added ug/ml	% Recov
D004	Arsenic	<0.5	5								
D005	Barium	<5.0	100								
D006	Cadmium	<0.5	1								
D007	Chromium	<1.0	5								
D008	Lead	<2.0	5								
D009	Mercury	<0.002	0.2								
D010	Selenium	<0.5	1								
D011	Silver	<0.2	5								
D012	Endrin (GC)	<0.02	0.02	<0.02	<0.02	<0.02	0.02	104	<0.02	0.02	163
D013	Lindane (GC)	<0.4	0.4	<0.4	<0.4	<0.4	0.4	108	<0.4	0.4	105
D014	Methoxychlor (GC)	<10	10	<10	<10	<10	10	110	<10	10	113
D015	Toxaphene (GC)	<0.5	0.5	<0.5	<0.5	<0.5	0.5	96	<0.5	0.5	100
D016	2,4-D	<10	10	<10	<10	<10	10	143	<10	10	103
D017	2,4,5-TP (Silvex)	<1	1	<1	<1	<1	1	115	<1	1	120

ETC ENVIRONMENTAL TESTING and CERTIFICATION

June 10, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

RCRA EP Toxicity Contaminants (QR11)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
C3145	Clean Water Inc.	SITE 690	CL1-2-10	051183	1625	

EPA Hazardous Waste Number	Parameter	Sample Concen. mg/l	RCRA Alert Level mg/l	QC Replicate		QC Blank and Spiked Blank			QC Matrix Spike		
				First mg/l	Second mg/l	Blank Data ug/ml	Concen. Added ug/ml	% Recov	Unspiked Extract ug/ml	Concen. Added ug/ml	% Recov
D004	Arsenic	<0.5	5								
D005	Barium	<5.0	100								
D006	Cadmium	<0.8	1								
D007	Chromium	<1.0	5								
D008	Lead	<2.0	5								
D009	Mercury	<0.002	0.2								
D010	Selenium	<0.5	1								
D011	Silver	<0.2	5								
D012	Endrin (GC)	<0.02	0.02	<0.02	<0.02	<0.02	0.02	104	<0.02	0.02	163
D013	Lindane (GC)	<0.4	0.4	<0.4	<0.4	<0.4	0.4	108	<0.4	0.4	105
D014	Methoxychlor (GC)	<10	10	<10	<10	<10	10	110	<10	10	113
D015	Toxaphene (GC)	<0.5	0.5	<0.5	<0.5	<0.5	0.5	96	<0.5	0.5	100
D016	2,4-D	<10	10	<10	<10	<10	10	143	<10	10	103
D017	2,4,5-TP (Silvex)	<1	1	<1	<1	<1	1	115	<1	1	120

ENVIRONMENTAL TESTING and CERTIFICATION

June 15, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

RCRA EP Toxicity Contaminants (QR11)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
C3143	Clean Water Inc.	SITE 690	CLI-1-12	051183	1235	

EPA Hazardous Waste Number	Parameter	Sample Concen. mg/l	RCRA Alert Level mg/l	QC Replicate First mg/l	QC Replicate Second mg/l	QC Blank and Spiked Blank: Blank Data ug/ml	QC Blank and Spiked Blank: Concen. Added ug/ml	QC Blank and Spiked Blank: % Recov	QC Matrix Spike: Unspiked Extract ug/ml	QC Matrix Spike: Concen. Added ug/ml	QC Matrix Spike: % Recov
D004	Arsenic	<0.5	5								
D005	Barium	<5.0	100								
D006	Cadmium	<0.8	1								
D007	Chromium	<1.0	5								
D008	Lead	<2.0	5								
D009	Mercury	0.002	0.2								
D010	Selenium	<0.5	1								
D011	Silver	<0.2	5								
D012	Endrin (GC)	<0.02	0.02	<0.02	<0.02	<0.02	0.02	104	<0.02	0.02	163
D013	Lindane (GC)	<0.4	0.4	<0.4	<0.4	<0.4	0.4	108	<0.4	0.4	105
D014	Methoxychlor (GC)	<10	10	<10	<10	<10	10	110	<10	10	113
D015	Toxaphene (GC)	<0.5	0.5	<0.5	<0.5	<0.5	0.5	96	<0.5	0.5	100
D016	2,4-D	<10	10	<10	<10	<10	10	143	<10	10	103
D017	2,4,5-TP (Silvex)	<1	1	<1	<1	<1	1	115	<1	1	120

ETC ENVIRONMENTAL TESTING and CERTIFICATION

June 13, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

RCRA EP Toxicity Contaminants (QR11)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
C3199	Clean Water, Inc.	SITE 690	CL10-3-8.5	051383	0950	

EPA Hazardous Waste Number	Parameter	Sample Concen. mg/l	RCRA Alert Level mg/l	QC Replicate First mg/l	QC Replicate Second mg/l	QC Blank and Spiked Blank: Blank Data ug/ml	QC Blank and Spiked Blank: Concen. Added ug/ml	QC Blank and Spiked Blank: % Recov	QC Matrix Spike: Unspiked Extract ug/ml	QC Matrix Spike: Concen. Added ug/ml	QC Matrix Spike: % Recov
D004	Arsenic	<0.5	5								
D005	Barium	<5	100								
D006	Cadmium	<0.8	1								
D007	Chromium	2.2	5								
D008	Lead	<2	5								
D009	Mercury	<0.002	0.2								
D010	Selenium	<0.5	1								
D011	Silver	<0.2	5								
D012	Endrin (GC)	<0.02	0.02	<0.02	<0.02	<0.02	0.02	104	<0.02	0.02	163
D013	Lindane (GC)	<0.4	0.4	<0.4	<0.4	<0.4	0.4	108	<0.4	0.4	105
D014	Methoxychlor (GC)	<10	10	<10	<10	<10	10	110	<10	10	113
D015	Toxaphene (GC)	<0.5	0.5	<0.5	<0.5	<0.5	0.5	96	<0.5	0.5	100
D016	2,4-D	<10	10	<10	<10	<10	10	143	<10	10	103
D017	2,4,5-TP (Silvex)	<1	1	<1	<1	<1	1	115	<1	1	120

ETC ENVIRONMENTAL TESTING and CERTIFICATION

June 10, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

RCRA EP Toxicity Contaminants (QR11)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
C3042	Clean Water Inc.	SITE 690	BCL-3-3-3 (EWAY)	051183	1030	

EPA Hazardous Waste Number	Parameter	Sample Concen. mg/l	RCRA Alert Level mg/l	QC Replicate First mg/l	QC Replicate Second mg/l	QC Blank and Spiked Blank: Blank Data ug/ml	QC Blank and Spiked Blank: Concen. Added ug/ml	QC Blank and Spiked Blank: % Recov	QC Matrix Spike: Unspiked Extract ug/ml	QC Matrix Spike: Concen. Added ug/ml	QC Matrix Spike: % Recov
D004	Arsenic	<0.5	5								
D005	Barium	<5.0	100								
D006	Cadmium	<0.8	1								
D007	Chromium	<1.0	5								
D008	Lead	<2.0	5								
D009	Mercury	<0.002	0.2								
D010	Selenium	<0.5	1								
D011	Silver	<0.2	5								
D012	Endrin (GC)	<0.02	0.02	<0.02	<0.02	<0.02	0.02	104	<0.02	0.02	163
D013	Lindane (GC)	<0.4	0.4	<0.4	<0.4	<0.4	0.4	108	<0.4	0.4	105
D014	Methoxychlor (GC)	<10	10	<10	<10	<10	10	110	<10	10	113
D015	Toxaphene (GC)	<0.5	0.5	<0.5	<0.5	<0.5	0.5	96	<0.5	0.5	100
D016	2,4-D	<10	10	<10	<10	<10	10	143	<10	10	103
D017	2,4,5-TP (Silvex)	<1	1	<1	<1	<1	1	115	<1	1	120

ENVIRONMENTAL TESTING and CERTIFICATION

June 10, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

RCRA EP Toxicity Contaminants (QR11)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
C3048	Clean Water Inc.	SITE 690	BCL-2-3-10	051083	1005	

EPA Hazardous Waste Number	Parameter	Sample Concen. mg/l	RCRA Alert Level mg/l	QC Replicate First mg/l	QC Replicate Second mg/l	QC Blank and Spiked Blank: Blank Data ug/ml	QC Blank and Spiked Blank: Concen. Added ug/ml	QC Blank and Spiked Blank: % Recov	QC Matrix Spike: Unspiked Extract ug/ml	QC Matrix Spike: Concen. Added ug/ml	QC Matrix Spike: % Recov
D004	Arsenic	<0.5	5								
D005	Barium	<5.0	100								
D006	Cadmium	<0.8	1								
D007	Chromium	<1.0	5								
D008	Lead	<2.0	5								
D009	Mercury	<0.002	0.2								
D010	Selenium	<0.5	1								
D011	Silver	<0.2	5								
D012	Endrin (GC)	<0.02	0.02	<0.02	<0.02	<0.02	0.02	104	<0.02	0.02	163
D013	Lindane (GC)	<0.4	0.4	<0.4	<0.4	<0.4	0.4	108	<0.4	0.4	105
D014	Methoxychlor (GC)	<10	10	<10	<10	<10	10	110	<10	10	113
D015	Toxaphene (GC)	<0.5	0.5	<0.5	<0.5	<0.5	0.5	96	<0.5	0.5	100
D016	2,4-D	<10	10	<10	<10	<10	10	143	<10	10	103
D017	2,4,5-TP (Silvex)	<1	1	<1	<1	<1	1	115	<1	1	120

ETC ENVIRONMENTAL TESTING and CERTIFICATION

June 15, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

RCRA EP Toxicity Contaminants (QR11)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
C3471	Clean Water Inc.	SITE 690	ASF2-0 CLAY	051883		

EPA Hazardous Waste Number	Parameter	Sample Concen. mg/l	RCRA Alert Level mg/l	QC Replicate First mg/l	QC Replicate Second mg/l	QC Blank and Spiked Blank: Blank Data ug/ml	QC Blank and Spiked Blank: Concen. Added ug/ml	QC Blank and Spiked Blank: % Recov	QC Matrix Spike: Unspiked Extract ug/ml	QC Matrix Spike: Concen. Added ug/ml	QC Matrix Spike: % Recov
D004	Arsenic	<0.2	5								
D005	Barium	<5	100								
D006	Cadmium	<0.8	1								
D007	Chromium	<1	5								
D008	Lead	<2	5								
D009	Mercury	<0.002	0.2								
D010	Selenium	<0.2	1								
D011	Silver	<0.5	5								
D012	Endrin (GC)	<0.02	0.02	<0.02	<0.02	<0.02	0.02	130	<0.02	0.02	166
D013	Lindane (GC)	<0.4	0.4	<0.4	<0.4	<0.4	0.4	113	<0.4	0.4	116
D014	Methoxychlor (GC)	<10	10	<10	<10	<10	10	120	<10	10	115
D015	Toxaphene (GC)	<0.5	0.5	<0.5	<0.5	<0.5	0.5	128	<0.5	0.5	137
D016	2,4-D	<10	10	<10	<10	<10	10	86	<10	10	119
D017	2,4,5-TP (Silvex)	<1	1	<1	<1	<1	1	105	<1	1	113

ETC ENVIRONMENTAL TESTING and CERTIFICATION

June 15, 1983

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

RCRA EP Toxicity Contaminants (QR11)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
C3470	Clean Water Inc.	SITE 690	ASF6-0 CLAY	051883		

EPA Hazardous Waste Number	Parameter	Sample Concen. mg/l	RCRA Alert Level mg/l	QC Replicate First mg/l	QC Replicate Second mg/l	QC Blank and Spiked Blank: Blank Data ug/ml	QC Blank and Spiked Blank: Concen. Added ug/ml	QC Blank and Spiked Blank: % Recov	QC Matrix Spike: Unspiked Extract ug/ml	QC Matrix Spike: Concen. Added ug/ml	QC Matrix Spike: % Recov
D004	Arsenic	<0.2	5								
D005	Barium	<5	100								
D006	Cadmium	<0.8	1								
D007	Chromium	<1	5								
D008	Lead	<2	5								
D009	Mercury	<0.002	0.2								
D010	Selenium	<0.2	1								
D011	Silver	<0.5	5								
D012	Endrin (GC)	<0.02	0.02	<0.02	<0.02	<0.02	0.02	130	<0.02	0.02	166
D013	Lindane (GC)	<0.4	0.4	<0.4	<0.4	<0.4	0.4	113	<0.4	0.4	116
D014	Methoxychlor (GC)	<10	10	<10	<10	<10	10	120	<10	10	115
D015	Toxaphene (GC)	<0.5	0.5	<0.5	<0.5	<0.5	0.5	128	<0.5	0.5	137
D016	2,4-D	<10	10	<10	<10	<10	10	86	<10	10	119
D017	2,4,5-TP (Silvex)	<1	1	<1	<1	<1	1	105	<1	1	113

TCDD Data Report - Page 1

Lab: ETC Corp.

Date: 06/10/83-06/11/83
GC Column: 60M SP2340

ETC Number	Sample Number	E/C	Grams Wet Weight	ppb TCDD	D.L.	320/322	Surrogate Percent Accuracy	Area 320	Area 322	Area 257	Area 328+	Area 332	Area 334	Comments
6/7 MB	MB	J/AD	-	ND	0.08	-	98	-	-	-	5302	6918	8666	
C3099S	495G-0080N	J/AD	10.30	0.88	-	0.81	93	169	209	83	512	565	740	
C2156	QA REP	J/AD	10.54	ND	0.17	-	98	-	-	-	2779	3620	4551	
C2156R	QA REP	J/AD	10.52	ND	0.18	-	100	-	-	-	2107	2635	3276	
C3043	CL9-1-6	J/AD	11.15	ND	0.07	-	100	-	-	-	717	748	950	
C3044	CL2-3-6	J/AD	10.15	ND	0.13	-	94	-	-	-	639	715	905	
C3142	CL1-3-9	J/AD	10.06	-**	-	-	-	-	-	-	-	-	-	No ISTD or Surrogate
C342S	CL4-2-6	J/AD	10.50	ND	7.6*	0.81	110	77	95	28	19	18	25	257<2.5:1 S/N 328,332, & 334 <5:1 S/N

+Corrected for contribution by native TCDD (Subtract 0.009 of m/e 322).

* Repeat analysis, sample could not be cleaned up using perscribed (protocol) options.
** To be repeated.

MB = Method Blank
P = Partial Scan
N = Native TCDD Spike
D = Duplicate (Intralab)
FB = Field Blank

H = High Resolution
ND = Not Detected
DL = Detection Limit
J = Jar Extraction
S = Soxhlet Extraction

A, B, C,D- Clean Up Option (or any combination)

CALIBRATION SUMMARY

ug/kg* TCDD	Native RRF	DATE	TIME	Surrogate RRF
1.0	0.89	6/03/83	1715 hrs.	1.02
5.0	0.87	6/03/83	1810 hrs.	1.09
25.0	0.80	6/03/83	1845 hrs.	1.01
1.0	0.83	6/11/83	1825 hrs.	1.01

QUALITY CONTROL SUMMARY

ITEM	# OF DATA POINTS	MEAN ± S.D.
Surrogate Accuracy	27	98.5+/-11.1
Native TCDD Recovery	1	88%
Method Blank	1	ND
Duplicate Pairs	1	ND
Partial Scan Confirmation	1	Confirmed

* Assumes 10 gram sample.

CALIBRATION SUMMARY

ug/kg* TCDD	Native RRF	DATE	TIME	Surrogate RRF
1.0	0.74	6/03/83	1110 hrs.	0.82
5.0	0.78	6/03/83	1150 hrs.	0.91
25.0	0.76	6/03/83	1230 hrs.	0.87
1.0	0.75	6/10/83	0920 hrs.	0.82
1.0	0.80	6/10/83	1800 hrs.	0.92

* Assumes 10 gram sample.

QUALITY CONTROL SUMMARY

ITEM	# OF DATA POINTS	MEAN ± S.D.
Surrogate Accuracy	27	98.5+/-11.1
Native TCDD Recovery	1	88%
Method Blank	1	ND
Duplicate Pairs	1	ND
Partial Scan Confirmation	1	Confirmed

CALIBRATION SUMMARY

ug/kg* TCDD	Native RRF	DATE	TIME	Surrogate RRF
1.0	0.81	6/04/83	1400 hrs.	1.03
5.0	0.83	6/04/83	1455 hrs.	1.07
25.0	0.82	6/04/83	1530 hrs.	1.06
1.0	0.76	6/10/83	0900 hrs.	0.97
1.0	0.80	6/10/83	1800 hrs.	0.98
1.0	0.79	6/11/83	1015 hrs.	1.01

QUALITY CONTROL SUMMARY

ITEM	# OF DATA POINTS	MEAN ± S.D.
Surrogate Accuracy	27	98.5+/-11.1
Native TCDD Recovery	1	88%
Method Blank	1	ND
Duplicate Pairs	1	ND
Partial Scan Confirmation	1	Confirmed

* Assumes 10 gram sample.

Partial Scan Confirmation

		Response Ratios			% Relative Abundances*							
ETC Number	Sample Number	320/324	257/259	194/196	160	161	194	196	257	259	320	324
C4427	C-1	1.68	1.09	1.45	10.0	9.7	23.0	15.9	42.2	38.8	84.8	50.4

* Relative to m/e 322.

TCDD Data Report - Page 1

Lab: ETC Corp.

Date: 08/17/83
GC Column: 60M SP2340

ETC Number	Sample Number	E/C	Grams Wet Weight	ppb TCDD	D.L.	320/322	Surrogate Percent Accuracy	Area 320	Area 322	Area 257	Area 328+	Area 332	Area 334	Comments
SET35MB	MB	J/AD	10.00	ND	0.12	-	94	-	-	-	1202	1380	1680	
C3099S	QA SPIKE	J/AD	10.00	0.92	-	0.83	91	395	474	167	1055	1226	1548	
C4757	QA REP	J/AD	10.97	ND	0.14	-	84	-	-	-	2516	3345	3870	
C4757	QA REP	J/AD	10.94	ND	0.29	-	95	-	-	-	3315	3685	4663	
C4666	CL4-2-6	J/ADC	10.14	18.00	-	0.67	82	2052	3083	789	276	375	439	

+Corrected for contribution by native TCDD (Subtract 0.009 of m/e 322).

MB = Method Blank
P = Partial Scan
N = Native TCDD Spike
D = Duplicate (Intralab)
FB = Field Blank

H = High Resolution
ND = Not Detected
DL = Detection Limit
J = Jar Extraction
S = Soxhlet Extraction

A, B, C,D- Clean Up Option (or any combination)

CALIBRATION SUMMARY

ug/kg* TCDD	Native RRF	DATE	TIME	Surrogate RRF
1.0	0.89	6/03/83	1715 hrs.	1.02
5.0	0.87	6/03/83	1810 hrs.	1.09
25.0	0.80	6/03/83	1845 hrs.	1.00
1.0	0.79	6/17/83	1000 hrs.	0.95

QUALITY CONTROL SUMMARY

ITEM	# OF DATA POINTS	MEAN ± S.D.
Surrogate Accuracy	3	89+/-6.2%
Native TCDD Recovery	1	92%
Method Blank	1	ND
Duplicate Pairs	-	-
Partial Scan Confirmation	1	Unconfirmed

* Assumes 10 gram sample.

Partial Scan Confirmation

		Response Ratios			% Relative Abundances*							
ETC Number	Sample Number	320/324	257/259	194/196	160	161	194	196	257	259	320	324
C4666	CL4-2-6P	1.91	1.14	0.93	15	33	25	27	40	35	65	34

* Relative to m/e 322.

TCDD Data Report - Page 1

Lab: ETC Corp.

Date: 05/31/83-06/02/83

ETC Number	Sample Number	E/C	Grams Wet Weight	ppb TCDD	D.L.	320/322	Surrogate Percent Accuracy	Area 320	Area 322	Area 257	Area 328+	Area 332	Area 334	Comments
5/27MB	MB	J/AD	-	ND	0.59	-	110	-	-	-	1257	1553	2020	
C3392S	525G-011N	J/AD	10.02	1.1	-	0.77	110	574	749	317	1280	1602	2148	
C3428	CL6-4-12	J/AD	10.06	ND	0.50	-	110	-	-	-	986	1252	1679	
C3428R	CL6-4-12D	J/AD	10.26	ND	0.40	-	120	-	-	-	720	842	1047	
C3429	CL4-2-6	J/AD	10.26	-	-	-	-	-	-	-	-	-	-	No ISTD

+Corrected for contribution by native TCDD (Subtract 0.009 of m/e 322).

MB = Method Blank
P = Partial Scan
N = Native TCDD Spike
D = Duplicate (Intralab)
FB = Field Blank

H = High Resolution
ND = Not Detected
DL = Detection Limit
J = Jar Extraction
S = Soxhlet Extraction

A, B, C,D- Clean Up Option (or any combination)

Partial Scan Confirmation

		Response Ratios			% Relative Abundances*							
ETC Number	Sample Number	320/324	257/259	194/196	160	161	194	196	257	259	320	324
C0611	SNNSNDAW5112P	1.50	1.00	3.94	11	14	67	17	33	33	75	50

* Relative to m/e 322.

TCDD Data Report - Page 2

CALIBRATION SUMMARY

ug/kg* TCDD	Native RRF	DATE	TIME	Surrogate RRF
1.0	0.81	5/31/83	1000 hrs.	0.78
5.0	0.74	5/31/83	1040 hrs.	0.79
25.0	0.73	5/31/83	1115 hrs.	0.82
1.0	0.83	5/31/83	1145 hrs.	0.81
1.0	0.71	6/02/83	0800 hrs.	0.82
1.0	0.77	6/02/83	1630 hrs.	0.87

* Assumes 10 gram sample.

QUALITY CONTROL SUMMARY

ITEM	# OF DATA POINTS	MEAN ± S.D.
Surrogate Accuracy	2	111+/-9.0
Native TCDD Recovery	2	110%+/-0
Method Blank	1	ND
Duplicate Pairs	1	ND
Partial Scan Confirmation	1	Unconfirmed

F35

VOLUME II

Continuation . . . April 28, 1983

RECEIVED
APR
WASTE MANAGEMENT
BRANCH

Attachment K

Comparison of USEPA/ETC (CWM) Analysis

(1 copy furnished separately)

Volume I is filed with A38 (1983) - 3 of 3

Attachment L

Laboratory Consultants

NAMES & ADDRESSES

OF

OUTSIDE TESTING CONCERNS

USED BY CWM-FREMONT

Allied Analytical & Research Laboratories
P. O. Box 24330
Dallas, Texas 75224
214/337-8996

Aqua Tech
P. O. Box 436
Marion, Ohio 43302
614/382-5991

CWM-Calumet City
P. O. Box 1[illegible]96
Calumet City, Illinois 60409
312/891-1500

Hazelton Environmental Sciences Corp.
9200 Leesburg Turnpike
Vienne, Virginia 22180
312/564-0700

Howard Labs
P. O. Box 3[illegible]9
Dayton, Ohio 45449
Joan Howard - 513/294-6856

IMS America, Ltd.
Butler & Maple Avenue
Ambler, Pennsylvania 19002
215/643-0400

Macola, Inc.
P. O. Box 4[illegible]3
Marion, Ohio 43302
Bob Glowacki - 419/397-[illegible]659

Trace Elements Company
460 South Northwest Highway
Park Ridge, Illinois 60068
Susan - 312/696-2070

Attachment M

Data on DCB Waste Stream

WASTE STREAMS FROM DCB MANUFACTURER

CONFIDENTIAL

Bofors Nobel, Inc., Muskegon, Mi. (Formerly Lakeway, Inc.)

YEAR	NW-288*	NW-288B*	NW-239*	NW-403**	NW-403A**	NW-404**	NW-1007***	NW-1009***
1976	114,975	0	11,000	0	0	0	0	0
1977	499,002	52,800	207,066	486,800	5,000	639,000	0	0
1978	0	214,293	125,498	420,974	4,800	427,127	174,418	0
1979	0	0	0	0	0	0	655,257	349,709
1980	0	0	0	0	0	0	551,395	508,712
1981	0	0	0	0	0	0	1,243,080	653,110
1982	0	0	0	0	0	0	1,488,544	677,833
1983 of April 26, 1983)	0	0	0	0	0	0	335,549	206,730
	613,977	267,093	343,564	907,774	9,800	1,066,127	4,448,153	2,396,094

*CD - Hauled by Chem Dyne, Hamilton, Ohio

**A - Hauled by Approved Industrial Service, Michigan

***CWM - Hauled by Chemical Waste Management, Inc.

JA/ma
4-27-83

BOFORS (LAKEWAY)

BOFORS ~~LAKEWAY~~, INC.
Nobel

CONFIDENTIAL

May 14, 1980

Ohio Liquid Disposal, Inc.
504 Liberty Street
Fremont, Ohio 43420

Attention: Mr. Peter Miller

Dear Peter:

The specification sheets for our waste acids from the DCB process are enclosed.

Thank you for your prompt help in resolving our disposal problem. I hope this work translates into an effective long range program. We look forward to the visit of your lab person.

Very truly yours,

BOFORS LAKEWAY, INC.

John Lee

John W. Lee
Purchasing Agent

JWL/ft
Encs.

5025 EVANSTON AVENUE • MUSKEGON, MICHIGAN 49443
TELEPHONE 616 788 2341
TELEX 228455

DCB Spent Acid Wash Waste

Approximate Analysis:

Specific gravity	1.3 (weight per gallon 10.83)
Sulfuric acid	35.0%
Amines (see below)	5.3%
Water	58.7%
Hydrochloric Acid	1.0%
Toluene	Passes flash point greater than 100°F.

Amines contain approximately 5% ortho chloraniline and 2% amine tars and solid amines.

5/14/80

CONFIDENTIAL

DCB Mother Liquor

Approximate analysis:

Specific gravity	1.196 (9.96 lbs. per gallon)
Sulfuric acid	24.2%
Hydrochloric acid	4.4%
% amines	1.3%
Water	70.1%

Amines not analyzed for content.

Approximate gallons one year: 307,200

7-11-78

CONFIDENTIAL

DCB Concentrated Mother Liquor

Approximate analysis:

Specific gravity	1.416 (11.79 lbs. per gallon)
Sulfuric acid	50.6%
Hydrochloric acid	0.6%
Amines	3.4%
Water	45.4%

Amines contain 0.4% ortho chloraniline and 2.3% amine tars and solid amines. Also includes more than 0.5% but less than 1% 3,3' dichlorobenzidine dihydrochloride.

Approximate gallons one year 770,000

7-11-78

CONFIDENTIAL

DCB

Physical Properties

Name - 3,3' Dichlorobenzidine Dihydrochloride. A white to off white damp crystal.

Hazards

Fire and Explosion

It will melt before it burns, but when it does burn it gives highly toxic fumes. Use water, foam, dry chemical or CO_2 to extinguish fire.

Health

DCB is a suspected carcinogen and is regulated by the Federal and State governments. No TLV has been established, but this material should be handled with no contact. All safety and health precautions outlined by the Company must be followed. These rules and regulations were written to protect your health. The effects of DCB are suspected of having a latency period of 15 to 16 years.

Storage and Handling

Storage of DCB is in fibre drums. The outside of these drums must be decontaminated before they come out of the pack-out tower. This is the responsibility of the operator. DCB must be handled in the pack-out area in a rubber suit with full air hood. When centrifuging, operator must wear rubber suit and full air hood.

Spill or Leak Procedure

If any spill or leak occurs immediately vacate area and report to the foreman. Foreman will immediately put on a rubber suit and air hood, or instruct operator to do so, and then decontaminate the spill with potassium permanganate. After spraying with permanganate, wash the area with water. After the spill has been cleaned up and protective equipment has been decontaminated and properly stored away, the foreman must fill out a DCB spill report. The foreman will notify Jon Dixon so he can report the spill to the Department of Public Health.

First Aid

For eyes - flush with water for 15 minutes and get medical attention. The material is very corrosive because it is a hydrochloric acid salt.
For skin - flush skin with plenty of water and then wash with soap and water.
For ingestion - induce vomiting and dilute with water and then again induce vomiting. Then immediately take person to hospital.

CONFIDENTIAL

Bofors moves deeper into chemicals

Swedish explosives producer has sharply hiked investment in chemicals, including nitro aromatics plant to go on stream in U.S. next year

Dermot A. O'Sullivan
C&EN, London

C&EN staff photo

Bofors Nobel's Norberg and Cederberg discuss plans for chemical division

"We intend to become the number one nitrator in the U.S." This is the unabashed profession of Per-Olov Norberg, vice president and general manager of Bofors Nobel, the chemicals arm of Sweden's Bofors. Bofors has been among the world's foremost makers of military hardware and explosives for nearly 100 years.

Norberg's objective appears well set to be realized. Bofors Lakeway has a unit for making a variety of nitro aromatics going in at Muskegon, Mich. When it starts up early next year, Lakeway will make an extensive range of specialty intermediates for the chemical and pharmaceutical industries.

Lakeway will have plenty of backup expertise and know-how to help it achieve Norberg's goal. Bofors has been in the nitration business since Alfred Nobel, whose research laid the foundation of nitration chemistry, bought the company in 1894.

With the $8.2 million purchase of Lakeway in 1977, the company became an integrated part of Bofors' chemical effort. This thrust is centered in the Nobel division that now embraces four discrete but interrelated profit centers—Nobel Kemi, Nobel Chematur, Bofors Plast, and Lakeway.

Bofors has made sizable capital investments at its Muskegon plant. Production capability has been expanded some 25%. Chemicals made there go into dyes, surfactants, pesticides, pharmaceuticals, x-ray diagnostic agents, and color film, among other things.

Also being built at Muskegon is a facility for regenerating concentrated sulfuric acid from dilute, spent acid based on a technique developed at Nobel Kemi. This first BOSAC (Bofors spent acid concentration) unit outside Sweden likely will be the forerunner of a number to be installed in the U.S. and elsewhere.

Hakan Cederberg, until recently marketing director at Nobel Kemi, moves to Lakeway next week to become vice president of marketing and sales. "Lakeway will form the base for our expansion in the U.S. centered on our proprietary process know-how originating here in Sweden," Cederberg explains. "We considered it absolutely necessary to have production capability in the U.S. so as to be in a position to meet the potential of the market."

The Lakeway acquisition stems directly from a major policy decision taken a few years ago by Bofors' top executives to move the company deeper into chemicals. Norberg has been the chief architect of the diversification plan.

One move was to persuade the Bofors board to set aside some $50 million to fund a three-year capital investment program. "We undertook an ambitious scheme to modernize our plants and move more aggressively with our research and development and marketing resources to sell our know-how," Norberg recalls.

This plan essentially is complete. "Now we need to increase our production capacity to an extent I didn't foresee in 1976," Norberg says. "The next three-year plan calls for an additional $50 million of investment capital."

The fact that the Nobel divisions' plants are operating at full capacity is encouraging, particularly when most chemical companies are complaining that their units are underutilized. The reason, of course, is that Bofors Nobel concentrates its efforts on specialties.

"We are not involved in bulk chemicals," Norberg explains. "Pharmaceutical and other large industrial concerns contract with us to make the intermediates they need. And since we don't pose a competitive threat, they are not reluctant to dis-

ales of Bofors Nobel have more ıan doubled since 1975

ıillions	1978	1977	1976	1975
)FORS GROUP	$653	$545	$451	$400
)FORS NOBEL*	$137	$116	$78	$65
ıbel Kemi	56	30	41	40
ıfors Plast	37	23	21	19
Chematur	22	45	16	6
Lakeway	22	18		
Nobel sales as % of total	21.0%	21.3%	17.3%	16.3%

[illegible] sales to other Bofors divisions. Note: 1978 currency [illegible] rate of $1.00 = 4.27 Swedish kronor used throughout [illegible] Bofors

Bofors' products range from steel to transducers

Bofors dates from 1646. Located at Karlskoga 15[illegible] miles west of Stockholm, it operated as an iron foundry for 200 years. The company turned to production of guns around 1850.

Alfred Nobel, a Swedish scientist and entrepreneur whose estate went to fund the Nobel Prize awards, took over Bofors in 1894. He carried out his fundamental research on nitration chemistry and the development of explosives at Karlskoga during the remaining years of his life.

Today, Bofors is a conglomerate. Its products range from steel to transducers. The company employs 14,000 workers, 10% of whom are located outside Sweden.

The Bofors group of companies' sales last year totaled $653 million. There are six divisions in the group—Ordnance (with sales in 1978 of $292 million), Steel ($132 million), Nobel ($108 million), NOHAB ($74 million), Electronics ($32 million) and UVA ($13 million). The NOHAB division makes printing presses, locomotives, water turbines, etc. The UVA division makes specialized tooling equipment such as cylindrical grinding machines.

Bofors' chemical activities are centered in the Nobel division. Four companies comprise the division. Nobel Kemi makes specialized chemical intermediates and explosives and conducts basic research and development. Bofors Lakeway in the U.S. parallels Nobel Kemi's activities to some extent. Nobel Chematur is the chemical engineering arm. Nobel Chematur markets and licenses know-how and contracts to build chemical plants on a turnkey basis worldwide. Bofors Plast makes a line of molded plastic items mainly for the automotive and defense industries.

cuss their requirements with our R&D people."

The proportion of capital invested in chemicals has risen steeply in the past few years. Last year, the $22 million that the Nobel division spent accounted for 41% of Bofors' total capital funding. In contrast, 1975's $3 million investment figure was only 13% of the total.

On the other hand, the increased spending on chemical plant and equipment has resulted in a noticeable upswing in the Nobel division's sales. In 1978, earnings after depreciation amounted to $10 million, 22% of the corresponding earnings for Bofors as a whole. This contrasts sharply with the chemical division's $1.4 million postdepreciation earnings in 1975, less than 4% of the overall group total that year.

Winberg: division heads have autonomy

Norberg has the wholehearted backing of Claes-Ulrik Winberg, Bofors' president. Winberg gives his division heads considerable scope and autonomy in planning and running their operations. He generally goes along with their recommendations when they present their annual budgets for review. At the same time, he exercises the shrewd managerial skill of keeping the reins of the company's diverse operations well in hand without seeming to do so too obviously.

Winberg admits that production of ordnance items will continue to be the major area of Bofors' activities. He recognizes, however, that the considerable knowledge of nitration and oxidation chemistry that Bofors has acquired over the years in connection with development of propellants and explosives can be adapted profitably to nonmilitary, commercial outlets.

Nitration of aromatics and heterocyclics, followed by oxidation, acid chlorination, reduction, esterification, and so forth, are the chemical steps at which the Nobel division's R&D chemists are particularly adept. Starting with benzene, benzoic acid, and toluene, for example, a stable of products has been built up that comprises well over 100 chemical entities. Some are little more than chemical curiosities. But many have become essential intermediates for making a wide spectrum of products.

Nitration is carried out using a mixture of concentrated nitric and sulfuric acid. Recently, the company [illegible] a technique that, it claims, results in better yields and fewer by-products than the conventional batch processes. It also provides greater operating safety and less energy consumption (C&EN, Nov. 20, 1978, page 2[illegible]). Dilute nitric acid recovered from the nitration step is used for acid oxidation.

Norberg is particularly proud of the BOSAC continuous spent acid recovery system. Designed primarily to take care of the dilute acid emerging from the nitration process, it fulfills several functions. Recovered nitric acid can be channeled to the nitric acid oxidation operations. Dilute sulfuric acid is upgraded to 96% acid. This, in turn, can be recycled to the nitration units or sold for making fertilizer.

At the same time, BOSAC solves the difficult environmental problem posed by waste acid handling. It replaces the costly step of neutralizing with lime, for instance. Moreover, Norberg points out, the sulfuric acid recovered has a high economic value. About 1 lb of concentrated acid is obtained from 1.5 lb of spent acid. "A BOSAC plant will pay for itself in a very short time," he claims.

The recovery plant is of modular design. Each unit, comprising 12 concentrator tubes, yields up to 26.5 tons of H_2SO_4 daily.

The BOSAC concept is fairly simple. Spent acid passes through a bundle of vertical silica tubes where it is heated to 3[illegible]0° C. During its passage down the tubes, organic material decomposes and water is stripped off. The 96% acid that emerges at the bottom goes to a cooler and then to a storage vessel. Thermal efficiency of about 85% is achieved by means of heat exchangers.

Norberg is laying the groundwork to ensure continued growth and viability of his division. In a preliminary agreement just concluded with Astra, Sweden's leading pharmaceutical company, Nobel Kemi will provide a number of chemical intermediates that Astra will use for making a variety of health-care products. Local anesthetics comprise an important line with a sizable sales potential, he points out.

Another move is the takeover of Synecon Chemicals. This Swedish company is developing quaternary ammonium salts for use in phase transfer catalysis.

Further acquisitions also are in the cards. Norberg would like to take over another U.S. company and hints that a search is being made for prospective candidates. Participation in a Japanese venture also may materialize eventually. □

OHIO LIQUID DISPOSAL, INC.

CONFIDENTIAL

CUSTOMER SAMPLE REPORT

SAMPLE # NW ~~[illegible]~~ #239 DATE RUN: 2/24/77

CUSTOMER: Chem Dyne DATE RECV'D: 2-24-77

SAMPLE CODE: Lakeway DISCHARGED TO: Pond 5 4800 gal

SAMPLE IDENTIFICATION: [Acid Wash by aggaumu and analysis]

TESTS RESULTS

WATER

PH _____ TOTAL ALKALINITY OR ACIDITY 8,385 mg/l (33%)

SS _____ DS _____ TS _____ ASH _____

COD _____ (≡36% H_2SO_4) BOD _____ PHENOL _____

SO_4 ~~29,093~~ 440,593 ppm (~~[illegible]~~%) Cl 5,904 Fe^{+++} _____ TOTAL Fe _____

T. HARD _____ Ca _____ COND. _____ SPGR 1.23

O & G (HEXANE) _____ O & G (CHLOROFORM) _____

TEST RESULTS

OIL

ASH _____ CARBON _____ FLASH _____

SULFUR _____ VISCOSITY _____

BS & W _____

OTHER TESTS: Reaction with Pond 5 - OK no reaction
Thin layer of floating solvent - odor of benzene
Contains insoluble organic material (solids)

REMARKS: _____

ANALYST: _____

new Waste Stream

OHIO LIQUID DISPOSAL, INC.

CONFIDENTIAL

CUSTOMER SAMPLE REPORT

SAMPLE # NW-288 DATE RUN: 8/2/76

CUSTOMER: Chem-Dyne (Hamilton, O.) DATE RECV'D: 7/31/76 and 8/1/76

SAMPLE CODE: Lakeway Chem. Muskegon, Mi. DISCHARGED TO: Pono #4 (8,000 gal.)

SAMPLE IDENTIFICATION: Spent acid - (HCl : Sulfuric) loads #1, 2

TESTS RESULTS

WATER

PH -0.00 TOTAL ALKALINITY OR ACIDITY 3,159 me/l — 15% sulfuric &

SS 675 ppm DS TS 61,470 ppm ASH

COD 6,774 ppm BOD PHENOL

SO_4 42,590 ppm Cl 88,475 ppm Fe^{+++} TOTAL Fe

T. HARD Ca COND. SPGR 1.04

O & G (HEXANE) 9 ppm O & G (CHLOROFORM)

TEST RESULTS

OIL

ASH CARBON FLASH

SULFUR VISCOSITY

BS & W

OTHER TESTS:

REMARKS: Chem-dyne claims dichlorobenzidine! · 2HCl.

ANALYST: [illegible]

new waste stream

OHIO LIQUID DISPOSAL, INC.

CONFIDENTIAL

CUSTOMER SAMPLE REPORT

SAMPLE # NW-288 - B

DATE RUN: 8/3/76

CUSTOMER: Chem-Dyne

DATE RECV'D: 8/2/76

SAMPLE CODE: (#1)

DISCHARGED TO: Pond #4 (4,000 gal)

SAMPLE IDENTIFICATION: Spent Acid - (HCl & Sulfuric)

Pale color

Load #3

TESTS RESULTS

WATER

pH 0.02 TOTAL ALKALINITY OR ACIDITY 2,878 me/l

SS 1,110 ppm DS TS 63,085 ppm ASH

COD 5,645 ppm BOD PHENOL

SO_4 46,746 ppm Cl Fe^{+++} TOTAL Fe 147 mg/l

T. HARD Ca COND. SPGR 1.04

O & G (HEXANE) 2 ppm O & G (CHLOROFORM)

TEST RESULTS

OIL

ASH CARBON FLASH

SULFUR VISCOSITY

BS & W

OTHER TESTS: Total Cu = 4.75 mg/l.

Cr = 51 "

REMARKS:

ANALYST:

CONFIDENTIAL

OHIO LIQUID DISPOSAL, INC.

CUSTOMER SAMPLE REPORT

SAMPLE # NW-403 DATE RUN: 2/18/77

CUSTOMER: Approved Industrial DATE RECV'D: 2/17/77

SAMPLE CODE: DISCHARGED TO: Pond #5 (4,800 gal.)

SAMPLE IDENTIFICATION: Acid wash

TESTS RESULTS
WATER

pH _____ TOTAL ALKALINITY OR ACIDITY 8,775 mg/l.

SS _____ DS _____ TS _____ ASH _____

COD _____ BOD _____ PHENOL _____

SO_4 428,248 ppm Cl _____ Fe^{+++} _____ TOTAL Fe _____

T. HARD _____ Ca _____ COND. _____ SPGR 1.31

O & G (HEXANE) _____ O & G (CHLOROFORM) _____

TEST RESULTS
OIL

ASH _____ CARBON _____ FLASH _____

SULFUR _____ VISCOSITY _____

P S & W _____

OTHER TESTS: Compatability: OK with Pond #5.

REMARKS: Spl appears to be same as sales sample.

ANALYST: _____

(P) CONFIDENTIAL

OHIO LIQUID DISPOSAL, INC.

CUSTOMER SAMPLE REPORT

SAMPLE # NW 403-A DATE RUN:

CUSTOMER: Approved - Lakeway DATE RECV'D: 4-20-77 am (billing)

SAMPLE CODE: 1st Load of day Truck # 29 approx 3000 gal. DISCHARGED TO: Pond

SAMPLE IDENTIFICATION: Acid Wash (Trailer No. 01)

Excess reclaimed H_2SO_4 put in this load by Lakeway Surcharge loaded for load.

TESTS RESULTS

WATER

57.9% H_2SO_4

2nd Sample =

pH ____ (TOTAL) ALKALINITY OR (ACIDITY) 17,850 mg/l

17,430 mg/l 2nd Sample

SS ____ DS ____ TS ____ ASH ____

COD ____ BOD ____ PHENOL ____

(SO_4) 809,503 ppm (Cl) 10,000 mg/l Fe^{+++} ____ TOTAL Fe ____

T. HARD ____ Ca ____ COND. ____ (SPGR) 1.475

O & G (HEXANE) ____ O & G (CHLOROFORM) ____ " 2nd Sample =

TEST RESULTS

OIL

ASH ____ CARBON ____ FLASH above 215°F COC

SULFUR ____ VISCOSITY ____

BS & W ____

OTHER TESTS: Reaction w/Pond 5-OK

Not typical

REMARKS: Light layer of black, curdy organic material - floating

Sharp HCl odor

ANALYST: ____

OHIO LIQUID DISPOSAL, INC.

CUSTOMER SAMPLE REPORT

CONFIDENTIAL

SAMPLE # NW 4084 DATE RUN: 2/22/77

CUSTOMER: Approved DATE RECV'D: 2-22-77 1:30 pm

SAMPLE CODE: Lakeway DISCHARGED TO: Pond 5 4500 (1st load) this material

SAMPLE IDENTIFICATION: ~~Acid Wash~~ Mother Liquor

TESTS RESULTS

WATER

pH _____ TOTAL ALKALINITY OR ACIDITY ~~[illegible]~~ 6,825 me/l

SS _____ DS _____ TS _____ ASH _____

COD _____ BOD _____ PHENOL _____

SO_4 290,766 ppm Cl 60,522 ppm Fe^{+++} _____ TOTAL Fe _____

T. HARD _____ Ca _____ COND. _____ SPGR 1.20

O & G (HEXANE) 70 ppm O & G (CHLOROFORM) 2,980 ppm

3,050 total EXTRACTABLES

TEST RESULTS

OIL

ASH _____ CARBON _____ FLASH _____

SULFUR _____ VISCOSITY _____

BS & W _____

OTHER TESTS: Compatibility Pond 5 - OK. No harsh reaction.

REMARKS: Cleaner acid than usual - sample from bottom of truck. Much lighter in color. Not black, but a dark amber color.

ANALYST: _____

ORIGINATOR REQUEST FOR DECISION.

WASTE PROFILE SHEET NUMBER

PROPOSED TREATMENT/DISPOSAL FACILITY: Wm. Lynch Disposal, Inc.

ORIGINATOR NAME: [illegible]

WMI COMPANY: DCB Spent Acid Waste

PROPOSED TRANSFER FACILITY (IF ANY)

DATE: 4/6/81

NW-1009

PRELIMINARY FINDINGS.

THE ABOVE PROFILE SHEET (OR WRITTEN DESCRIPTION) HAS BEEN REVIEWED. I FIND IT IS:

- ☑ COMPLETE AND CONTAINS SUFFICIENTLY CERTAIN WASTE DESCRIPTION TO ENABLE ITS PROPER CLASSIFICATION, SAFE HANDLING, AND SUBSEQUENT DETERMINATIONS OF CONFORMITY OR NON-CONFORMITY
- ☐ INCOMPLETE OR INSUFFICIENT FOR THE REASONS NOTED ON THE PROFILE SHEET (OR WRITTEN DESCRIPTION)

A SPECIAL WASTE ANALYSIS REPORT ☑ HAS ☐ HAS NOT BEEN PREPARED. I HAVE DETERMINED:

- ☐ ADDITIONAL ANALYSES OR INFORMATION ARE NEEDED, AS NOTED ON THE REPORT FORM
- ☐ SAMPLE DOES NOT CONFORM TO PROFILE SHEET DESCRIPTION, AS NOTED ON FORM.
- ☑ ANALYSIS IS SUFFICIENT, AND SAMPLE CONFORMS TO PROFILE SHEET DESCRIPTION.
- ☐ AN ANALYSIS IS NOT NECESSARY ACCORDING TO COMPANY POLICY _____ (IDENTIFY POLICY EXCEPTION)

ON THE BASIS OF THE PROFILE SHEET AND ANALYSIS REPORT (IF REQUIRED), I FIND (CHECK ONE MAIN BOX)

- ☑ THE WASTE IS REGULATED AS HAZARDOUS ☑ BY USEPA (HAZARDOUS WASTE NO. D002) AND/OR ☑ BY THE STATE IN WHICH THE TREATMENT/DISPOSAL FACILITY IS LOCATED.
- ☐ THE WASTE IS NOT REGULATED AS HAZARDOUS, BUT SHOULD BE SO TREATED FOR PURPOSES OF COMPANY POLICY, BECAUSE _____
- ☐ THE WASTE IS NOT REGULATED BY THE DISPOSAL FACILITY STATE AS NON-HAZARDOUS SPECIAL WASTE
- ☐ THE WASTE IS NOT REGULATED AS HAZARDOUS OR NON-HAZARDOUS SPECIAL WASTE.

DISPOSAL DECISION. BASED UPON MY EVALUATION OF THE WASTE AND THE FACILITY, I CONCLUDE

☑ THE SPECIAL WASTE IS TECHNICALLY ACCEPTABLE FOR TREATMENT/DISPOSAL AT THE PROPOSED FACILITY BEGINNING current date, USING THE FOLLOWING METHOD(S)

ADDITIONAL CONDITIONS: avoid contact

- ☐ FACILITY IS ALREADY FULLY PERMITTED (OR AUTHORIZED) TO RECEIVE THE WASTE
- ☐ NECESSARY PERMIT APPLICATIONS HAVE BEEN FILED. ALLOW _____ DAYS TO OBTAIN PERMIT
- ☐ FACILITY IS NOT NOW PERMITTED. ORIGINATOR SHOULD PROVIDE ME WITH INSTRUCTIONS TO FILE NECESSARY APPLICATIONS AND ALLOW _____ DAYS TO OBTAIN PERMIT.

☐ THE SPECIAL WASTE IS TECHNICALLY UNACCEPTABLE AT THE PROPOSED FACILITY BECAUSE _____

COMPLETED BY FACILITY ☑ TECHNICAL MGR. ☐ REGIONAL ENGINEER

DATE _____ NAME: Wm Bartlett

SIGNATURE: Wm Bartlett

DISPOSAL DECISION APPROVAL OR REJECTION BY FACILITY GENERAL MANAGER.

- ☑ I WILL ACCEPT THE SPECIAL WASTE DESCRIBED IN THE PROFILE SHEET, ON THE ABOVE CONDITIONS
- ☐ I WILL ACCEPT THE WASTE BUT ONLY ON THE FOLLOWING ADDITIONAL CONDITIONS _____
- ☐ I WILL NOT ACCEPT THE WASTE UNDER ANY CONDITIONS

DATE 4-6-81 SIGNATURE: [illegible]

TRANSFER STATION DECISION. I HAVE REVIEWED THE PROFILE SHEET AND ANALYTICAL REPORT

- ☐ THE WASTE MAY BE RECEIVED AT THE ABOVE TRANSFER FACILITY BEGINNING _____
- ☐ THE WASTE MAY NOT BE RECEIVED BECAUSE _____

SIGNATURE _____

WASTE PROFILE SHEET CODE

CONFIDENTIAL

GENERATOR'S WASTE MATERIAL PROFILE SHEET

GENERAL DIRECTIONS In order for us to determine whether we can lawfully, safely and environmentally transport, store, treat or dispose of your waste stream, we must ask certain information about your waste All of the information we seek is necessary, for our purposes and yours Be complete in your answers if your response is "none," so indicate Answers must be in ink or typewritten Information you provide will be maintained in strictest confidence Please make a copy of this form for your records, returning the original to the location indicated below.

THIS FORM AND ANY SUPPLEMENTAL INFORMATION SHOULD BE RETURNED TO

Ohio Liquid Disposal, Inc.
3956 St. Rt. 412
Vickery, Ohio 43464
Attn: Jon Laliberte

1. GENERATOR NAME: Bofors Lakeway, Inc.
2. GENERATING FACILITY NAME/ADDRESS/USEPA FACILITY I D NUMBER (IF ANY): MID 000 260 893
   5025 Evanston Avenue
   Muskegon, Michigan 49443
3. COMPANY CONTACTS

GENERAL	John Lee	TITLE	Purchasing Agent	PHONE	616-788-2341
		TITLE		PHONE	
TECHNICAL	Jim Cousino	TITLE	Lab Manager	PHONE	616-788-2341
		TITLE		PHONE	

4. WASTE NAME: DCB Spent Acid Wash (Spent Sulfuric Acid)
5. PROCESS GENERATING WASTE: 3,3' Dichlorobenzidine
6. WASTE CHARACTERISTICS:
   A. PHASES/LAYERS: BILAYERED ☐ MULTILAYERED ☐ NONE ☐
   B. PHYSICAL STATE AT 70°F: SOLID ☐ SEMI-SOLID ☐ LIQUID ☒ POWDER ☐ OTHER: _____
   C. SOLIDS TOTAL (%): _____ TOTAL DISSOLVED (ppm or %): _____
   D. SPECIFIC WEIGHT (AS # PER UNIT): 10.8 pounds per gallon
   E. pH 1 (Show the following as range of %)

AS	H_2SO_4	25 - 31 %	H_3PO_4	- %
	HCl	0 - 1.0 %	NaOH	- %
	HF	- %	NH_4OH	- %
	HNO_3	- %	$Ca(OH)_2$	- %
OTHER		- %		- %
		- %		- %

CK BB

FLASH POINT: _____ °F (CLOSED CUP TEST ONLY)

G. VAPOR PRESSURE (in mm of Hg at 25°C) _____
H. BTU PER # _____ ASH CONTENT _____ %
I. CHARACTERISTIC COLOR Amber DISTINCTIVE ODOR Acidic
J. HALOGENATED? Yes _____ % SULFONATED? _____ %
K. ALPHA RADIATION AS pCi/l _____

Ortho Chlorobenzene	2 – 4%	
Xylene-Tres	2 – 4%	
Toluene	0 – 0.5%	
	–	

(ATTACH ADDITIONAL PAGES IF NECESSARY)

DOES THIS WASTE CONTAIN ENDRIN, LINDANE, METHOXYCHLOR, TOXAPHENE, 2,4-D, 2,4,5-TP SILVEX, OR ANY OTHER ORGANIC COMPOUNDS LISTED BY USEPA AT 40 CFR 261.24? _____ IF SO, PLEASE NOTE ABOVE.

B. HEAVY METALS (WITH ppm RANGES):

	TOTAL	TOTAL LEACHABLE		TOTAL	TOTAL LEACHABLE
Ag			Hg		
As			Ni		
Ba			Pb		
Cd			Se		
Cr			Zn		
Cu			Other (ATTACH ADDITIONAL PAGES)		

(IF YOU HAVE DETERMINED TOTAL LEACHABLES USING USEPA'S "EP TOXICITY TEST PROCEDURE" — AT 40 CFR, PART 261, APPENDIX II — SO INDICATE BY MARKING "EP" AFTER THE RESULT SHOWN ABOVE.)

C. INORGANIC COMPONENTS (WITH % RANGES):

			OTHER			
TOTAL CYANIDE	—	%	Sulfuric Acid	25	31	%
FREE CYANIDE	—	%	Hydrochloric Acid	0	1	%
SULFIDE AS:	—	%	Water	59.5	71	%
BISULFITE AS:	—	%				%
SULFITE AS:	—	%				%

(ATTACH ADDITIONAL PAGES IF NECESSARY)

D. DOES THIS WASTE STREAM CONTAIN BIOLOGIC MATERIALS, PATHOGENS, OR ETIOLOGICAL AGENTS? NO _____ IF SO, ATTACH ADDITIONAL PAGES DESCRIBING SUCH MATERIALS.

E. IS THE WASTE A PESTICIDE OR PRODUCED BY A PESTICIDE MANUFACTURING PROCESS? _____
IF SO, INDICATE WHETHER IT CONTAINS:

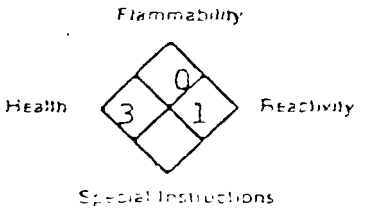
- ☐ ORGANOPHOSPHATES — CONTAINING SULFUR ☐ YES ☐ NO
- ☐ CARBAMATES
- ☐ CHLORINATED HYDROCARBONS

HAZARDOUS COMPONENTS AND CHARACTERISTICS

A. HAZARDOUS PROPERTIES (INSERT NUMBER CODES PER INSTRUCTIONS ON LAST PAGE)

(1) TOXICITY RATING: INHALATION 2 DERMAL 3 ORAL 3

(2) HAZARD IDENTIFICATION SYSTEM.



B. LIST ANY OTHER ACUTE OR CHRONIC HAZARDS ASSOCIATED WITH OR ALLEGED TO BE ASSOCIATED WITH HUMAN CONTACT WITH OR EXPOSURE TO THE WASTE: _____

TRANSPORTATION PURSUANT TO THE HAZARDOUS MATERIALS TRANSPORTATION ACT? ____
(SEE 49 C.F.R. 172-101 AND 173 FOR "HAZARDOUS MATERIALS" LIST AND CHARACTERISTICS) IF SO, PLEASE ADVISE OF THE FOLLOWING

(1) CORRECT SHIPPING DESCRIPTION: Sulfuric Acid Spent

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(2) HAZARD CLASS(ES): Corrosive

(3) MATERIAL I.D. NO (S) UN-1832

B. DOES THIS WASTE CONTAIN ANY "HAZARDOUS SUBSTANCE" AS DEFINED BY REGULATIONS OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY PURSUANT TO SECTION 311 OF THE CLEAN WATER ACT? Yes (SEE 40 CFR 117 FOR "HAZARDOUS SUBSTANCES" AND CATEGORIES) IF SO, PLEASE ADVISE OF THE FOLLOWING:

(1) THE NAMES OF EACH HAZARDOUS SUBSTANCE PRESENT IN THE WASTE, THE HAZARD CATEGORY (X, A, B, C OR D) AND THE APPROXIMATE CONCENTRATION OF THE SUBSTANCE BY WEIGHT IN THE WASTE
Toluene

(ATTACH ADDITIONAL PAGES IF NECESSARY)

C. IS THIS WASTE A "HAZARDOUS WASTE" AS DEFINED BY REGULATIONS OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY PURSUANT TO SECTION 3001 OF THE RESOURCE CONSERVATION AND RECOVERY ACT? yes (SEE 40 CFR, PART 261 FOR WHAT IS A "HAZARDOUS WASTE") IF SO, STATE:

(1) THE USEPA HAZARDOUS WASTE NUMBER(S). Corrosive - D002

(2) DO YOU CLAIM TO BE A SMALL QUANTITY GENERATOR? ____ (SEE 40 CFR 261.5)

D. IS THIS WASTE A "HAZARDOUS WASTE" AS DEFINED BY THE ENVIRONMENTAL REGULATORY AGENCY IN YOUR STATE? yes IF SO, STATE WHY IT IS SO DEFINED AND ANY STATE HAZARDOUS WASTE CODE NUMBERS ASSIGNED Chloramines - Class - 08-6

IS THE INFORMATION PROVIDED IN SECTIONS 6-9 BASED UPON LABORATORY ANALYSIS OF THE WASTE MATERIAL? yes IF SO, PLEASE ADVISE OF THE DATE OF THE MOST RECENT ANALYSIS: June 1979

HAVE YOU OBTAINED TOXICITY STUDIES OF THIS WASTE STREAM? No IF SO, PLEASE ATTACH A COPY OF THE RESULTS.

QUANTITY/SHIPPING REQUIREMENTS:

ANTICIPATED VOLUME IS: 1,147,000

GALLONS ☒ TONS ☐ CUBIC YARDS ☐ DRUMS ☐ OTHER ☐

PER: DAY ☐ WEEK ☐ MONTH ☐ YEAR ☒ ONE TIME ☐

TRANSPORTATION EQUIPMENT REQUIRED Stainless Steel Tank Truck

SERVICE/SCHEDULING REQUIREMENTS ____

GENERATOR'S AUTHORIZED SIGNATORY Robert A. Schlek TITLE MGR. ENVIR. SERV. DATE 3/3/81

CK. BY

CONFIDENTIALITY AGREEMENT

In consideration for the Generator's release of the above information, and any other supplemental data provided, I agree to treat such information as confidential property and will not disclose such information to others except as is required by law, and in such circumstances only after first giving notice to the Generator.

By ____
Name

____
Title

SALES	CODE
RVD	A 23928

PROFILE SHEET CODE NO

CONFIDENTIAL

RECERTIFICATION OF GENERATOR'S WASTE MATERIAL PROFILE SHEET

THIS FORM AND ANY SUPPLEMENTAL INFORMATION SHOULD BE RETURNED TO

Chemical Waste Mgmt Inc
Midwest Area Sales Office
4300 W 123rd Street
Alsip, Ill 60658 Attn: Mr Ken Johnson

1 GENERATOR NAME Bofors Nobel Inc.

2 GENERATING FACILITY NAME/ADDRESS Bofors Nobel Inc./5025 Evanston Avenue, Muskegon, Michigan, 49443

3 COMPANY CONTACTS

GENERAL	John W. Lee	TITLE	Director of Purchasing	PHONE	(616) 788-2341
	Ralph J. Wolthuis	TITLE	VP Environmental & ~~Gov't Affairs~~	PHONE	same
TECHNICAL	Robert Quintilliano	TITLE	Production Mgr.	PHONE	same
	Dennis Romankowski	TITLE	Environmental Mgr.	PHONE	same

4. WASTE NAME: DCB Spent Acid Wash

5. PROCESS GENERATING WASTE: 3,3 Dichlorobenzidene

The undersigned does hereby represent to Chemical Waste Management of Illinois, Inc.

(insert name of disposal company) THAT:

1. The waste generically described above was the subject of a complete description in the "Generator's Waste Material Profile Sheet" with the code designation shown in the upper left corner.
2. That the referenced Profile Sheet had been executed by Robert A. Schlak (insert name of authorized signatory) on 3/31/81 (insert date)
3. The waste description contained in the referenced Profile Sheet remains true and correct in all respects.
4. The Generator has not, since the date of the referenced Profile Sheet, become aware of any human health or environmental hazards associated with the Waste Materials other than those already noted in the referenced Profile Sheet.

DATE 11/9/82

GENERATOR'S AUTHORIZED SIGNATORY

NAME John W. Lee

SIGNATURE John W. Lee

TITLE Director of Purchases/Traffic

(CK 83)

THIS FORM HAS BEEN DEVELOPED BY AND FOR THE USE OF CHEMICAL WASTE MANAGEMENT, INC. AND OTHER WASTE MANAGEMENT, INC. COMPANIES

ORIGINATOR REQUEST FOR DECISION. EQ

WASTE PROFILE SHEET NUMBER IA 0036

PROPOSED TREATMENT/DISPOSAL FACILITY Mon Valley Disposal Inc.

ORIGINATOR NAME [illegible]

WMI COMPANY DCB Matthew Bigwood

PROPOSED TRANSFER FACILITY (IF ANY)

DATE 4/6/81

NW-10007

PRELIMINARY FINDINGS.

THE ABOVE PROFILE SHEET (OR WRITTEN DESCRIPTION) HAS BEEN REVIEWED. I FIND IT IS:

- ☑ COMPLETE AND CONTAINS SUFFICIENTLY CERTAIN WASTE DESCRIPTION TO ENABLE ITS PROPER CLASSIFICATION, SAFE HANDLING, AND SUBSEQUENT DETERMINATIONS OF CONFORMITY OR NON-CONFORMITY.
- ☐ INCOMPLETE OR INSUFFICIENT FOR THE REASONS NOTED ON THE PROFILE SHEET (OR WRITTEN DESCRIPTION)

A SPECIAL WASTE ANALYSIS REPORT ☑ HAS ☐ HAS NOT BEEN PREPARED. I HAVE DETERMINED

- ☐ ADDITIONAL ANALYSES OR INFORMATION ARE NEEDED, AS NOTED ON THE REPORT FORM
- ☐ SAMPLE DOES NOT CONFORM TO PROFILE SHEET DESCRIPTION, AS NOTED ON FORM
- ☑ ANALYSIS IS SUFFICIENT, AND SAMPLE CONFORMS TO PROFILE SHEET DESCRIPTION
- ☐ AN ANALYSIS IS NOT NECESSARY ACCORDING TO COMPANY POLICY _____ (IDENTIFY POLICY EXCEPTION.)

ON THE BASIS OF THE PROFILE SHEET AND ANALYSIS REPORT (IF REQUIRED), I FIND. (CHECK ONE MAIN BOX)

- ☑ THE WASTE IS REGULATED AS HAZARDOUS ☑ BY USEPA (HAZARDOUS WASTE NO D002) AND/OR ☑ BY THE STATE IN WHICH THE TREATMENT/DISPOSAL FACILITY IS LOCATED.
- ☐ THE WASTE IS NOT REGULATED AS HAZARDOUS, BUT SHOULD BE SO TREATED FOR PURPOSES OF COMPANY POLICY, BECAUSE: _____
- ☐ THE WASTE IS NOT REGULATED BY THE DISPOSAL FACILITY STATE AS NON HAZARDOUS SPECIAL WASTE
- ☐ THE WASTE IS NOT REGULATED AS HAZARDOUS OR NON-HAZARDOUS SPECIAL WASTE.

DISPOSAL DECISION. BASED UPON MY EVALUATION OF THE WASTE AND THE FACILITY, I CONCLUDE:

☑ THE SPECIAL WASTE IS TECHNICALLY ACCEPTABLE FOR TREATMENT/DISPOSAL AT THE PROPOSED FACILITY BEGINNING current date, USING THE FOLLOWING METHOD(S) direct pond discharge and deep well disposal

ADDITIONAL CONDITIONS: _____

- ☑ FACILITY IS ALREADY FULLY PERMITTED (OR AUTHORIZED) TO RECEIVE THE WASTE
- ☐ NECESSARY PERMIT APPLICATIONS HAVE BEEN FILED. ALLOW _____ DAYS TO OBTAIN PERMIT
- ☐ FACILITY IS NOT NOW PERMITTED. ORIGINATOR SHOULD PROVIDE ME WITH INSTRUCTIONS TO FILE NECESSARY APPLICATIONS AND ALLOW _____ DAYS TO OBTAIN PERMIT.

☐ THE SPECIAL WASTE IS TECHNICALLY UNACCEPTABLE AT THE PROPOSED FACILITY BECAUSE _____

COMPLETED BY FACILITY ☑ TECHNICAL MGR ☐ REGIONAL ENGINEER

DATE _____ NAME Wm Bartelt

SIGNATURE Wm Bartelt

DISPOSAL DECISION APPROVAL OR REJECTION BY FACILITY GENERAL MANAGER.

- ☑ I WILL ACCEPT THE SPECIAL WASTE DESCRIBED IN THE PROFILE SHEET, ON THE ABOVE CONDITIONS
- ☐ I WILL ACCEPT THE WASTE, BUT ONLY ON THE FOLLOWING ADDITIONAL CONDITIONS: _____
- ☐ I WILL NOT ACCEPT THE WASTE UNDER ANY CONDITIONS

DATE 4-6-81 SIGNATURE [illegible] OK [illegible]

TRANSFER STATION DECISION. I HAVE REVIEWED THE PROFILE SHEET AND ANALYTICAL REPORT.

- ☐ THE WASTE MAY BE RECEIVED AT THE ABOVE TRANSFER FACILITY BEGINNING _____
- ☐ THE WASTE MAY NOT BE RECEIVED BECAUSE _____

DATE _____ SIGNATURE _____

A 00000

WASTE PROFILE SHEET CODE

CONFIDENTIAL

GENERATOR'S WASTE MATERIAL PROFILE SHEET

GENERAL DIRECTIONS: In order for us to determine whether we can lawfully, safely and environmentally transport, store, treat dispose of your waste stream, we must ask certain information about your waste. All of the information we seek is necessary. our purposes and yours. Be complete in your answers. If your response is "none," so indicate. Answers must be in ink or typewritten. Information you provide will be maintained in strictest confidence. Please make a copy of this form for your records, turning the original to the location indicated below.

THIS FORM AND ANY SUPPLEMENTAL INFORMATION SHOULD BE RETURNED TO:

Ohio Liquid Disposal, Inc.
3956 St. Rt. 412
Vickery, Ohio 43464
Attn: Jon Laliberte

1. GENERATOR NAME: Bofors Lakeway, Inc.

GENERATING FACILITY NAME/ADDRESS/USEPA FACILITY I.D. NUMBER (IF ANY): MID 000 260 893
5025 Evanston Avenue
Muskegon, MI 49443

2. COMPANY CONTACTS:

GENERAL John Lee TITLE Purchasing Agent PHONE 616-788-2341
TITLE PHONE

TECHNICAL Jim Cousino TITLE Lab Manager PHONE 616-788-2341
TITLE PHONE

WASTE NAME: DCB Mother Liquor

PROCESS GENERATING WASTE 3,3' Dichlorobenzidine

WASTE CHARACTERISTICS:

A. PHASES/LAYERS: BILAYERED ☐ MULTILAYERED ☐ NONE ☐

B. PHYSICAL STATE AT 70°F: SOLID ☐ SEMI-SOLID ☐ LIQUID ☒ POWDER ☐ OTHER

C. SOLIDS: TOTAL (%): TOTAL DISSOLVED (ppm or %):

D. SPECIFIC WEIGHT (AS # PER UNIT): 9.96 pounds per gallon

E. pH (Show the following as range of %)

AS. H_2SO_4	20 – 25 %	H_3PO_4	– %
HCl	1 – 5 %	NaOH	– %
HF	– %	NH_4OH	– %
HNO_3	– %	$Ca(OH)_2$	– %
OTHER:	– %		– %
	– %		– %

GK BB

F. ASH POINT: °F (CLOSED CUP TEST ONLY)

G. VAPOR PRESSURE (in mm of Hg at 25°C):

H. BTU PER # ASH CONTENT %

I. CHARACTERISTIC COLOR Amber DISTINCTIVE ODOR Acidic

J. HALOGENATED? Yes % SULFONATED? %

K. ALPHA RADIATION AS pCi/l

A. ORGANIC COMPONENTS (WITH RANGES — INCLUDE WHETHER IN ppm)

3,3' Dichlorobenzidine 0 — 1%

(ATTACH ADDITIONAL PAGES IF NECESSARY)

DOES THIS WASTE CONTAIN ENDRIN, LINDANE, METHOXYCHLOR, TOXAPHENE, 2,4-D, 2,4,5-TP SILVEX, OR ANY OTHER ORGANIC COMPOUNDS LISTED BY USEPA AT 40 CFR 261.24? _____ IF SO, PLEASE NOTE ABOVE

B. HEAVY METALS (WITH ppm RANGES)

	TOTAL	TOTAL LEACHABLE		TOTAL	TOTAL LEACHABLE
Ag			Hg		
As			Ni		
Ba			Pb		
Cd			Se		
Cr			Zn		
Cu			Other (ATTACH ADDITIONAL PAGES)		

(IF YOU HAVE DETERMINED TOTAL LEACHABLES USING USEPA'S "EP TOXICITY TEST PROCEDURE" – AT 40 CFR, PART 261, APPENDIX II — SO INDICATE BY MARKING "EP" AFTER THE RESULT SHOWN ABOVE)

C. INORGANIC COMPONENTS (WITH % RANGES)

			OTHER			
TOTAL CYANIDE	—	%	Sulfuric Acid	20	25	%
FREE CYANIDE	—	%	Hydrochloric Acid	1	5	%
SULFIDE AS:	—	%			—	%
BISULFITE AS:	—	%			—	%
SULFITE AS:	—	%			—	%

(ATTACH ADDITIONAL PAGES IF NECESSARY)

D. DOES THIS WASTE STREAM CONTAIN BIOLOGIC MATERIALS, PATHOGENS, OR ETIOLOGICAL AGENTS? _____ IF SO, ATTACH ADDITIONAL PAGES DESCRIBING SUCH MATERIALS

E. IS THE WASTE A PESTICIDE OR PRODUCED BY A PESTICIDE MANUFACTURING PROCESS? _____ IF SO, INDICATE WHETHER IT CONTAINS:

- ☐ ORGANOPHOSPHATES — CONTAINING SULFUR ☐ YES ☐ NO
- ☐ CARBAMATES
- ☐ CHLORINATED HYDROCARBONS

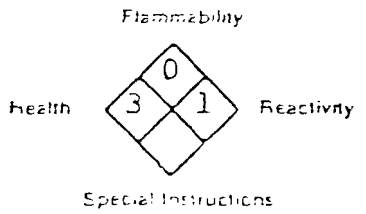
HAZARDOUS COMPONENTS AND CHARACTERISTICS

A. HAZARDOUS PROPERTIES (INSERT NUMBER CODES PER INSTRUCTIONS ON LAST PAGE)

(1) TOXICITY RATING: INHALATION 2 DERMAL 3 ORAL 3

CK BB

(2) HAZARD IDENTIFICATION SYSTEM:



B. LIST ANY OTHER ACUTE OR CHRONIC HAZARDS ASSOCIATED WITH OR ALLEGED TO BE ASSOCIATED WITH HUMAN CONTACT WITH OR EXPOSURE TO THE WASTE:

3,3' Dichlorobenzidine - A carcinogenic suspect

TRANSPORTATION PURSUANT TO THE HAZARDOUS MATERIALS TRANSPORTATION ACT? (SEE 49 CFR 172.101 AND 172 FOR "HAZARDOUS MATERIALS" LIST AND CHARACTERISTICS) IF SO, PLEASE ADVISE OF THE FOLLOWING

(1) CORRECT SHIPPING DESCRIPTION Hydrochloric Acid Mixture

(2) HAZARD CLASS(ES) Corrosive - Toxic

(3) MATERIAL ID NO (S) NA 1789

B. DOES THIS WASTE CONTAIN ANY "HAZARDOUS SUBSTANCE" AS DEFINED BY REGULATIONS OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY PURSUANT TO SECTION 311 OF THE CLEAN WATER ACT? yes (SEE 40 CFR 117 FOR "HAZARDOUS SUBSTANCES" AND CATEGORIES) IF SO, PLEASE ADVISE OF THE FOLLOWING.

(1) THE NAMES OF EACH HAZARDOUS SUBSTANCE PRESENT IN THE WASTE, THE HAZARD CATEGORY (X, A, B, C OR D) AND THE APPROXIMATE CONCENTRATION OF THE SUBSTANCE BY WEIGHT IN THE WASTE

3,3' Dichlorobenzidine

(ATTACH ADDITIONAL PAGES IF NECESSARY)

C. IS THIS WASTE A "HAZARDOUS WASTE" AS DEFINED BY REGULATIONS OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY PURSUANT TO SECTION 3001 OF THE RESOURCE CONSERVATION AND RECOVERY ACT? yes (SEE 40 CFR, PART 261 FOR WHAT IS A "HAZARDOUS WASTE") IF SO, STATE:

(1) THE USEPA HAZARDOUS WASTE NUMBER(S): D000, D002

(2) DO YOU CLAIM TO BE A SMALL QUANTITY GENERATOR? _____ (SEE 40 CFR 261.5)

D. IS THIS WASTE A "HAZARDOUS WASTE" AS DEFINED BY THE ENVIRONMENTAL REGULATORY AGENCY IN YOUR STATE? yes IF SO, STATE WHY IT IS SO DEFINED AND ANY STATE HAZARDOUS WASTE CODE NUMBERS ASSIGNED: 3,3' Dichlorobenzidine #00091-94-1

IS THE INFORMATION PROVIDED IN SECTIONS 6-9 BASED UPON LABORATORY ANALYSIS OF THE WASTE MATERIAL? yes IF SO, PLEASE ADVISE OF THE DATE OF THE MOST RECENT ANALYSIS: June '80

HAVE YOU OBTAINED TOXICITY STUDIES OF THIS WASTE STREAM? no IF SO, PLEASE ATTACH A COPY OF THE RESULTS.

QUANTITY/SHIPPING REQUIREMENTS:

ANTICIPATED VOLUME IS: 176,000

GALLONS ☒ TONS ☐ CUBIC YARDS ☐ DRUMS ☐ OTHER ☐

PER: DAY ☐ WEEK ☐ MONTH ☐ YEAR ☒ ONE TIME ☐

TRANSPORTATION EQUIPMENT REQUIRED Rubber lined tank trailer

SERVICE/SCHEDULING REQUIREMENTS _____

GENERATOR'S AUTHORIZED SIGNATORY: Robert A. Schlet TITLE MGR ENVL SERV DATE 3/3/81

CK
EB

CONFIDENTIALITY AGREEMENT: _____

In consideration for the Generator's release of the above information, and any other supplemental data provided, [illegible] to treat information as confidential property and will not disclose such information to others except as is required by law, and in circumstances only after first giving notice to the Generator.

By _____
Name

_____
Title

RVD | A00360

PROFILE SHEET CODE NO

CONFIDENTIAL

RECERTIFICATION OF GENERATOR'S WASTE MATERIAL PROFILE SHEET

THIS FORM AND ANY SUPPLEMENTAL INFORMATION SHOULD BE RETURNED TO:

Chemical Waste Mgmt Inc
Midwest Area Sales Office
4300 W 123rd Street
Alsip, Ill 60658 Attn: Mr Ken Johnson

1 GENERATOR NAME Bofors Nobel Inc.

2 GENERATING FACILITY NAME/ADDRESS Bofors Nobel Inc./5025 Evanston Avenue
Muskegon, Michigan, 49443

3 COMPANY CONTACTS

GENERAL	John W. Lee	TITLE	Director of Purchasing	PHONE	(616) 788-2341
	Ralph J. Wolthuis	TITLE	VP Environmental & ~~Govt Affairs~~	PHONE	same
TECHNICAL	Robert Quintilliano	TITLE	Production Mgr.	PHONE	same
	Dennis Romankowski	TITLE	Environmental Mgr	PHONE	same

4 WASTE NAME DCB Mother Liquor

5 PROCESS GENERATING WASTE 3,3 Dichlorobenzidene

The undersigned does hereby represent to Chemical Waste Management of Illinois, Inc.

(insert name of disposal company) THAT

1. The waste generically described above was the subject of a complete description in the "Generator's Waste Material Profile Sheet" with the code designation shown in the upper left corner
2. That the referenced Profile Sheet had been executed by Robert A. Schlak (insert name of authorized signatory) on 3/31/81 (insert date)
3. The waste description contained in the referenced Profile Sheet remains true and correct in all respects
4. The Generator has not since the date of the referenced Profile Sheet become aware of any human health or environmental hazards associated with the Waste Material's other than those already noted in the referenced Profile Sheet

DATE 11/9/82

GENERATOR'S AUTHORIZED SIGNATORY

NAME John W. Lee

SIGNATURE John W. Lee

TITLE Director of Purchasing/Traffic

OK
BB

THIS SIGNATURE HAS BEEN ADOPTED BY AND FOR THE USE OF CHEMICAL WASTE MANAGEMENT, INC. AND OTHER WASTE MANAGEMENT COMPANIES

BOFORS NOBEL INC.

April 22, 1983

Mr. Chuck Riley
Ohio Liquid Disposal
3956 State Road 412
Vickery, OH 43464

Dear Mr. Riley:

The purpose of this letter is to confirm our telephone conversation of this morning regarding the volatility of 3, 3' dichlorobenzidine dihydrochloride (DCB).

To the best of our knowledge, DCB's vapor pressure is negligible or nil. We have assumed that since DCB is a solid acid salt, it's vapor pressure is not a factor in its dispersion characteristics. Air quality permit applications filed by us with the Michigan Department of Natural Resources have been based on this assumption and they have never attempted to refute this.

Enclosed is our Material Safety Data Sheet for DCB. If we can be of any further assistance do not hesitate to call myself, Jim Cousino, or Dennis Romankowski.

Sincerely,

Thomas J. Weeda

Thomas J. Weeda
Director of Safety & Health

TJW:kh

Enc: MSDS for DCB

cc: NR, RJW, DR, JLC

5025 Evanston Avenue / Muskegon Michigan 49443 / Telephone (616) 788-2341 / Telex 228455

BOFORS NOBEL INC.

MATERIAL SAFETY DATA SHEET

Date: 4/3/82
By: TJW

DCB

I. IDENTIFICATION

Chemical Name:	3,3' - Dichlorobenzidine dihydrochloride
Trade Name:	Dichlorobenzidine dihydrochloride
Formula:	$C_{12}H_{10}Cl_2N_2$-2HCl
CAS Registry Number:	612-83-9
Manufacturers:	Bofors Nobel, Inc. 5025 Evanston Avenue Muskegon, Michigan 49443
Emergency Telephone Number:	(616) 788-2341

II. PHYSICAL DATA

Appearance:	White to greyish crystalline powder.
Solubility:	Sightly soluble in water, soluble in alcohol and dilute acids.
Melting Point:	130 - 134°C
Boiling Point:	Decomposes
Percent Volatiles:	Nil
Flashpoint:	None, decomposes
Flammable Limits:	None, decomposes

III. FIRE AND EXPLOSION DATA

Extinguishing Media: Water, water fog, CO_2, dry chemical, foam

Special Firefighting Procedures:

Firefighters should use self-contained breathing apparatus and wear protective clothing.

For Warranty Information see reverse side.

BOFORS NOBEL INC.

MATERIAL SAFETY DATA SHEET

Date: 4/3/82
By: TJW

DCB

III. FIRE AND EXPLOSION DATA (continued)

Decomposition Products: CO, CO_2, chloride fumes

IV. HEALTH HAZARD DATA

Threshold Limit Value: None established, however DCB dihydrochloride is classified as an Industrial Substance Suspected of Carcinogenic Potential for Man by the ACGIH and as a Cancer Suspect Agent by OSHA (29CFR1910.1007, in Federal Register 23072, May 28, 1975).

Acute Oral Toxicity: LD_{50} = 3820 mg/kg (rat)

Mutagenicity Data: Microsomal Mutagenicity Assay run with Salmonella typhimurium showed mutagenic activity at dosage rate of 50 mg/plate.

DCB handling and usage is strictly regulated by both the Federal and various State occupational safety and health regulatory agencies. See 29CFR 1910.1007 for the federal regulations. If your state is covered by an OSHA state plan, the regulatory requirements may be different. Follow all applicable safety, health, and environmental regulations when handling, using, or disposing of this material.

Warning Properties: The skin may experience a stinging sensation when in contact with DCB dihydrochloride. This is due to the acidic nature of the material.

FIRST AID

Eye Contact: Flush thoroughly with water for at least 15 minutes. Hold eyelids apart if necessary to obtain complete flushing. Then obtain medical attention.

Skin Contact: Wash affected area thoroughly with soap and water. Obtain medical attention if irritation persists.

For Warranty Information see reverse side.

BOFORS NOBEL INC.

MATERIAL SAFETY DATA SHEET

Date: 4/3/82
By: TJW

DCB

IV. HEALTH HAZARD DATA (continued)

FIRST AID

Inhalation:	Remove exposed person to fresh air, obtain medical attention.
Ingestion:	Obtain medical attention.

V. REACTIVITY DATA

Stability:	Stable
Hazardous Polymerization:	Will not occur.
Conditions to Avoid:	Exposing material to heat may cause decomposition to toxic chloride fumes.

VI. SPILL OR LEAK PROCEDURES

While wearing a clean, impervious suit, gloves, boots and continuous air supply hood; shovel powder into metal or plastic container. (Dry sweeping or dry mopping is prohibited!) Decontaminate with 3% Sodium Hypochlorite solution until all white powder turns brownish. Wash remaining powder or ground with 3% sodium hypochlorite until all residue turns brownish.

Alternate Decontamination Solutions:

a) 3% potassium permanganate

b) An aqeous solution of 5% tetrapotassium pyrophosphate and 10% sodium ethyl hexyl sulfate.

c) Aqeous solutions of 1% oxalic acid followed by 1% sodium nitrite.

For Warranty Information see reverse side.

BOFORS NOBEL INC.

MATERIAL SAFETY DATA SHEET

Date: 4/3/82
By: TJW

DCB

VII. SPECIAL PROTECTION INFORMATION

Ventilation:	Any area where DCB·HCl is stored, handled, or used must be under negative air pressure relative to surrounding areas. Any local exhaust ventilation must direct contaminated air away from the worker. General and local ventilation should be adequate to keep employee exposure to a minimum.
Eye Protection:	Safety glasses, chemical goggles, and/or face shield.
Skin Protection:	Impervious full body protection (acid or air suit), impervious gloves and boots.
Respiratory Protection:	Use either a NIOSH approved dust respirator or a NIOSH approved continuous air supplied hood. Air hoods must be worn during any decontamination operations or other operations that could result in contact with DCB·HCl.
Personal Hygiene:	Any area where DCB is handled or stored in closed systems must be posted as a regulated area. All employees leaving the area must wash their hands, arm, face and neck. Any area where DCB is discharged from a closed system or charged from an open to a closed system must be maintained as an isolated area. Each employee working in the isolated area must take a shower after his last exit of the day. See 29CFR1910.1007 for details.

For Warranty Information see reverse side.

ATTACHMENT N

HYDE PARK RAINWATER FUNOFF

May 23, 1979

Congressman Ronald M. Mottl
Congress of the United States
House of Representatives
Washington, D.C. 20515

Dear Congressman Mottl:

This is in response to your letter of April 19, inquiring into certain of the particulars involved in the transportation and disposal, by Ohio Liquid Disposal, Inc., of water-base wastes from the inactive Hyde Park landfill in Niagara Falls, New York. Our responses are numbered to conform to your questions.

1. OLD has accepted a certain aqueous waste stream from Hooker's Hyde Park landfill, consisting primarily of precipitation runoff from the covered landfill surface, (the material is more than 99% water). The runoff water did come into contact with the landfill leachate, thereby picking up some of the contaminants in the leachate. However, OLD was responsible only for the contaminated runoff water, found in the upper horizon of the lagoon, and not for the heavier leachate material found in lower lagoon levels.

(a) From January, 1977 to March 19, 1979, OLD received 4.36 million gallons of contaminated runoff water from the Hyde Park site.

(b) Every truck arriving at our facility is sampled to determine whether or not the contents conform to the contracted-for material. In addition, specific detailed analyses have been performed on a case-by-case, as-needed basis. When OLD was alerted to the allegations that the Hyde Park landfill itself contains certain pesticides and precursors in pesticide formulation, we contracted with two independent laboratories to conduct analyses of the Hyde Park waste for materials alleged to have been disposed. While OLD has, thus, obtained many analyses of the chemical composition, we have not, however, conducted any toxicity tests on the waste stream.

(c) As noted in (b), we have not conducted toxicity studies on the waste stream, or on specific chemical components of the stream. However, our analyses of incoming waste show, typically, phenol concentrations in the range of 900-1300 parts per million. We are also attaching a sheet summarizing analytical results for the special chemical parameters, as provided us by independent laboratories. We should advise that Ohio EPA has also conducted analyses for many of these same materials; as we understand it, no detectable concentrations of the materials were found.

2. The vast majority of the runoff wastewater, (in excess of 90%), was transported by OLD from the Hyde Park site.

(a) Matlack, Inc. is the only transporter, other than OLD itself, who hauled contaminated runoff water from the Hyde Park site to OLD. Matlack operated out of its terminal in Niagara Falls.

(b) The route used to transport the material was: Interstate 90, from Niagara Falls, through New York and Pennsylvania into Ohio; then, the Ohio Turnpike (I-80) west to Fremont (Exit 6).

(c) Only vehicles meeting USDOT specifications, for the transport of hazardous materials, are used. In addition, before moving the waste, vehicle drivers inspect the tanker to assure that all hatches are properly bolted down and sealed and that loading valves are tightly closed and safety capped. There has never been a spill of Hooker waste in transit to OLD's facility.

. You are correct that OLD is not now receiving the ontaminated runoff water from the Hyde Park site. Effective midnight, March 19, 1979, OLD suspended further transportation and disposal of that waste stream.

(a) Our determination to stop receipt of the runoff water arose out of our concern over the continuing allegations/revelations with respect to past industrial practices in the Niagara Falls area, in conjunction with a failure on the part of the information media to be able to explain to the public toxicological concepts, such as the difference between a toxic substance and a toxic concentration of a substance. As a consequence of both, OLD found it necessary, both to satisfy its own internal safety and environmental requirements and to satisfy public concerns, to analyze the waste stream for each new chemical which was alleged to be present in the waste. Frankly, each news story coming out of Niagara Falls seemed to announce a new "suspected" chemical. Although our own analyses, as we have already said, showed either no presence or merely minute concentrations of these chemicals, the perturbations caused our operations by each new story finally became too much. It has taken OLD fifteen years of ethical operations to secure a high level of confidence with both our community and the Ohio EPA. Our desire to maintain that degree of confidence convinced us, even though analytical data showed no danger to the public health, that further receipts of the Hooker waste were unwarranted.

(b) The Ohio EPA is aware of our cessation of receipt of the runoff water. Ohio EPA is also aware of the nature of that waste stream, having taken its own samples and conducted its own analyses last summer.

4. No new Hooker wastes were substituted for the runoff water. However, as Hooker intended, as we understand it, to incinerate the runoff water and leachate combination, certain wastes which were being incinerated were then brought to the OLD deepwell facility. These materials - basically tank car washings - did not really constitute a "new" material, as OLD had received tank car washings whenever the incinerator was down. We will be pleased to provide you with information on the general chemical composition and volumes of these tank car washings in the event you should desire it, even though the material was not new or a substitute for the landfill runoff water.

I hope we have answered your inquiries to your satisfaction. However, should you desire additional information relative to the concerns of your constituents or to the concerns of the Oversight and Investigations Subcommittee, I will be pleased to assist you.

Sincerely,

Donald Eckardt

CHEMICALS FOR WHICH ANALYSES CONDUCTED

CONCENTRATIONS EXPRESSED IN PARTS PER MILLION PPM.

	DATES OF TRUCK SAMPLES (APPROXIMATE)											
	8/21/78			11/7/78	1/19/79	1/22/79	2/7/79	2/17/79	3/7/79	3/16/79	3/22/79	3/28/79
	VEH. 1	VEH. 2	VEH. 3									
BENZENE	0.31	0.28	0.29									
LINDANE	ND	ND	ND									
MIREX	ND	ND	ND									
DDT	ND	ND	ND									
C-56	ND	0.80	0.20	ND	ND	ND	ND	ND	ND	0.18	ND	ND
DIELDRIN				ND	ND	ND	ND	ND	ND	ND	ND	ND
ENDRIN				ND	ND	ND	ND	ND	ND	ND	ND	ND
TCDD				ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-T	—				0.52	ND	ND	ND	ND	ND	ND	ND

ND = NOT DETECTABLE

ANALYTICAL RESULTS: SAMPLES OF HYDE PARK RUNOFF WATER ARRIVING AT O.L.I.

42 381 50 SHEETS 5 SQUARE
42 382 100 SHEETS 5 SQUARE
42 389 200 SHEETS 5 SQUARE

Jerson
Price

Then (F) OLD Hooker contact

Hooker

345 THIRD STREET, BOX 728, NIAGARA FALLS, NEW YORK 14302, PHONE (716) 278-7000

E. Davis
T. Pruitt
J. Coll
H. Miller
R. Raymond
J. Hanna

April 4, 1979

Honorable Ronald M. Mottl
Congress of the United States
House of Representatives
Washington, D. C. 20515

Dear Mr. Mottl:

This is in response to your letter of March 28, 1979 to Mr. Bruce Davis, our Executive Vice President. I have taken the liberty of responding to that letter since the questions which you have raised generally fall within my area of responsibility. The answers to your questions are as follows:

1. Essentially all of the liquid wastes from our Niagara Falls facility are incinerated in our own on-site residue disposal system. In 1977 we started to use Ohio Liquid Disposal, located in Freemont, Ohio, for the disposal of aqueous wastes and certain by-product acids which were in excess of our own disposal capacity. We have averaged 1 to 2 truckloads per day of these types of materials and continue to move such a volume today. Our solid wastes are landfilled in the vicinity of Niagara Falls by New York State approved disposal facilities.

2. The composition of the aqueous waste is water which contains trace amounts of organic materials and certain metal salts. The acid wastes are sulfuric and muriatic acids. More detailed analytical information is available if desired. This same information is also on file at Ohio Liquid Disposal.

3. In handling our waste materials, Ohio Liquid Disposal uses physical-chemical treatment equipment and deep well injection. They are permitted to operate these facilities under license from the Ohio EPA.

4. Detailed information regarding the soil composition and geological formulations at Ohio Liquid Disposal facilities are obtainable from Ohio Liquid Disposal and/or the Ohio EPA.

5. These wastes are transported in trucks supplied by Ohio Liquid Disposal or, infrequently, other licensed chemical haulers who are well aware of the need for special precautions during shipping.

I trust that the above information will prove to be of assistance. Please do not hesitate to contact us if you should require any further information which you feel we might have and which would allow you to better understand your areas of concern.

Very truly yours,

F. D. Neruda
Vice President
Special Environmental Programs

RONALD M. MOTTL
23RD DISTRICT, OHIO
COMMITTEES
VETERANS' AFFAIRS
SUBCOMMITTEES
SPECIAL INVESTIGATIONS (CHAIRMAN)
MEDICAL FACILITIES AND BENEFITS
—
INTERSTATE AND FOREIGN COMMERCE
SUBCOMMITTEES
OVERSIGHT AND INVESTIGATIONS
COMMUNICATIONS

SUBURBAN CAUCUS
FOUNDER AND CO-CHAIRMAN

Congress of the United States
House of Representatives
Washington, D.C. 20515

WASHINGTON OFFICE
1232 LONGWORTH HOUSE OFFICE BUILDING
TELEPHONE (202) 225-5731
DISTRICT OFFICES:
2951 FEDERAL OFFICE BUILDING
CLEVELAND, OHIO 44199
TELEPHONE (216) 522-4382
14812 DETROIT AVENUE, #207
LAKEWOOD, OHIO 44107
TELEPHONE (216) 522-7152
5393 PEARL ROAD
PARMA, OHIO 44129
TELEPHONE (216) 888-3636

March 28, 1979

B. D. DAVIS
MAR 30 1979
RECEIVED

Mr. Bruce Davis
Exeuctive Vice President, Hooker Chemical Co.
Box 728
Niagra Falls, New York 14302

Dear Mr. Davis:

As you may know, the House Commerce Subcommittee on Oversight and Investigations, on which I serve, is presently holding hearings on the problems associated with inactive and abandoned hazardous waste sites.

The Hooker Chemical Company has been a topic of much discussion -- as its operations related to Love Canal and the Hyde Park Landfill. Consequently, it is my understanding that representatives of your company may be asked to testify in the near future.

In prior hearings, various witnesses, from neighboring industries, unions, and New York State offices, have said they believe Hooker is disposing its waste in Ohio. Realizing that I am from Ohio, I am confident you can appreciate my concerns.

Therefore, in conjunction with these hearings, I aks that you please supply me with answers to the following questions:

1) Where is the exact location of your present disposal sites? To what extent are you depositing your daily waste material in Ohio?

2) What is the chemical composition of this "hazardous" waste?

3) In what manner are these wastes being handled? What method of disposal are you using -- are landfills or deep wells to be the mode of disposal?

4) Have any studies been conducted on the soil composition of these environs or on the geologic formations of the area?

5) How are these wastes being transported to Ohio. What types of precautions are being taken to ensure there is no accidental spillage en route?

Mr. Davis, your consideration of my request would be greatly appreciated. It is my understanding the Subcommittee will be continuing its hearings on this issue in early April. Therefore, I hope to have your answers to these questions at the very soonest possible -- the first week in April.

Sincerely,

Ron Mottl

RONALD M. MOTTL
Member of Congress

RM/gkd

hooker

345 THIRD STREET, BOX 728, NIAGARA FALLS, NEW YORK 14302, PHONE (716) 278-7000

January 24, 1979

Mr. Peter Williamson
Vice President
Ohio Liquid Disposal, Inc.
504 Liberty Street
Fremont, Ohio 43420

Dear Mr. Williamson:

As you may be aware, Hooker is presently engaged in remedial work designed to upgrade the closed-out Hyde Park Boulevard landfill site located in the Town of Niagara, New York. The work is being conducted in accordance with plans submitted to the New York State Department of Environmental Conservation. A drainage basin located adjacent to the landfill site known as Bloody Run is also under study for any remedial work that may be necessary.

In connection with the above activities, Hooker obtained a spot sample of leachate from the landfill lagoon and a further sample from the sediment in the drainage basin. These samples were analyzed by an outside lab and the presence of tetrachlorodibenzo-p-dioxin (TCDD) was detected at very low levels as follows: 1.5 ppb (lagoon leachate) and 7.5 ppb (drainage basin sediment). These analytical results have been provided to various governmental agencies for informational purposes. As the attached report from our outside lab indicates, we do not have conclusive evidence that the compound detected is actually 2,3,7,8 TCDD and not other isomers of tetrachlorodibenzo-p-dioxin.

We have also analyzed samples from residential wells located North of the landifll site. On January 23, 1979 our outside lab verbally reported that TCDD was not detected in any of the wells.

While Hooker continues to study the significance of the above data, Hooker is not aware of any evidence to date that the TCDD levels detected in the samples analyzed present a substantial risk to human health.

Very truly yours,

T. P. Johnston, Manager
Operations Support

TPJ:rm
Attachment

CARBORUNDUM

The Carborundum Company · P O Box 1054 · Niagara Falls, New York 14302

December 29, 1978

Mr. Bernie Carreno
Superintendant, Environmental Control
Hooker Chemical and Plastics Corp.
47th and Buffalo Avenue
Niagara Falls, New York 14302

Subject: Analytical Results - Carborundum Project OX

Dear Mr. Carreno:

The following are the results of the first two samples analyzed for TCDD:

Sample	TCDD Found
(1) Leachate #50278044	1.5 ppb
(2) Sediment #50278045	7.5 ppb

Although a mass spectrum very close to that of 2,3,7,8-TCDD was obtained from the extract of the sediment sample, we still do not have conclusive evidence that the compound is actually 2,3,7,8-TCDD, and not other isomers.

If you have any questions, please feel free to contact either myself or Dr. Anthony Wong.

Sincerely,

Robert E. Meierer
Project Coordinator

cc: A. Wong
OX File

REM:pw

TRACE ELEMENTS INC.
460 SOUTH NORTHWEST HIGHWAY • PARK RIDGE, ILLINOIS • 60068 • 312 / 696-2070

February 8, 1979

LABORATORY REPORT #5016

File
O-D

Mr. Don Price
Chemical Waste Management
900 Jorie Blvd.
Oakbrook, Illinois 60521

Sample received
February 2, 1979

[TEI-9208] Pond Waste Water NW-338
1-27-79 Hooker, New York

Dieldrin, ug/ml (ppm)	< 0.008
Endrin	< 0.008
Hexachlorocyclopentadiene	< 0.008
Tetrachlorodibenzo-p-dioxin	< 1.0
2,4,5 - Trichlorophenoxyacetic acid	< 0.008

Steve Cipa

TRACE ELEMENTS INC.
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January 29, 1979 **LABORATORY REPORT** #4994

Mr. Don Price
Chemical Waste Management
P.O. Box 214
Calumet City, Illinois 60409

Sample received
January 19, 1979

[TEI-9188] NW-338 Pond Leachate

Method of analysis:

A) Isolation/extraction procedures :

1) Chlorinated phenoxy acid herbicides

2) Base-neutral extractables

B) Quantitation using selected ion monitoring gas chromatography - mass spectrometry.

Results:

Dieldrin	< 0.005	ug/ml (ppm)
Endrin	< 0.005	"
Hexachlorocyclopentadiene	< 0.005	"
Tetrachlorodibenzo-p-dioxin	< 1.0	"
2,4,5 - Trichlorophenoxyacetic acid	0.52	"

Steven P. Cesa

TRACE ELEMENTS INC.
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February 28, 1979

LABORATORY REPORT #5073

Mr. Don Price
Chemical Waste Management
900 Jorie Blvd.
Oakbrook, Illinois 60521

Samples received
Feb. 20-21, 1979

[TEI-9262] Thief Sample #338 - 2/7/79

[TEI-9266] Thief Sample NW-338 Pond Leachate Water 2-17-79

Both samples were analyzed simultaneously:

	[TEI-9262]	[TEI-9266]
Dieldrin	< 0.01ug/ml	< 0.01 ug/ml
Endrin	< 0.01 "	< 0.01 "
Hexachlorocyclopentadiene	< 0.01 "	< 0.01 "
Tetrachlorodibenzo-p-dioxin	< 1.0 "	< 1.0 "
2,4,5 - Trichlorophenoxyacetic Acid	< 0.01 "	< 0.01 "

3-1
cc: Sidotti
Williamson

TRACE ELEMENTS INC.
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"C. Sirotti 3-16-79

LABORATORY REPORT

March 13, 1979 #5099

Mr. Don Price
Chemical Waste Management
900 Jorie Blvd.
Oak Brook, Illinois 60521

Sample received
March 7, 1979

[TEI-9326] Industrial Waste Water - Pond #338
Niagara Falls - Hooker, New York 3/3/79

Dieldrin, ug/ml	< 0.01
Endrin, ug/ml	< 0.01
Hexachlorocyclopentadiene, ug/ml	< 0.01
Tetrachlorodibenzo-p-dioxin, ug/ml	< 1.0
2,4,5-Trichlorophenoxyacetic acid, ug/ml	< 0.01

G. E. Marka

TRACE ELEMENTS INC.
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March 27, 1979

LABORATORY REPORT

#5168

Mr. Don Price
Chemical Waste Management
900 Jorie Blvd.
Oak Brook, Illinois 60521

Sample received
March 16, 1979

[TEI-9378] Waste Water NW-338 3/8/79

Endrin, ug/ml	< 0.01
Dieldrin, ug/ml	< 0.01
Hexachlorocyclopentadiene, ug/ml	0.18
Tetrachlorodibenzodioxin, ug/ml	< 0.01
2,4,5 - trichlorophenoxylacetic acid, ug/ml	< 0.01

TRACE ELEMENTS INC.
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March 30, 1979

LABORATORY REPORT #5191

Mr. Don Price
Chemical Waste Management
900 Jorie Blvd.
Oak Brook, Illinois 60521

Samples received
March 20, 1979

[TEI-9392.01] South Basin - Hyde Park
[TEI-9392.02] West Basin - Hyde Park
[TEI-9392.03] Hooker, New York - Pond Hyde Park

	9392.01 * ug/ml	9392.02 * ug/ml	9392.03 ug/ml
Endrin	< 0.01	< 0.01	< 0.01
Dieldrin	< 0.01	< 0.01	< 0.01
Hexachlorocyclopentadiene	< 0.01	0.002	< 0.01
Tetrachlorodibenzodioxin	< 1.0	< 1.0	< 1.0
Trichlorophenoxyacetic acid	< 0.5	< 0.5	< 0.5

*Sample indicates the possible presence of Aldrin and 2,4-D.

TRACE ELEMENTS INC.
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March 30, 1979

LABORATORY REPORT #5191

Mr. Don Price
Chemical Waste Management
900 Jorie Blvd.
Oak Brook, Illinois 60521

Samples received
March 20, 1979

[TEI-9392.01] South Basin - Hyde Park
[TEI-9392.02] West Basin - Hyde Park
[TEI-9392.03] Hooker, New York - Pond Hyde Park

	9392.01 * ug/ml	9392.02 * ug/ml	9392.03 ug/ml
Endrin	< 0.01	< 0.01	< 0.01
Dieldrin	< 0.01	< 0.01	< 0.01
hexachlorocyclopentadiene	< 0.01	0.002	< 0.01
Tetrachlorodibenzodioxin	< 1.0	< 1.0	< 1.0
Tricalorophenoxyacetic acid	< 0.5	< 0.5	< 0.5

*Sample indicates the possible presence of Aldrin and 2,4-D.

$ 400.00/sampl

$1,200.00

INVOICE COPY

TRACE ELEMENTS INC.
460 SOUTH NORTHWEST HIGHWAY • PARK RIDGE, ILLINOIS • 60068 • 312 / 696-2070

JOHN
JOHNE
JEFF
FILE

April 9, 1979

LABORATORY REPORT

#5232

Mr. Don Price
Chemical Waste Management
900 Jorie Blvd.
Oak Brook, Illinois 60521

Samples received
March 21, 1979

[TEI-9405.01] Ohio Liquid Disposal - Pond 4 - North End

[TEI-9405.02] Ohio Liquid Disposal - Pond 4 - South End

[TEI-9405.03] Ohio Liquid Disposal - Pond 4 - Middle

[TEI-9405.04] Ohio Liquid Disposal - Pond Leachate (from Hooker - Niagara Falls, New York)

The three pond samples were very different from any other previously submitted. While previous samples were aqueous, these were organic. Running an infrared spectrum of the 9405.03 sample showed it to be largely alkane hydrocarbon with a small amount of water present. In order to better determine the nature of the hydrocarbons present, a Kovats Indices characterization was done using a 3% OV-1 column programmed from 60 → → → 280° C at 10°/min by GC-FID. This indicated the hydrocarbons to be centered around C_{16} with the major components occuring from C_{12} - C_{19} [boiling range: 215 - 330° C (420 - 625°F)].

These results showed that the samples could not be extracted with organic solvent in the usual manner as the sample itself is organic, and also showed that the boiling range was too high to simply concentrate the sample without losing the components of interest. It was also noted that the samples were too viscous to directly inject. The outcome was to dilute the samples to a less viscous state in a 2% isopropanol: 98% heptane solvent and run the mass spectrum analysis on this solution for the pesticides. The herbicide (2,4,5-T) on the other hand could be extracted from the hydrocarbon in the following manner: Dilute a portion of sample with methylene chloride to reduce viscosity and extract 3 times with alkaline solution. This converts the acid herbicides to their carboxylic salts allowing them to solubilize in the aqueous portion without pulling in much of the hydrocarbon. This solution could then be treated in the usual manner for chlorophenoxy acids in waste water.

The 9405.04 sample was aqueous and could be run in the usual manner following EPA procedures for pesticides and herbicides. The pesticide extraction of this sample was run for a complete gas chromatographic-mass spectrometric analysis and showed components as hydrocarbons, chloroaniline, chloropropiophenone, 2-nitroxylene and many possibly silylated species.

TRACE ELEMENTS INC.
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April 9, 1979

LABORATORY REPORT #5232

Mr. Don Price
Chemical Waste Management
900 Jorie Blvd.
Oak Brook, Illinois 60521

Samples received
March 21, 1979

Sample composition (approximate):

	Aqueous (%)	Hydrocarbon (%)
9405.01	80	20
9405.02	15	85
9405.03	20	80
9405.04	+ 99	-

Results (in ug/ml)	Dieldrin	Endrin	C-56	TCDD	2,4,5-T
9405.01 (aqueous)	< 0.01	< 0.01	< 0.01	< 1.0	- - -
9405.01 (organic)	<10	<10	<10	<50	<10
9405.02	<10	<10	<10	<50	<10
9405.03	<10	<10	<10	<50	<10
9405.04	< 0.01	< 0.01	< 0.01	< 1.0	< 0.01

TRACE ELEMENTS INC.
460 SOUTH NORTHWEST HIGHWAY • PARK RIDGE, ILLINOIS • 60068 • 312 / 696-2070

November 14, 1978 **LABORATORY REPORT** #4840

Mahendra Sandesara
Chemical Waste Management
P.O. Box 214
Calumet City, Illinois 60409

Sample received
Nov. 7, 1978

[TEI-9014]

Even with this technique, the sample was extremely complex. There is a very large amount of low to moderate boiling material. To assure accuracy the following steps were taken:

1) Two columns were used - 25m SE-30 WCOT column and a 18m OV-17 WCOT column.

2) Standards dieldrin and endrin were run to verify retention time. Results are noted in the above table.

3) Multiple ions of each compound were monitored and isotope ratios checked. In the case of C-5,6 - 5 ions were monitored. This required multiple injections.

4) Aldrin was added to the sample to check procedural recovery. This allowed limits of detection to be calculated.

With all these checks, none of the four pesticide residues were detected. Enclosed is one of the chromatograms to illustrate the complexity of this analysis.

Steven P. Capra

TRACE ELEMENTS INC.
460 SOUTH NORTHWEST HIGHWAY • PARK RIDGE, ILLINOIS • 60068 • 312 / 696-2070

November 14, 1978 **LABORATORY REPORT** #4840

RECEIVED
NOV 16 1978
CHEMICAL WASTE MANAGEMEN

Mahendra Sandesara
Chemical Waste Management
P.O. Box 214
Calumet City, Illinois 60409

P.O. #63278

Sample received
Nov. 7, 1978

[TEI-9014] Waste Material N.W. #795

Results

The sample was analyzed for four pesticide residues. None of the four were detected.

Compound	Level of detection
Dieldrin	< 0.005 mg/l
Endrin	< 0.005 mg/l
TCDD	< 0.1 mg/l
C-5,6	< 0.1 mg/l

Procedure

The infrared spectrum was first checked and revealed the sample was in the majority water. Checking, the pH was 1. The sample was neutralized with 10 ml 50% KOH per 100 ml of sample. A heavy precipitate resulted which amounted to 10.5g per 300 ml (3.5% by weight); this precipitate was reddish-brown in color. The supernatant was extracted as for EPA priority pollutants pesticides. This involves extracting 3 times with 60 ml 15% methylene chloride - 85% hexane, concentrating the combined organic fractions to about 20 ml, drying by passing through a Na_2SO_4 Column and finally concentrating to less than 1 ml. Analysis was performed on the HP 5992 GC-MS by monitoring some of the most prominant ions. This allows increased sensitivity with greater selectivity.

Compound	Prominant ions	EPA Retention Time	Observed
C-5,6	237,239,235,95	12.4 min	-
Dieldrin	79,108,263	24.8	24.3 min
Endrin	81, 82, 263	27.4	26.8
TCDD	320, 322	-	-

Ohio Liquid Disposal, Inc.
504 Liberty Street, P. O. Box 628, Fremont, Ohio 43420
Phone 419/332-2688

April 27, 1979

The Honorable Ronald M. Mottl
1232 Longworth House Office Building
Washington, D. C. 20515

Dear Mr. Congressman:

We have received your inquiry of 19 April, 1979 to D. L. Eckhardt concerning our role in the transportation, treatment and disposal of certain waste materials from Hooker Chemical and Plastics Corporation in Niagara Falls, N. Y. I have taken the liberty, on behalf of Mr. Eckhardt, of answering Questions Nos. 1, 2 and 4; it is my understanding that Question 3 will be addressed by our corporate office in Oak Brook, Illinois.

To put the correct light on the answers below, let me begin with a little background concerning our business. Every material that reaches our plant is in some way "hazardous"--that is the nature of our business. As such, these materials are all "potentially injurious to public health", to use your words, by virtue of their chemical characteristics such as corrosivity, toxicity or reactivity, or because they pose environmental hazards to fresh water waterways. It is our business and, indeed, our duty to transport, treat, detoxify and dispose of these materials in the safest possible manner, a practice we have pursued since the treatment plant was begun in 1964.

The Hooker waste materials in question were found to be compatible with our treatment and disposal regimens, determined by sample before we agreed to accept these wastes, and have continued to be so to the present. Each truck load as received is analyzed for certain basic parameters to ensure the constancy of the waste stream. Hooker on its behalf has endeavored also to maintain as little variation as possible in the wastes knowing full well of our policy to refuse to accept waste loads that do not meet the specifications agreed on at the institution of service. We are convinced that Hooker materials received over

the past two years have been handled and disposed of in the most environmentally-sound fashion possible with an absolute minimum of risk to the citizens of Ohio.

Question (1): We have accepted from Hooker the wastes you mentioned, namely the landfill runoff/leachate mix (our code NW-338) and three essentially similar acidic wastes consisting primarily of sulfuric acid (our codes NW-335, 336, 337)

(a)

Waste Number	Service Period	Total Volume (gallons)
NW-335-6-7	Oct. 1976-Present	509,900
NW-338	January 1977-March 1979	4.36 million

(b) Every truck reaching our plant is sampled to determine whether or not the contents is the expected material. In addition, specific detailed analyses are performed on a case-by-case, as-needed basis. In the case of the acids, their sulfuric acid strength ranges from 77-95% with water, iron salts, chlorine, hydrochloric acid and sulfur monochloride as contaminants. Toxicity testing for such a corrosive mixture is obviously redundant. The leachate is an aqueous stream containing inorganic salts and traces of organics that vary in concentration with the season. The toxicity level of the stream as a whole has never been tested. Typical analytical ranges are listed below:

pH 4.0-6.0		Phenol	900-1300 pm
Total solids:	20,000-25,000 ppm	C.O.D.	5000-8000 ppm
Ash	18,000-22,000 ppm	Hexane extractables	200-300 ppm
Sulfate	800- 1,000 ppm	Total Organic Carbon	2300-2600 ppm
Chloride	500- 1,500 ppm		
Specific gravity	1.01-1.03		

(c) In the case of the acid streams, up to 95% of the products are toxic; in the leachate, we estimate a maximum concentration of toxic components of 0.15% (1,500 ppm). Our estimates of total chlorinated hydrocarbons is less than 0.001% (<10 ppm).

Question (2): (a) To my knowledge, the only transporter other than Ohio Liquid Disposal who brings Hooker wastes to our plant is Matlack, Inc.

(b) Both companies use the same route, namely Interstate 90 from Niagara Falls through New York and Pennsylvania into Ohio, then the Ohio Turnpike (I-80) west to Fremont (Exit 6).

(c) Only properly coded vehicles under DOT regulations are allowed to transport these materials. The driver makes a final inspection of his vehicle before leaving Hooker's premises to assure that all hatches are properly bolted down and sealed and that loading valves are tightly closed and safety capped.

Question (4): No new wastes were specifically added to replace the Hooker leachate. As indicated above, the leachate stream was one of a group of aqueous wastes that we from time to time have transported,treated or disposed of for Hooker. The current volume of all such wastes ranges on the average from 25,000-40,000 gallons per month.

I hope this information has been of use to you. If you have any further questions concerning us or our operation, please contact us or the Northwest District office of the Ohio EPA in Bowling Green.

Sincerely yours,

Peter Williamson

Peter Williamson
Regional Technical Director

PW:mk

RONALD M. MOTTL
23RD DISTRICT, OHIO
COMMITTEES
VETERANS' AFFAIRS
SUBCOMMITTEES:
SPECIAL INVESTIGATIONS (CHAIRMAN)
MEDICAL FACILITIES AND BENEFITS
—
INTERSTATE AND FOREIGN COMMERCE
SUBCOMMITTEES:
OVERSIGHT AND INVESTIGATIONS
COMMUNICATIONS

SUBURBAN CAUCUS
FOUNDER AND CO-CHAIRMAN

Congress of the United States
House of Representatives
Washington, D.C. 20515

WASHINGTON OFFICE:
1232 LONGWORTH HOUSE OFFICE BUILDING
TELEPHONE: (202) 225-5731
DISTRICT OFFICES:
2951 FEDERAL OFFICE BUILDING
CLEVELAND, OHIO 44199
TELEPHONE: (216) 522-4382
14812 DETROIT AVENUE, #207
LAKEWOOD, OHIO 44107
TELEPHONE: (216) 522-7152
5393 PEARL ROAD
PARMA, OHIO 44129
TELEPHONE: (216) 888-3636

April 19, 1979

Don Eckhardt, President
Ohio Liquid Disposal, Inc.
504 Liberty Street
Fremont, Ohio 43420

Dear Mr. Eckhardt:

As you may know, the Interstate and Foreign Commerce Subcommittee on Oversight and Investigations has been holding a series of hearings on hazardous waste disposal. Bruce Davis and various other officials representing Hooker Chemical and Plastics Corporation have testified on Hooker's own waste disposal activities in Niagara Falls and other locales across the country.

Ohio Liquid Disposal (OLD) was cited as one disposal service Hooker has employed to handle its waste material. Since some of this waste is potentially injurious to public health, I was immediately alarmed by this revelation.

Therefore, I would like to take this opportunity to pose several questions to you which were left unanswered during these past hearings. I would be most appreciative if your replies are as complete and detailed as possible.

1) I was informed that OLD has been the recipient of Hooker's aqueous wastes and certain by-product acids for approximately two years. This material is leachate, from the Hyde Park lagoon, which contains phenol and other chlorinated hydrocarbons known to be toxic.

   a) What is the total volume of this waste you have handled?

   b) Have you ever taken a sampling of this material, yourself, to determine the chemical composition of this waste being dumped and its level of toxicity?

   c) Could you tell me the quantities of these toxic substances?

2) I understand these wastes have been transported in trucks supplied by Ohio Liquid Disposal and other licensed chemical haulers.

   a) Who are these "other" licensed haulers?

   b) What is the route used to transport these materials?

   c) What sort of precautions are taken to prevent accidental spillage en route?

3) In his testimony, Mr. Davis informed me that Ohio Liquid Disposal has discontinued its handling of this material.

   a) What was the rationale behind this change of mind?

   b) Is Ohio EPA aware of the change?

4) Mr. Davis further mentioned that Hooker is now sending to OLD another substance of a different nature for disposal. If so, what is the chemical composition of this new waste material and in what amounts?

Thank you for your help in this matter. Your prompt response would be greatly appreciated.

Sincerely,

Ron Mottl

RONALD M. MOTTL
Member of Congress

RMM/gkd

April 27, 1979

The Honorable Ronald M. Mottl
1232 Longworth House Office Building
Washington, D. C. 20515

Dear Mr. Congressman:

We have received your inquiry of 19 April, 1979 to D. L. Eckhardt concerning our role in the transportation, treatment and disposal of certain waste materials from Hooker Chemical and Plastics Corporation in Niagara Falls, N. Y. I have taken the liberty, on behalf of Mr. Eckhardt, of answering Questions Nos. 1, 2 and 4; it is my understanding that Question 3 will be addressed by our corporate office in Oak Brook, Illinois.

To put the correct light on the answers below, let me begin with a little background concerning our business. Every material that reaches our plant is in some way "hazardous"--that is the nature of our business. As such, these materials are all "potentially injurious to public health", to use your words, by virtue of their chemical characteristics such as corrosivity, toxicity or reactivity, or because they pose environmental hazards to fresh water waterways. It is our business and, indeed, our duty to transport, treat, detoxify and dispose of these materials in the safest possible manner, a practice we have pursued since the treatment plant was begun in 1964.

The Hooker waste materials in question were found to be compatible with our treatment and disposal regimens, determined by sample before we agreed to accept these wastes, and have continued to be so to the present. Each truck load as received is analyzed for certain basic parameters to ensure the constancy of the waste stream. Hooker on its behalf has endeavored also to maintain as little variation as possible in the wastes knowing full well of our policy to refuse to accept waste loads that do not meet the specifications agreed on at the institution of service. We are convinced that Hooker materials received over

(b) Both companies use the same route, namely Interstate 90 from Niagara Falls through New York and Pennsylvania into Ohio, there the Ohio Turnpike (I-80) west to Fremont (Exit 6).

(c) Only properly coded vehicles under DOT regulations are allowed to transport these materials. The driver makes a final inspection of his vehicle before leaving Hooker's premises to assure that all hatches are proper-
1 ly bolted down and sealed and that loading valves are tightly closed and safety capped.

Question (4): No new wastes were specifically added to replace the Hooker leachate. As indicated above, the leachate stream was one of a group of aqueous wastes that we from time to time have transported,treated or disposed of for Hooker. The current volume of all such wastes ranges on the average from 25,000-40,000 gallons per month.

I hope this information has been of use to you. If you have any further questions concerning us or our operation, please contact us or the Northwest District office of the Ohio EPA in Bowling Green.

Sincerely yours,

Peter Williamson
Regional Technical Director

PW:mk

the past two years have been handled and disposed of in the most environmentally-sound fashion possible with an absolute minimum of risk to the citizens of Ohio.

Question (1): We have accepted from Hooker the wastes you mentioned, namely the landfill runoff/leachate mix (our code NW-338) and three essentially similar acidic wastes consisting primarily of sulfuric acid (our codes NW-335, 336, 337)

(a)

Waste Number	Service Period	Total Volume (gallons)
NW-335-6-7	Oct. 1976-Present	509,900
NW-338	January 1977-March 1979	4.36 million

(b) Every truck reaching our plant is sampled to determine whether or not the contents is the expected material. In addition, specific detailed analyses are performed on a case-by-case, as-needed basis. In the case of the acids, their sulfuric acid strength ranges from 77-95% with water, iron salts, chlorine, hydrochloric acid and sulfur monochloride as contaminants. Toxicity testing for such a corrosive mixture is obviously redundant. The leachate is an aqueous stream containing inorganic salts and traces of organics that vary in concentration with the season. The toxicity level of the stream as a whole has never been tested. Typical analytical ranges are listed below:

pH 4.0-6.0		Phenol	900-1300 pm
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Sulfate	800-11,000 ppm	Total Organic Carbon	2300-2600 ppm
Chloride	500- 1,500ppm		
Specific gravity	1.01-1.03		

(c) In the case of the acid streams, up to 95% of the products are toxic; intthe leachate, we estimate a maximum concentration of toxic components of 0.15% (1,500 ppm). Our estimates of total chlorinated hydrocarbons is less than 0.001% (10 ppm).

Question (2): To my knowledge, the only transporter other than Ohio Liquid Disposal who brings Hooker wastes to our plant is Matlack, Inc.

Attachment O

Berm Stability & Containment Study Reports

April 18, 1983

To: Mr. Gary Brown (CWMI)

From: John F. Clerici, PE
and J.B. Davis

Re: Dike Stability Evaluation

Dear Sir:

Data obtained at the site by other consultants has recently been reviewed. Based on this review Golder Associates believe that a phased approach to the study for the dike stability is now more appropriate.

Therefore, we now recommend doing half of the April 13, 1983, proposed field program. Only if the data obtained warrents will additional field work be performed. Golder Associates will have an experienced engineer on the site to modify the program as required.

GOLDER ASSOCIATES

Very truly yours,

John F. Clerici

John F. Clerici, PE

JC/ja
4-18-83

April 13, 1983

TO: G.R. Brown (CWMI)

FROM: John F. Clerici, P.E. and J.B. Davis

RE: Investigation of Dike Stability
Ohio Liquid Disposal Site

Dear Sirs:

Further to our recent discussions, the following is our proposed investigation program to evaluate the stability of the existing lagoon dikes at the above site.

Field Investigation Program

A. Lagoons 11 and 12

- Four (4) detailed sampled borings through existing dike fill and underlying lacusterine deposits to competent strata or rock. (Estimated total 200 ft. drilling and sampling).

- Four (4) detailed sampled borings through existing dike fill. (Estimated total 80 ft. drilling and sampling).

- In all holes alternating split spoon samples (with standard penetration tests) and thin-walled tube samples will be obtained at not greater than 5 ft. intervals of depth with stress controlled in situ vane tests carried out between samples where applicable.

- Following completion of each hole, piezometers will be installed for groundwater level monitoring purposes. (See sketch attached)

B. Lagoons 5 and 7

- Two (2) detailed sampled borings through existing dike fill and underlying lacusterine deposits to competent strata. (Estimated total 90 ft. of drilling and sampling).

- Six (6) detailed sampled borings through existing dike fill. (Estimated total 72 ft. of drilling and sampling).

- Sampling procedures and piezometer installations as per Lagoons 11 and 12 and attached sketch.

Laboratory Testing Program

- Water content determinations (each sample); estimate 150 tests.

- Atterberg Limit determinations; estimate 20 tests.

- Undrained triaxial compression tests with pore pressure measurement ($\bar{R}$ test); estimate 3 sets.

  Note: Full suite of classification tests (water contents, limits, gradations, specific gravities) to be run on triaxial samples.

Analyses

Initially, circular or non-circular arc stability analyses for undrained conditions will be carried out on typical interior and exterior dike slopes using in situ vane data. Subsequently, effective stress stability analyses will be carried out, if required, on critical sections identified from the initial undrained analyses.

Logistics

It is propsed that field work and laboratory testing (excluding triaxial testing) be carried out by Bowser-Morner Testing Laboratories, Inc. Golder Associates will supervise the field work (and modify as appropriate) and carry out the engineering analyses of the dike stability.

Timing

It is propsed to start the field work on April 18th and estimate that the field work will require about three weeks to complete. It is anticipated that the results of the initial (Undrained) stability analyses will be available within about two weeks of completion of the field work. The results of the effective stress analyses will follow soon after the results of the triaxial compression testing are available.

Please contact us if you have any questions.

GOLDER ASSOCIATES

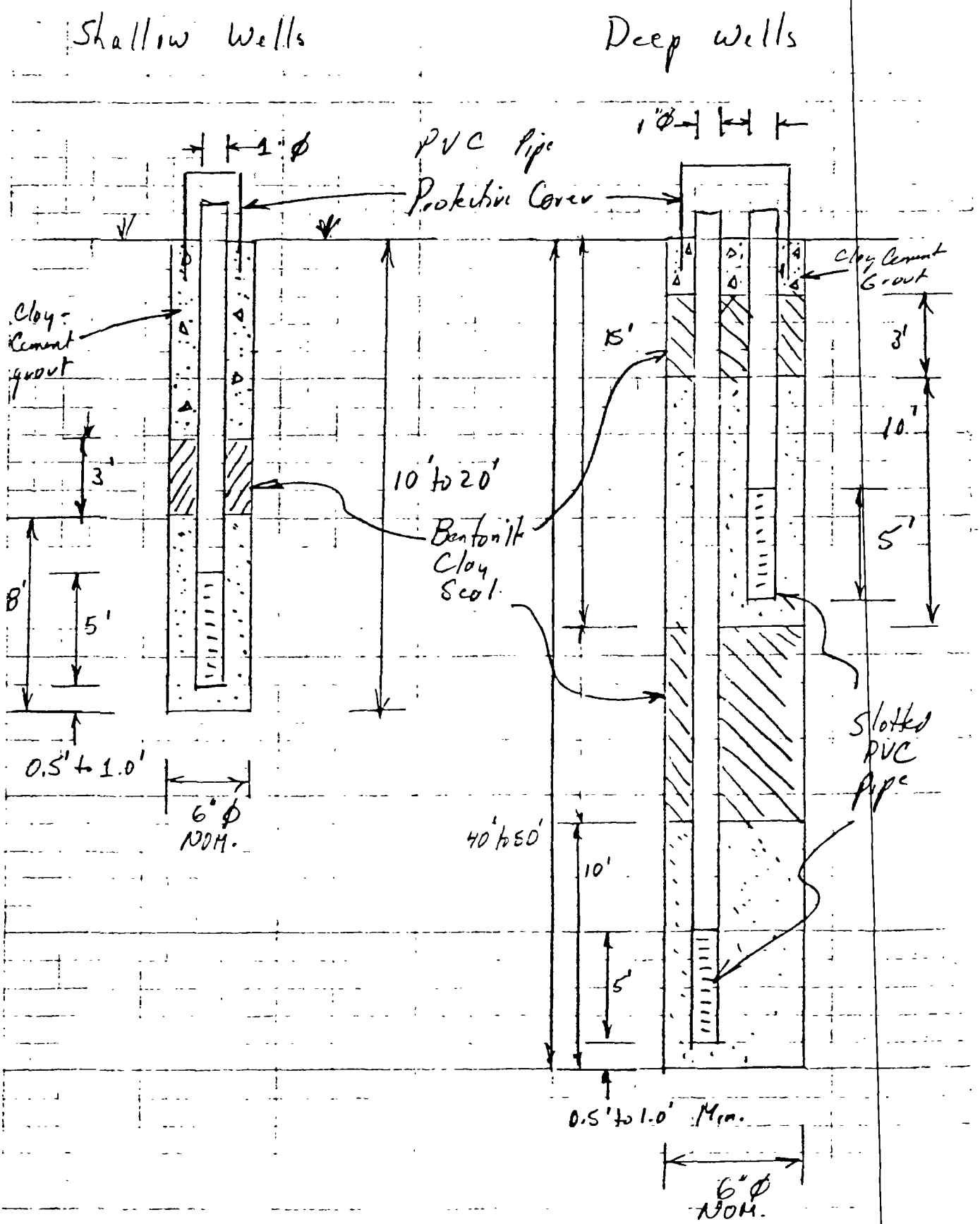
John F. Clerici, P.E.

J.B. Davis

JFC/JBD/dw

Golder Associates	SUBJECT Piezometer Sketch — No 1		
	Job No. 834 1358 Ref.	Made by GJC Checked Reviewed	Date 4/13/83 Sheet of

NTS



Chemical Waste Management Inc.

Containment Study

The purpose of this study is to review the adequacy of the tank area containment dikes. Two storage tank areas are located at the site. The larger area, located on the east side has primary, secondary and tertiary containment ability. The other area, located in the north central portion of the facility has only primary containment capability. Survey of these areas will be made to supplement aerial mapping of the facility. The storage volumes will then be evaluated with respect to federal regulations and the results with any remedial recommendations will be submitted to Chemical Waste Management in a letter report. The evaluation will consider methods to port water from the primary to secondary to tertiary containment areas as required. In addition, recommendations will be made to store additional fluids if required. It is presently anticipated that a letter report concerning the containment area adequacy can be prepared for Chemical Waste Management within a week to ten days of obtaining the survey data.

GOLDER ASSOCIATES

John F. Clerici
4-26-83

I duplicate

Attach C

Chemical Waste Management, Inc.
3003 Butterfield Road
Oak Brook, Illinois 60521
312/654-8800

6.5 million gallons have left the site

April 14, 1983

Mr. Basil G. Constantelos, Director
Waste Management Division
United States Environmental Protection Agency
230 S. Dearborn Street
Chicago, Illinois 60604

million: 98% to Industrial Burning

Dear Mr. Constantelos:

Attached are two lists of customers to whom Chemical Waste Management has supplied oil from its oil reclamation operations at the Ohio Liquid Disposal facility, Vickery, Ohio, and its facility at Springfield, Ohio. These lists are thought to be complete and the volumes of oil have been derived from company records. The usage reported on the sheet is as reported to us by the customers either through phone or personal contact or as derived from company records.

As we have stated before, the reclaimed product from O.L.D. has primarily gone to industrial fuel utilization; approximately 98% of the total 6.5M gallons.

Again, we consider these lists to be confidential in our transmittal to you.

Sincerely yours,

CHEMICAL WASTE MANAGEMENT, INC.

George Vander Velde

cc: Mr. Robert H. Maynard

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CHEMICAL WASTE MANAGEMENT, INC.
VICKERY, OHIO
OIL SHIPPED OFF-SITE
5-80 Through 3-83

AL-CAT Petroleum
11636 Champaign Street
Warren, Michigan 48089
313-827-8579 Bill Katzstein
Use: Blended into fuel stock
Volume: 4-81 through 5-81, 70,449 gallon

Allied Oil Co.
Cleveland, Ohio
216-771-3400 Mike Swan
Use: Blended into fuel for open hearth s
Volume: 1-80 through 10-82, 1,512,948 gal

Beck Suppliers
1000 North Front Street
Fremont, Ohio 43420
419-332-5527 Harry Beck
Use: Blended for use as fuel
Volume: 6-82 through 7-82, 89,090 gallons

Bowling Green Street Department
Bowling Green, Ohio
419-352-0067 Dave Barber
Use: Unknown (Barber is checking)
Volume: 6-81, 1,709 gallons

Can-Am
Box 40
Breslau, Ontario NOB 1MO
519-648-2226 Murry Crispin
Use: Solvents used as fuel for coke ovens
Volume: 1-80 through 5-80, 1,421 gallons

Cantrell Oil
626 North Fifth Street
Fremont, Ohio 43420
419-332-0901 Charles Cantrell
Use: Resold as fuel
Volume: 6-81 through 7-81, 13,794 gallons

Chemical Waste Management, Inc.
3106 Snyder-Domer Road
Springfield, Ohio 45002
513-969-8346 Rick Tighe
Use: Fuel for asphalt plants and drying kilns
(See attached customer list from CWM, Springfield, Ohio)
Volume: 5-81 through 10-82, 783,761 gallons

JAN/80 3/83

attachment B.7 - First Analytical Results - claimed confidential

maybe a used oil

will share info

Dames & Moore has sampled

NEED TO DO PCB INSP. ASAP

4/14/83

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Cresent Chemical
Main Street
Weston, Ohio 43569
419-669-2041 George Beatty
Use: Blended into product used as concrete form release oil
Volume: 5-80, 3,803 gallons

Erie Blacktop
P.O. Box 2351
Sandusky, Ohio 44870
419-588-2618 Dean Wycol
Use: Fuel for asphalt mfg.
Volume: 1-80 through 10-82, 87,880

Fluid Engineering
2500 New York Avenue
Whiting, Indiana 43694
219-932-9000 Jim Salmon
Use: Blended for use as fuel for open hearth steel furnaces and coke ovens
Volume: 12-81 through 1-82 52,652 gallons

Henry Packing
924 Fremont Pike
Perrysburg, Ohio 43551
419-874-4369 Ron Henry
Use: Fuel for industrial boiler
Volume: 7-80 through 1-83 49,939 gallons

J. E. Baker
3964 County Road #41
Millersville, Ohio 43448
419-638-2511
Use: Fuel for drying kiln and coating for RR cars
Volume: 1-81 through 1-83 68,217 gallons

Keenan Oil
2350 Seymour Avenue
Cincinnati, Ohio 45200
513-631-2900 Tim Wolfe
Use: Blended into fuel
Volume: 1-80 through 4-80, 36,007 gallons

Kopper's
2401 Front Street
Toledo, Ohio 43605
Bill Thompson
Use: Fuel for coke oven
Volume: 1-80 through 4-80, 393,214 gallons

4/14/83

CONFIDE...

Matco
P.O. Box 29
Maumee, Ohio 43557
419-893-7645 Jim Menges
Use: Fuel for asphalt plant
Volume: 6-80 through 6-82, 102,189 gallons

Michigan Petroleum
13650 Helen Street
Detroit, Michigan 48089
313-827-8579 John Picci
Use: Cutting Oil
Volume: 1-81 through 3-81 103,280 gallons

Ohio Road Paving
204 Strub Road
Sandusky, Ohio 44870
419-626-4067 Bob Huff
Use: Used as fuel for asphalt plant
Volume: 1-80 through 8-80 128,990 gallons

Reserve Petroleum
1386 Old Free Port Road
Pittsburgh, PA 15238
412-781-5200 Don Smith
Use: Used as blend for fuel
Volume: 12-81 through 1-83, 1,638,254 gallons

Sandusky Speedway
614 W. Perkins Avenue
Sandusky, Ohio 44870
419-625-4084 Dick Decker
Use:
Volume: 5-80 985 gallons

per G. Vanderwende PCB sample non detectable (2 ppm) as of 4/13/83

Probably roadoiling per J Miller 4/14/83

United Asphalt - Temp plant, no longer exists
3052 Route 20
Ashtabula, Ohio 44044
NO LISTING Dick Shelley
Use: Fuel for asphalt plant
Volume:

Wiseman Oil
Fort Pitt Federal Bldg.,524 Penn Av.
Pittsburgh, Pa. 15222
412-262-9290
Use: Blended into fuel stock
Volume: 11-80 through 8-81, 1,368,087 gallons

* Based on combination of company records and telephone calls representations are made to the complete accuracy of the inf

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Tank Leasing

Tank was leased from CWM for oil storage only. Only new product was stored in leased tank.

National Machine
P.O. Box 747
Tiffin, Ohio 44884
419-447-5211
Use:
Volume:

4/14/83

Ohio Liquid Disposal, Inc.
Northern Ohio Treatment Facility
3956 State Route 412, Vickery, Ohio 43464
Phone 419/547-7791

February 12, 1980

Mr. John L. Deering
Division of Industrial Wastewater
Ohio EPA
361 E. Broad Street, Box 1049
Columbus, Ohio 43216

Dear John,

In this letter I will summarize the information you requested in your letter of January 22, 1980.

Attached you will find an updated "Figure 1" which locates the lagoons at our Vickery disposal site. On September 11, 1975, Ohio Liquid Disposal, Inc. was issued a permit to install a Lime Neutralization Pretreatment Facility (Application #03-282). Pond 6W was a holding basin for treated material from this facility which was to be disposed of at the Fremont City Sewer Works. Since this activity has been abandoned and the Treatment Plant Facility placed in another service, Pond 6W will be closed during the summer of 1980.

To further clarify the situation and function of the Pond identified as "7/8" on our 1971 survey map, please refer to the enclosed survey map, revised 1979. During the summer of 1972, the dike walls of Ponds 4, 5, 7 and 8 were all raised two feet. These modifications did not include the partition dike between Ponds 7 and 8 which was actually lowered. In seven years the dike has disintigrated and lost all function as a barrier. Since that construction, the area previously identified as Ponds 7 and 8 has been referenced as Pond 7. No new topo map was made until the one completed in 1979. (See enclosure)

With respect to your comment regarding the permit language "a manner approved by the Ohio EPA" for reclamation of lagoons, I offer the following:

001831

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4182

I. Closure Schedule

Lagoon No.	Date of Completed Closure & Reclamation
1	October 15, 1980
2	September 1, 1979
3	October 30, 1977
4	March 30, 1983
5	None
6E	October 30, 1979
6W	September 1, 1980
7	None
9	January 30, 1981
10	May 30, 1981
11	None
12	June 30, 1984

II. Manner of Closure and Reclamation

All ponds are removed from service by halting any introduction of waste material to them. Reclamation begins with the removal of liquids and sludges.

In the past, the liquids were processed through remaining lagoons and ultimately directed to the deepwell disposal system. This method has had reasonable success and we expect to continue it. The sludges, however, were removed and placed in another pond which was still in service. Soil was trucked to the site from the surrounding communities to be used for final reclamation of the pond being closed. The high cost of this method is reflected in the high fuel consumption for transportation. It is also dependent upon the availability of these soils.

On June 5, 1979, Ohio Liquid Disposal, Inc. submitted an application for a Permit to Install a "Pug Mill System". This is to be used to encapsulate sludges in Pond 9 and use them for the ultimate reclamation of that pond as a substitute for purchased soils. It will also provide an environmentally secure matrix for the final disposition of these sludges. This Permit was granted on February 1, 1980.

I have enclosed a copy for Mr. Bennett Chambers' report on this application. The system will be throughly tested. We are hopeful that if this process proves successful, we may

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be able to utilize it for the reclamation of other ponds scheduled for closure.

Finally, in response to your request for a date for achieving capability to report volume injected into individual wells, it would appear that we may accomplish that task by November 1, 1980. The Clampitron Corporation has an instrument which, it claims, will work for high-pressure injection monitoring to each well. The cost of this meter is approximately $7,500. It will allow us to take several readings (GPM) on each well per week and calculate the volume but does not provide for strip-chart continual monitoring. If this is acceptable to your office, please advise me and we shall proceed with the purchase of such an instrument.

In the meantime, I would like to extend an invitation to you and your staff to visit the facility in Vickery and view for yourself the progress being made on the Pond Closure and Reclamation schedule.

Sincerely,

OHIO LIQUID DISPOSAL, INC.

Peter Miller

Peter G. Miller
Plant Manager

PGM/dw
cc: Francis Sidoti

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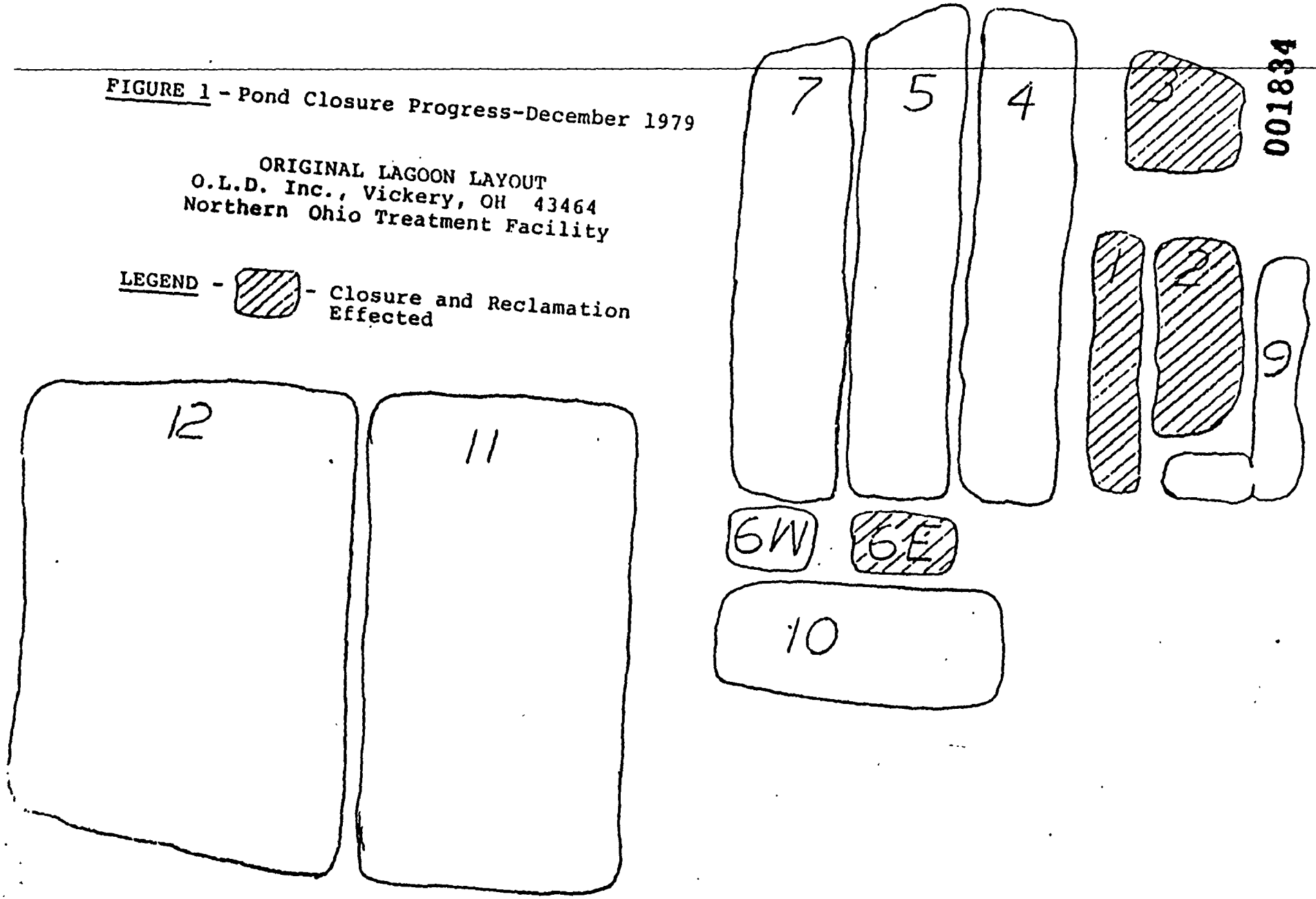
FIGURE 1 - Pond Closure Progress-December 1979

ORIGINAL LAGOON LAYOUT
O.L.D. Inc., Vickery, OH 43464
Northern Ohio Treatment Facility

LEGEND - - Closure and Reclamation Effected



001834

4185

BU SHAWL

Ohio Liquid Disposal, Inc.
504 Liberty Street, P. O. Box 628, Fremont, Ohio 43420
Phone 419/332-2688

RECEIVED
AUG 16 1978
Ohio Environmental Protection Agency
NORTHWEST DISTRICT

August 14, 1978

Mr. Kenneth Kerik, Commissioner
Board of Sandusky County
General Health District
108 S. Park Avenue
Fremont, Ohio 43420

Dear Mr. Kerik:

As I promised in my letter of 31 July, 1978, I am submitting herein an update report on the activities of Ohio Liquid Disposal, Inc., at its Northern Ohio Treatment Facility in Riley Township, Sandusky County. This letter summarizes our efforts during the period September 1, 1977, through July 31, 1978.

1. General Plant Development

   A. During the past 11 months, our operations have steadily increased in scope as is expected given the increase in regulatory pressure aimed at better environmental control of hazardous industrial wastes. To meet the need, we have added field personnel to provide at least two men on the plant per shift, 24 hours a day, seven days a week. This provides added personal safety and better environmental control. In addition to operating personnel, we have added two degreed chemists to our laboratory staff, thus increasing our ability to perform quality analyses on waste receipts, ground and surface waters, processed waste materials and injected liquids. We will soon be adding a third chemist to cover the lab at night.

12726 Confidential

B. The maintenance facility described in our previous report as being under construction has been finished. All our plant vehicles, pumps and other operating equipment can now be properly maintained and repaired. The building also serves as a parts and spare storage location, allowing us to inventory parts for immediate repair in the event of an equipment malfunction. The area is under the control of a full-time maintenance supervisor and his assistant who are responsible for total plant preventative maintenance as well.

C. Final drawings are now being approved for an addition to our laboratory facilities. A new wing with 1500 sq. ft. of lab space will be constructed this fall. The expansion will be used to house the sophisticated instruments needed for the detailed analyses now required by the regulatory agencies. This addition is in keeping with our aim to provide the best possible facilities for protection of the environment from contamination by industrial waste products.

D. As you know from previous reports and your site visit last year, we are following a program of pond elimination on the plant. The attached Figure 1 is a schematic of the pond layout at its most extensive, indicating the progress we have made in eliminating them. Pond 6, as you recall, was closed and restructured into a processing unit. Pond 3 was removed from service in 1976 and finally closed in October, 1977. Ponds 1 and 2 were removed from service in September, 1977, and are being closed now. We expect at least to finish closing Pond 1 prior to winter; final closure of Pond 2 may not be possible until early next year.

The next Ponds we will attack are Nos. 12 and

9. Pond 12, the largest of all, collects the most rainfall, so it is to our advantage to eliminate this basin as soon as possible. To this end we have constructed and installed a floating pump system to transfer the fluid from Pond 12 back to No. 11, the surge pond for the injection wells, for subsurface disposal. At our present injection rates we are faced with 4 to 4.5 years of transfer pumping before Pond 12 will be empty.

Pond 9 is our sludge and semisolids holding area, designed as a location for dewatering lime - gypsum - iron hydroxide slurries prior to final disposition. We are presently stabilizing some of these dewatered sludges with earth and depositing the mixture into the bottom of Pond 1 as fill. The total sludge volume will be reduced by summer's end and the system renovated. We are presently evaluating our long-term programs with respect to sludge disposal and hope to be able to restrict the use of Pond 9 by next summer.

2. Oil Recovery System

A. This system has functioned well in the past year with one exception: as an aftermath of the power loss occasioned by the blizzard of late January, we lost much of the PVC piping in the unit to freezing. We returned to operation by mid-February, but only with temporary piping replacements. During June and July a final restructuring of all external piping was made, replacing all plastic with stainless steel and installing heat tracing and insulation. The system is now fully capable of operating in all but the most severe blizzard conditions. The results of the past 11 months oil recovery efforts are listed in Table I and show that 1.8 million gallons of oil has been removed from the wastes processed through our plant, thus greatly reducing the amount of hydrocarbon present on the surface of our ponds.

001808

12728

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B. In keeping with our effort to reduce by hydrocarbon emissions, we have installed two new loading racks for filling tank trucks with stored oil. This equipment minimizes the chance of an oil spill during loading and provides more efficient, cleaner operations with less vapor loss.

C. As of this writing the surfaces of our two primary receiving ponds (pond nos. 4 and 5) are covered with floating sludges, although this has not been the usual condition. Careful attention to skimming free oil this spring kept the ponds relatively hydrocarbon free, thus minimizing the fugitive vapors. However, since July 1, the liquids generated by manipulating the sludges from Ponds 1 and 2 have been pumped to Pond 4, creating a heavy sludge blanket which we are working on daily. This, when added to the action of backhoe and drag line on the ancient sludges, has increased the fugitive hydrocarbon markedly this past month; however, none of these odors are of the noxious sulfide-mercaptan variety, but merely a temporary increase in the smell of oil.

3. Pretreatment and Redox System

A. Since our last report, we have converted our acid neutralization ("pretreatment") system to a completely enclosed chemical processing unit capable of treating certain toxic, reactive, or malodorous wastes to a point where they may be blended into our existing acidic wastes destined for the injection wells. In addition, we have retained the neutralization and sludge removal capability of the original system. The present process is capable of using waste chromic acid, hypochlorite ion or hydrogen peroxide as

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the oxidant although the latter is the preferred reagent. Typical hazardous and/or odorous species treated in this manner include sulfides, mercaptans, formaldehyde, acrylonitrile, cyanides, acrylate esters, etc. During this report period, we have treated 447,000 gallons in this fashion with the capability of reaching 10,000 gallons per day when new oxidant storage facilities, now under way, are completed.

4. Industrial Waste Disposal Well System

A. From Table I, you can see that the 4-well injection system currently in operation has been functioning well, averaging about 4.3 million gallons injected per month over the report period. The variations on a month to month basis are due to several factors such as power outages, equipment or instrument malfunction, routine maintenance and so on. These problems normally will curtail operations only for a day or two per month. However, as occured in April, 1978, there has been and will continue to be scheduled shut-downs for detailed examination of one or more wells. In that month, two wells were shut-down for the entire month for logging and some remedial activities, thus resulting in the low monthly injection volume. These shut-downs are absolutely required to ensure the integrity of the system and have been calculated into our annual operating estimates.

B. As you know, we have been operating our well system under the permits issued by the Division of Oil and Gas of the State Department of Natural Resources. The new State of Ohio Environmental Protection Agency permits, applied for in June 1976, have been drafted and reviewed by all interested parties, but not yet acted on by the Director of the OEPA. The reason

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for this is clear: the Sandusky County Board of Health has requested a Public Hearing on the Permits and the Director has yet to determine what course to follow.

It is our feeling that a Hearing will not be helpful to any of the parties involved for several reasons. First, since all the specific permit conditions your Board has requested have been included in the Permits already, no good purpose can be served by rehashing them again. Secondly, the Hearing process will delay permit issuance by at least 90 days, well into the start of winter. This will materially affect our ability to begin a stepped-up lagoon elimination program until the following spring. Thirdly, the new permit program will allow us to dispose of our stored waste liquids at a considerably higher rate than at present, thus speeding up the volume reduction your Board and we desire so much. Concomitant with volume reduction, of course, is a reduction in the fugitive vapor and odor problem. And finally, as soon as the Permits are granted, the Board of Health will begin to receive monthly reports on plant receipts, injection well operations and ground water monitoring data, all information that the Board is anxious to have. For these reasons, we respectfully suggest that your request for a Public Hearing be withdrawn.

5. Inventory Volume Reduction

A. Much discussion has been heard relative to the reduction of our stored plant wastes in our holding pond system. Table I lists by month the net reduction of inventoried wastes for the period covered in this report. As you can see, we have decreased our inventory in 10 of 11 months, the one occasion where this did not happen coming during a scheduled well shut-down. The average reduction was about 1.3 million gallons per month or about 15 million gallons per year, a figure we know we can maintain. However, under the new Permits when granted, the annual reduction should easily double, which supplies the most cogent reason for speeding up the Permit process.

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I hope this Report provides you and the Board of Health the information you require to judge accurately our progress. Please let me know if I can be of any further service to you.

Sincerely yours,

Peter Williamson

Peter Williamson
Vice-President & General Manager

PW:mk

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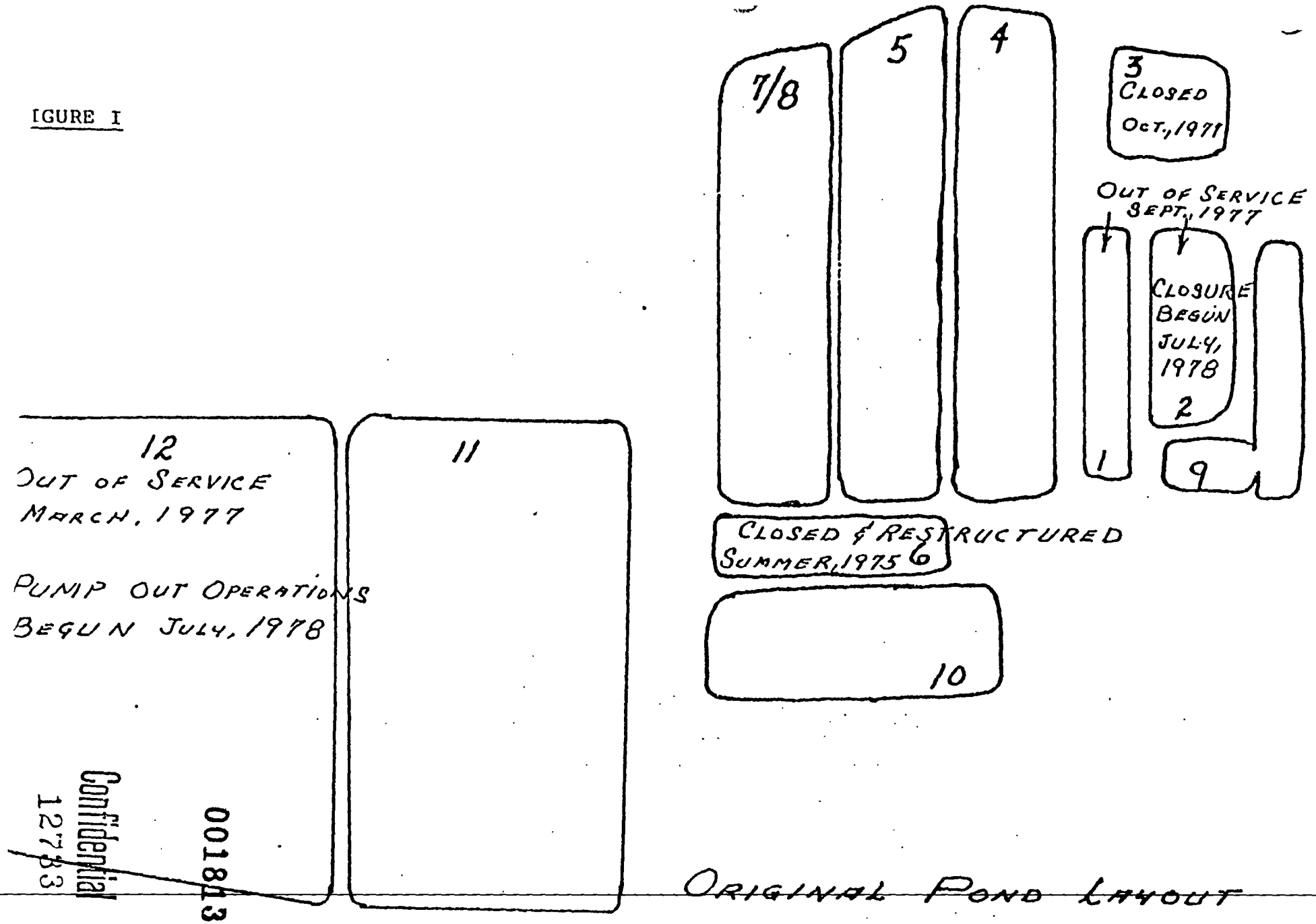
IGURE I



ORIGINAL POND LAYOUT

O. L. D. INC. VICKERY OH. 43464

NORTHERN OHIO TREATMENT FACILITY

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