Fisher Guide

Division of General Motors Corporation

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U.S. EPA, REGION V

Part "B" Application Hazardous Waste Facility Permit

ELYRIA PLANT
ELYRIA, OHIO

NOVEMBER 8, 1985

COPY 1

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Please print or type in the unshaded areas only
(fill–in areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved OMB No. 158-R0175

FORM 1 GENERAL

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

GENERAL INFORMATION

Consolidated Permits Program

(Read the "General Instructions" before starting.)

I. EPA I.D. NUMBER

F O H D 9 9 0 7 7 8 6 8 0

LABEL ITEMS

I. EPA I.D. NUMBER

III. FACILITY NAME

V. FACILITY MAILING ADDRESS

VI. FACILITY LOCATION

PLEASE PLACE LABEL IN THIS SPACE

GENERAL INSTRUCTIONS

If a preprinted label has been provided, affi: it in the designated space. Review the inform ation carefully; if any of it is incorrect, cros through it and enter the correct data in th appropriate fill–in area below. Also, if any o the preprinted data is absent *(the area to th left of the label space lists the informatio that should appear)*, please provide it in th proper fill–in area*(s)* below. If the label i complete and correct, you need not complet Items I, III, V, and VI *(except VI-B whic must be completed regardless)*. Complete a items if no label has been provided. Refer t the instructions for detailed item descrip tions and for the legal authorizations unde which this data is collected.

II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold–faced terms.

SPECIFIC QUESTIONS	MARK 'X' YES	MARK 'X' NO	MARK 'X' FORM ATTACHED
A. Is this facility a **publicly owned treatment works** which results in a **discharge** to **waters of the U.S.**? (FORM 2A)		X	
C. Is this a facility which currently results in **discharges** to **waters of the U.S.** other than those described in A or B above? (FORM 2C)	X		NA
E. Does or will this facility treat, store, or dispose of **hazardous wastes**? (FORM 3)	X		X
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)		X	
I. Is this facility a proposed **stationary source** which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)		X	

SPECIFIC QUESTIONS	MARK 'X' YES	MARK 'X' NO	MARK 'X' FORM ATTACH
B. Does or will this facility *(either existing or proposed)* include a **concentrated animal feeding operation** or **aquatic animal production facility** which results in a **discharge** to **waters of the U.S.**? (FORM 2B)		X	
D. Is this a proposed facility *(other than those described in A or B above)* which will result in a **discharge** to **waters of the U.S.**? (FORM 2D)		X	
F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)		X	
H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)		X	
J. Is this facility a proposed **stationary source** which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)		X	

III. NAME OF FACILITY

1 SKIP G M C F I S H E R G U I D E D I V E L Y R I A P L A N T

IV. FACILITY CONTACT

A. NAME & TITLE *(last, first, & title)*	B. PHONE *(area code & no.)*
2 L U C A S J A PLANT ENGINEER	2 1 6 3 2 9 1 2 5 0

V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX

3 P O B O X 4 0 2 5

B. CITY OR TOWN	C. STATE	D. ZIP CODE
4 E L Y R I A	O H	4 4 0 3 6

VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER

5 1 4 0 0 L O W E L L S T

B. COUNTY NAME

L O R A I N

C. CITY OR TOWN	D. STATE	E. ZIP CODE	F. COUNTY CODE *(if known)*
6 E L Y R I A	O H	4 4 0 3 6	

CONTINUED FROM THE FRONT

VII. SIC CODES (4-digit, in order of priority)

A. FIRST	B. SECOND
3714 (specify) AUTOMOTIVE COMPONENTS MFG.	(specify)
C. THIRD	**D. FOURTH**
(specify)	(specify)

VIII. OPERATOR INFORMATION

A. NAME: GMC FISHER GUIDE DIV ELYRIA PLANT

B. Is the name listed in Item VIII-A also the owner? [X] YES [ ] NO

C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.)
F = FEDERAL, S = STATE, P = PRIVATE, M = PUBLIC (other than federal or state), O = OTHER (specify)
P (specify)

D. PHONE (area code & no.): A 216 329 1000

E. STREET OR P.O. BOX: PO BOX 4025

F. CITY OR TOWN	G. STATE	H. ZIP CODE
ELYRIA	OH	44036

IX. INDIAN LAND

Is the facility located on Indian lands? [ ] YES [X] NO

X. EXISTING ENVIRONMENTAL PERMITS

A. NPDES (Discharges to Surface Water): N S-301*BD	D. PSD (Air Emissions from Proposed Sources): P NA
B. UIC (Underground Injection of Fluids): U NA	E. OTHER (specify): 1947040038 (specify) OHIO EPA, LIST ATTACHED
C. RCRA (Hazardous Wastes): R NA	E. OTHER (specify): (specify)

XI. MAP

Attach to this application a topographic map of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in the map area. See instructions for precise requirements.

XII. NATURE OF BUSINESS (provide a brief description)

The General Motors Corp., Fisher Body Div., Elyria Plant is a Manufacturer of Finished Automotive Hardware and Bright Trim. Necessary Maintenance and Toolroom functions are also operated at this location. Products produced at Fisher - Elyria include Steel and Aluminum Hinge Sub-assemblies, Sun Roof Sub-assemblies, Miscellaneous Small Steel Parts, Trim and Mechanical Parts of various Thermoplastics (uncoated and/or painted), and Foam Urethane Seat Back and Cushion Cores.

XIII. CERTIFICATION (see instructions)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME & OFFICIAL TITLE (type or print)	B. SIGNATURE	C. DATE SIGNED
GENERAL MANAGER	R J McKee	11-7-85

COMMENTS FOR OFFICIAL USE ONLY

Please print or type in the unshaded areas only
(fill—in areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved OMB No. 158-S80004

FORM 3 RCRA

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

HAZARDOUS WASTE PERMIT APPLICATION

Consolidated Permits Program

(This information is required under Section 3005 of RCRA.)

I. EPA I.D. NUMBER: F O H D 9 9 0 7 7 8 6 8 0

FOR OFFICIAL USE ONLY

APPLICATION APPROVED	DATE RECEIVED (yr., mo., & day)	COMMENTS

II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below *(mark one box only)* to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA I.D. Number, or if this is a revised application, enter your facility's EPA I.D. Number in Item I above.

A. FIRST APPLICATION *(place an "X" below and provide the appropriate date)*

[X] 1. EXISTING FACILITY *(See instructions for definition of "existing" facility. Complete item below.)*

FOR EXISTING FACILITIES, PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED *(use the boxes to the left)*: YR. 46, MO. 12, DAY NA

[ ] 2. NEW FACILITY *(Complete item below.)*

FOR NEW FACILITY PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR IS EXPECTED TO BEGIN: YR. MO. DAY

B. REVISED APPLICATION *(place an "X" below and complete Item I above)*

[ ] 1. FACILITY HAS INTERIM STATUS

[ ] 2. FACILITY HAS A RCRA PERMIT

III. PROCESSES – CODES AND DESIGN CAPACITIES

A. PROCESS CODE — Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are provided for entering codes. If more lines are needed, enter the code(s) in the space provided. If a process will be used that is not included in the list of codes below, then describe the process *(including its design capacity)* in the space provided on the form *(Item III-C).*

B. PROCESS DESIGN CAPACITY — For each code entered in column A enter the capacity of the process.

1. AMOUNT — Enter the amount.
2. UNIT OF MEASURE — For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Storage:		
CONTAINER *(barrel, drum, etc.)*	S01	GALLONS OR LITERS
TANK	S02	GALLONS OR LITERS
WASTE PILE	S03	CUBIC YARDS OR CUBIC METERS
SURFACE IMPOUNDMENT	S04	GALLONS OR LITERS
Disposal:		
INJECTION WELL	D79	GALLONS OR LITERS
LANDFILL	D80	ACRE-FEET *(the volume that would cover one acre to a depth of one foot)* OR HECTARE-METER
LAND APPLICATION	D81	ACRES OR HECTARES
OCEAN DISPOSAL	D82	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	D83	GALLONS OR LITERS

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Treatment:		
TANK	T01	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	T02	GALLONS PER DAY OR LITERS PER DAY
INCINERATOR	T03	TONS PER HOUR OR METRIC TONS PER HOUR OR GALLONS PER HOUR OR LITERS PER HOUR
OTHER *(Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Item III-C.)*	T04	GALLONS PER DAY OR LITERS PER DAY

UNIT OF MEASURE	UNIT OF MEASURE CODE	UNIT OF MEASURE	UNIT OF MEASURE CODE	UNIT OF MEASURE	UNIT OF MEASURE CODE
GALLONS	G	LITERS PER DAY	V	ACRE-FEET	A
LITERS	L	TONS PER HOUR	D	HECTARE-METER	F
CUBIC YARDS	Y	METRIC TONS PER HOUR	W	ACRES	B
CUBIC METERS	C	GALLONS PER HOUR	E	HECTARES	Q
GALLONS PER DAY	U	LITERS PER HOUR	H		

EXAMPLE FOR COMPLETING ITEM III *(shown in line numbers X-1 and X-2 below):* A facility has two storage tanks, one tank can hold 200 gallons and the other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

S: C DUP T/A: C 1

LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT (specify)	B. 2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY	LINE NUMBER	A. PROCESS CODE (from list above)	B. 1. AMOUNT	B. 2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY
X-1	S02	600	G		5				
X-2	T03	20	E		6				
1	T02	60,000	U		7				
2	T04	110	U		8				
3	S01	9,000	G		9				
4	S04	40,000	Y		10				

CONTINUE ON REVERSE

Continued from the front.

III. PROCESSES *(continued)*

C. SPACE FOR ADDITIONAL PROCESS CODES OR FOR DESCRIBING OTHER PROCESSES *(code "T04")*. FOR EACH PROCESS ENTERED HERE INCLUDE DESIGN CAPACITY.

T04 - 110 Gal/Day TDI Reaction - Decontamination.

IV. DESCRIPTION OF HAZARDOUS WASTES

A. **EPA HAZARDOUS WASTE NUMBER** — Enter the four—digit number from 40 CFR, Subpart D for each listed hazardous waste you will handle. If you handle hazardous wastes which are not listed in 40 CFR, Subpart D, enter the four—digit number*(s)* from 40 CFR, Subpart C that describes the characteristics and/or the toxic contaminants of those hazardous wastes.

B. **ESTIMATED ANNUAL QUANTITY** — For each **listed waste** entered in column A estimate the quantity of that waste that will be handled on an annual basis. For each **characteristic** or **toxic contaminant** entered in column A estimate the total annual quantity of all the non—listed waste*(s)* that will be handled which possess that characteristic or contaminant.

C. **UNIT OF MEASURE** — For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate codes are:

ENGLISH UNIT OF MEASURE	CODE
POUNDS	P
TONS	T

METRIC UNIT OF MEASURE	CODE
KILOGRAMS	K
METRIC TONS	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

D. **PROCESSES**

1. PROCESS CODES:
   For listed hazardous waste: For each **listed** hazardous waste entered in column A select the code*(s)* from the list of process codes contained in Item III to indicate how the waste will be stored, treated, and/or disposed of at the facility.
   For non—listed hazardous wastes: For each characteristic or toxic contaminant entered in column A, select the code*(s)* from the list of process codes contained in Item III to indicate **all** the processes that will be used to store, treat, and/or dispose of all the non—listed hazardous wastes that possess that characteristic or toxic contaminant.
   Note: Four spaces are provided for entering process codes. If more are needed: (1) Enter the first three as described above; (2) Enter "000" in the extreme right box of Item IV-D(1); and (3) Enter in the space provided on page 4, the line number and the additional code*(s)*.

2. PROCESS DESCRIPTION: If a code is not listed for a process that will be used, describe the process in the space provided on the form.

NOTE: HAZARDOUS WASTES DESCRIBED BY MORE THAN ONE EPA HAZARDOUS WASTE NUMBER — Hazardous wastes that can be described by more than one EPA Hazardous Waste Numbers shall be described on the form as follows:

1. Select one of the EPA Hazardous Waste Numbers and enter it in column A. On the same line complete columns B,C, and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.
2. In column A of the next line enter the other EPA Hazardous Waste Number that can be used to describe the waste. In column D(2) on that line enter "included with above" and make no other entries on that line.
3. Repeat step 2 for each other EPA Hazardous Waste Number that can be used to describe the hazardous waste.

EXAMPLE FOR COMPLETING ITEM IV *(shown in line numbers X-1, X-2, X-3, and X-4 below)* — A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operation. In addition, the facility will treat and dispose of three non—listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
X-1	K 0 5 4	900	P	T 0 3 D 8 0	
X-2	D 0 0 2	400	P	T 0 3 D 8 0	
X-3	D 0 0 1	100	P	T 0 3 D 8 0	
X-4	D 0 0 2				*included with above*

CONTINUE ON PA

Continued from page 2.

NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W O H D 9 9 0 7 7 8 6 8 0 — T/A: 1	W DUP — T/A: 2 — DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	D003	2	T	T04 S01	
2	F001	6	T	S02 S01	
3	F002	20	T	S01	
4	F006	4000	T	T02 S04	
5					
6					
7					
8					
9					
10					
11					
12					
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14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					

EPA Form 3510-3 (6-80)

CONTINUE ON REV

(enter "A", "B", "C", etc. behind the "3" to identify photocopied pages)

Continued from the front.

IV. DESCRIPTION OF HAZARDOUS WASTES *(continued)*

E. USE THIS SPACE TO LIST ADDITIONAL PROCESS CODES FROM ITEM D(1) ON PAGE 3.

EPA I.D. NO. *(enter from page 1)*

S F | T/A | C 6

V. FACILITY DRAWING

All **existing** facilities must include in the space provided on page 5 a scale drawing of the facility *(see instructions for more detail).*

VI. PHOTOGRAPHS

All existing facilities must include photographs *(aerial or ground—level)* that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas *(see instructions for more detail).*

VII. FACILITY GEOGRAPHIC LOCATION

LATITUDE *(degrees, minutes, & seconds)*	LONGITUDE *(degrees, minutes, & seconds)*

VIII. FACILITY OWNER

☐ A. If the facility owner is also the facility operator as listed in Section VIII on Form 1, "General Information", place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VIII on Form 1, complete the following items:

1. NAME OF FACILITY'S LEGAL OWNER	2. PHONE NO. *(area code & no.)*
E	

3. STREET OR P.O. BOX	4. CITY OR TOWN	5. ST.	6. ZIP CODE
F	G		

IX. OWNER CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

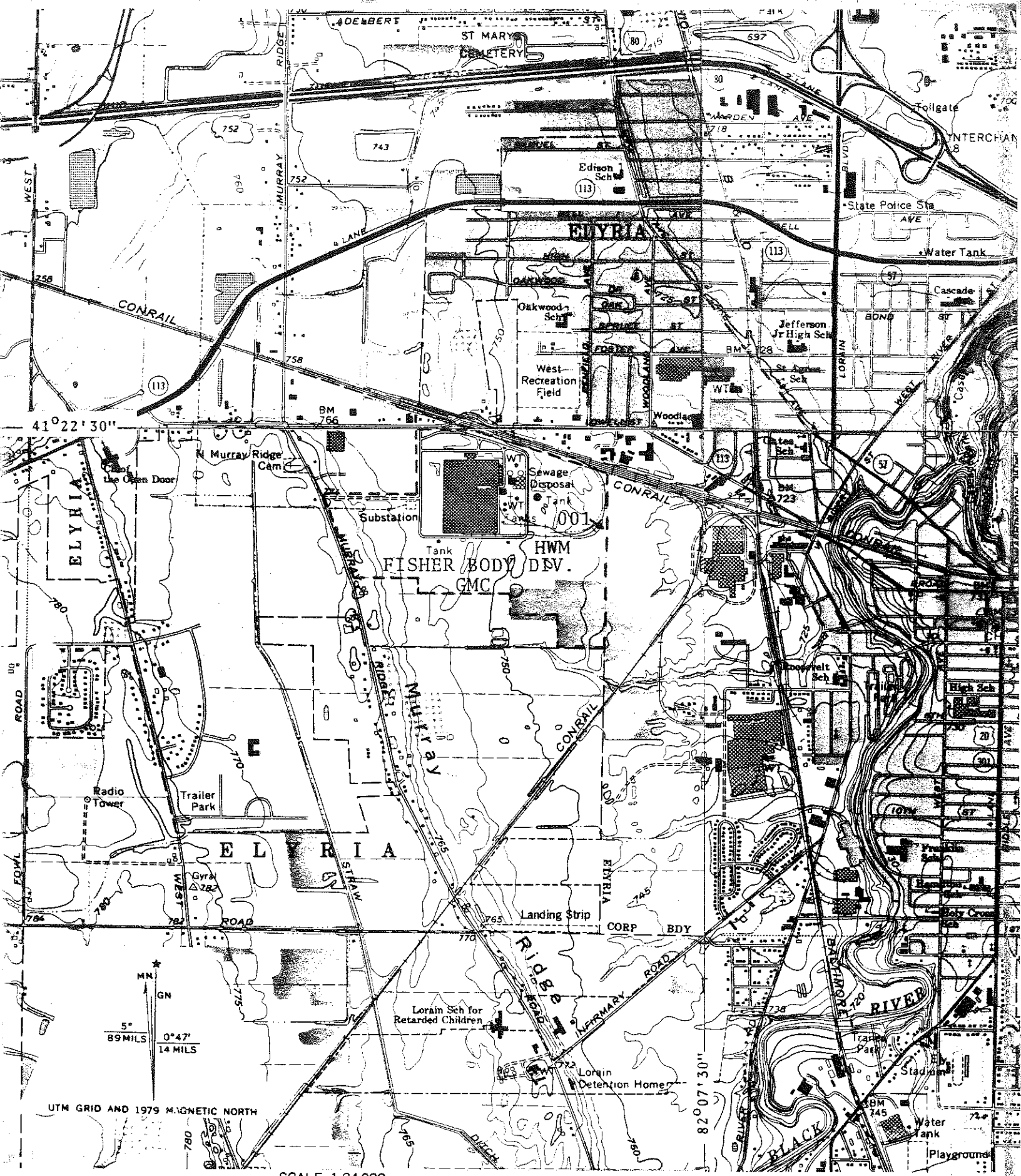
A. NAME *(print or type)*	B. SIGNATURE	C. DATE SIGNED
GENERAL MANAGER	K J McKee	11-7-85

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME *(print or type)*	B. SIGNATURE	C. DATE SIGNED

 CONTINUE ON PAGE 5



SCALE 1:24 000

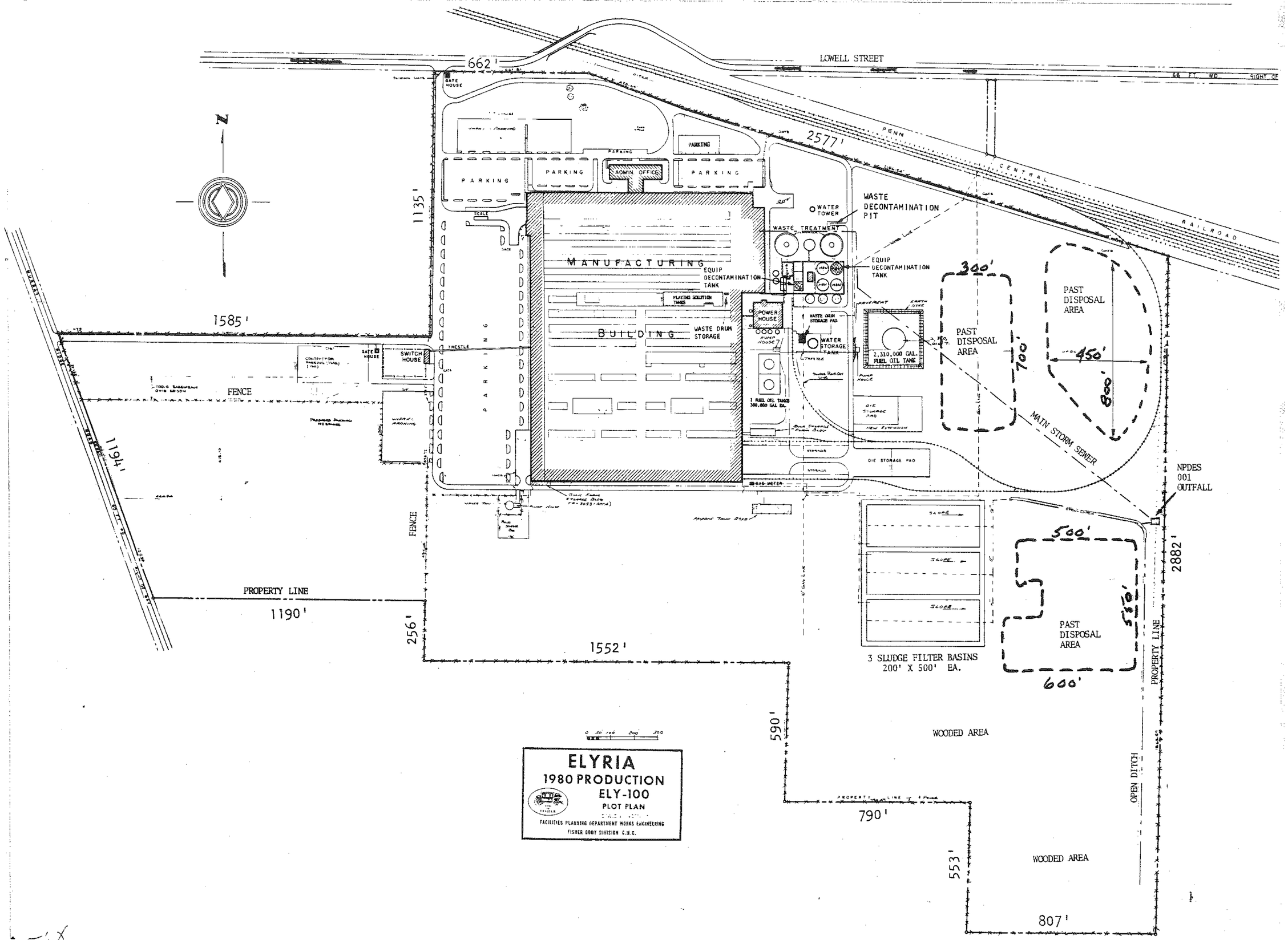
1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

FISHER BODY DIVISION
GENERAL MOTORS CORPORATION
ELYRIA, OHIO

COMPOSITE FROM
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
AVON, GRAFTON, OBERLIN, LORAIN
QUADRANGLES

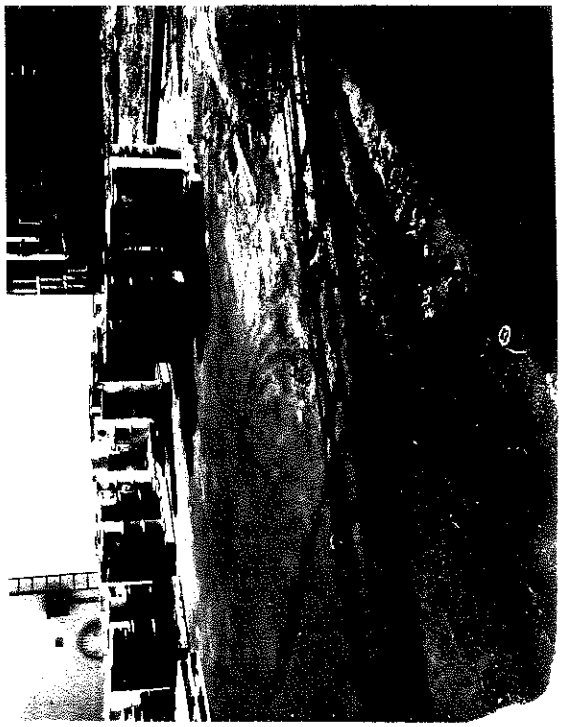
T gwd
10-80


LOWELL STREET
PENN CENTRAL RAILROAD
662'
2577'
1135'
1585'
1194'
1190'
256'
1552'
590'
790'
553'
807'
2882'
N
GATE HOUSE
PARKING
ADMIN. OFFICE
MANUFACTURING BUILDING
EQUIP DECONTAMINATION TANK
PLATING SOLUTION TANKS
WASTE DRUM STORAGE
WATER TOWER
WASTE TREATMENT
WASTE DECONTAMINATION PIT
POWER HOUSE
WATER STORAGE TANK
2,310,000 GAL. FUEL OIL TANK
OIL STORAGE PAD
SWITCH HOUSE
FENCE
PROPERTY LINE
PAST DISPOSAL AREA
300'
700'
450'
800'
500'
550'
600'
MAIN STORM SEWER
NPDES 001 OUTFALL
3 SLUDGE FILTER BASINS 200' X 500' EA.
WOODED AREA
OPEN DITCH
ELYRIA
1980 PRODUCTION
ELY-100
PLOT PLAN
FACILITIES PLANNING DEPARTMENT WORKS ENGINEERING
FISHER BODY DIVISION G.M.C.

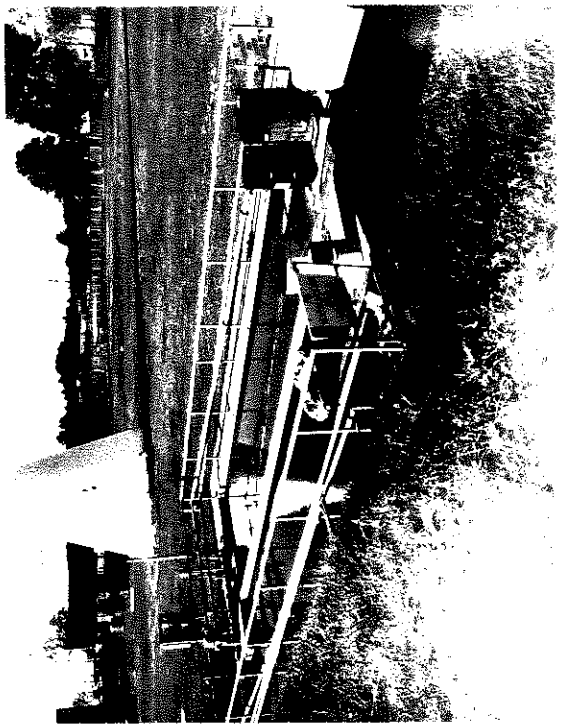
FISHER--ELYRIA

HAZARDOUS WASTE T-S-D FACILITIES 10-23-80

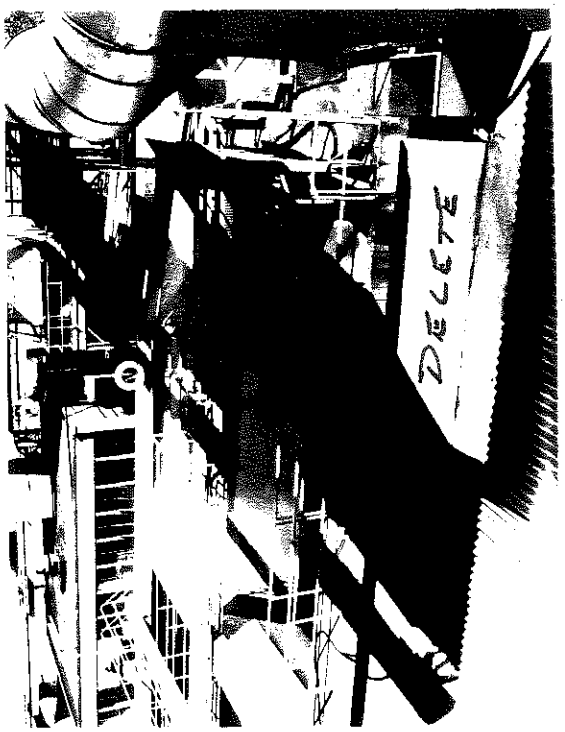
~~EQUIPMENT DECONTAMINATION TANK~~



WASTE DRUM STORAGE



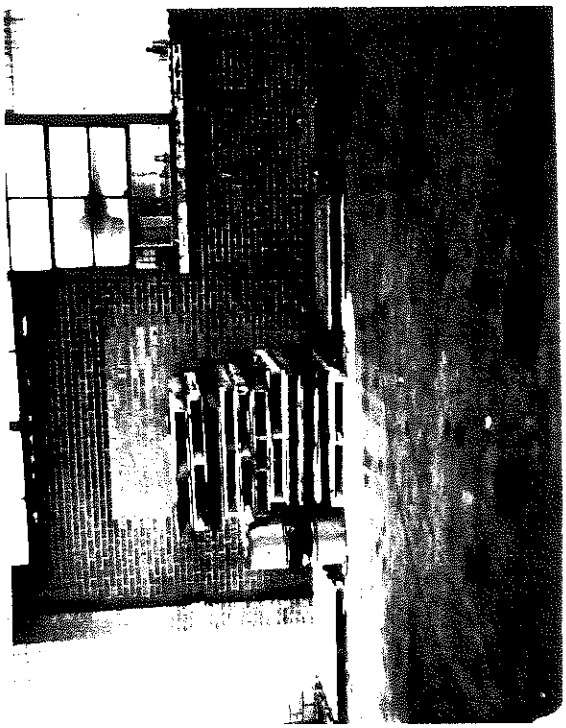
TDI & EQUIPMENT DECONTAMINATION



~~EQUIPMENT DECONTAMINATION TANK~~

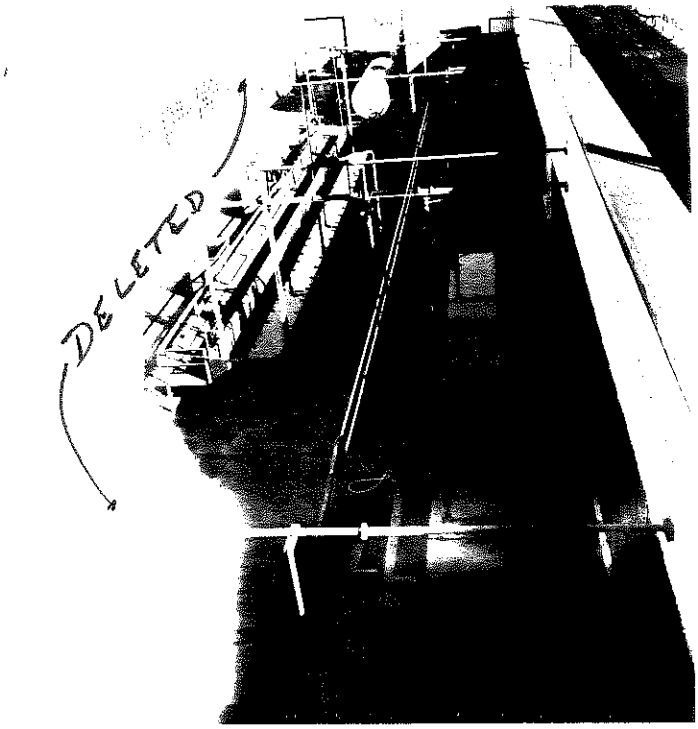
FISHER--ELYRIA

HAZARDOUS WASTE T-S-D FACILITIES 10-23-80



WASTE DRUM HOLDING

SLUDGE DRYING LAGOON



~~PLATING SOLUTION TANKS~~

I. GENERAL INFORMATION

In accordance with requirements established by the 1984 RCRA amendments, the Fisher Guide, Elyria, Ohio Plant, must submit a Part B Hazardous Waste Permit Application by November 8, 1985. This is predicated on the inclusion of a hazardous waste surface impoundment in it's waste water treatment facility.

EPA ID #	OHD004301091
Name of Facility:	General Motors Corporation Fisher Guide Division (Formerly Fisher Body Division) Elyria, Ohio Plant
Facility Operator:	Same
Mailing Address:	P.O. Box 4025 Elyria, Ohio 44036
Facility Contact:	James A. Lucas 216-329-1250

SECTION II

FACILITY DESCRIPTION

A. General Description

The General Motors Corporation, Fisher Guide Division, Elyria Plant is located in Lorain County, Ohio, at 1400 Lowell Street, in the town of Elyria.

This plant manufactures approximately 1,600 automotive component parts for General Motors vehicles. These parts include assorted plastic and metal automotive hardware, plastic interior/exterior trim, urethane foam seat backs, cushions, and arm rests. The processes involved in these manufacturing activities include machining, stamping, forming and welding of metal parts, metal coating, prime/finish painting, thermoforming and injection molding of thermoplastic parts, and foam molding.

Fisher Guide operates its own wastewater treatment facility at the Elyria Plant. All process wastewater from plant operations is discharged to this facility. Wastewater treatment includes hexavalent chrome reduction, pH adjustment, metals precipitation, water/solids separation, sludge dewatering, oil emulsion breaking, and oil/water separation. The effluent from the wastewater treatment operation is discharged to a storm sewer, and is regulated under NPDES permit #S301*BD. No wastes from outside sources are accepted for treatment, storage, or disposal at this facility.

The waste water treatment plant also incorporates two open concrete tanks for the purpose of decontaminating inactive production equipment. Demolished piping, tankage, and assorted plating equipment are occasionally placed in these tanks for the purpose of rinsing them prior to disposal. The rinsate from this decontamination process is directed into the waste water treatment facility. The decontamination tanks are considered part of the waste water treatment process, and thus regulated under the Clean Water Act. Consequently, these decontamination tanks were erroneously incorporated into the plant's Part A Hazardous Waste Permit Application as hazardous waste treatment code #T04. These tanks are not included in the Part B Application.

Prior to the recent discontinuation of electroplating operations this facility utilized five steel tanks for the temporary holding of spent plating solutions prior to treatment at the waste water treatment facility. The primary purpose of these tanks was to provide the necessary retention time to permit the concentrated solutions to be metered slowly to the waste water treatment plant. Since these tanks were also considered part of the waste water treatment process their inclusion into the plant Part A Application, as hazardous waste storage code #S02, was also erroneous. These tanks are, therefore, not included in the Part B Application.

The wastewater treatment facility incorporates three (3) sludge dewatering impoundments located south of the manufacturing building. These impoundments are used to dewater metal hydroxide wastewater treatment sludge (F006 U.S. EPA Waste ID Code) resulting from electroplating operations. The dewatering beds are hazardous waste surface impoundments, and as such are identified on the plant Part A Application by process codes S04 and T02.

The location and construction of the three (3) sludge dewatering impoundments are shown in the site plan view included with the Part B Application form. Each impoundment is 200 feet wide by 500 feet long, and is enclosed entirely by earthen berms. The bed of each impoundment is comprised of successive layers of sand and gravel above a network of four inch (4") drain tiles. This underdrain system allows the water in the sludge to percolate into the drainage network and be conveyed by gravity to the storm sewer.

Each impoundment has a useful sludge holding depth of three to four feet (4'), with a maximum capacity of 13,000 cubic yards of sludge. The dewatering system is capable of yielding a sludge solids content of up to 36 percent by weight.

The plant also incorporates a treatment facility for neutralizing non-reacted raw materials used in urethane foam molding (toluene diisocyanate). This facility consists of two open concrete tanks into which open drums of waste raw materials are placed and allowed to fully react. The neutralization of toluene diisocyanate (TDI) is assisted by the addition of water at this site. Fully reacted foam is subsequently disposed off-site in an approved landfill. This treatment process is identified on the plant Part A Application as hazardous waste treatment process code #T04.

Drummed hazardous wastes generated within the manufacturing plant are stored in 55 gallon drums in the marshaling area at column Y-8 within the plant prior to being transferred to an outdoor storage pad located at the east side of the coal car unloading area. Hazardous waste stored at these sites consists of waste paints, cleaners, and solvents from production and maintenance operations. All drums placed in the outside drum storage pad are subsequently removed by contracted waste hauler and disposed in a manner appropriate for each waste. These drum storage areas are collectively identified on the plant Part A Application as hazardous waste storage code #S01.

B Proposed Facility Changes

As of July 31, 1984, the Elyria Plant discontinued the majority of its electroplating operations. This effectively reduced the amount of sludge generated by the wastewater treatment plant. It was thus determined that sludge dewatering could be accomplished by means other than the three existing sludge dewatering impoundments.

Fisher Guide, therefore, has been pursuing installation of a plate filter press for dewatering sludge as it is produced. This will eliminate the need for the three dewatering surface impoundments, and allow for their final closure. This will also enable the plant to withdraw its Part A Application, and change its operating status from an interim TSD facility to Generator.

HAZARDOUS WASTE TRAFFIC PLAN

This plan will consider all hazardous wastes as belonging to one of three distinct groups: Liquid wastes in 55 gallon drums, solid wastes in 55 gallon drums, and wastewater treatment sludge. Lumber, scrap metal, foam and general trash are not included in this plan.

Liquid waste in 55 gallon drums would include all hazardous paint, solvent, adhesive mold release and TDI waste in addition to non-hazardous oil, polyol and hydraulic fluid wastes.

Solid waste in 55 gallon drums would include hazardous and non hazardous paint booth skimmings and paint rack cleaning ash.

Wastewater treatment sludge is the F006 Sludge generated at the on-site process Wastewater Treatment Plant - Permit No. 3IS00001*CD.

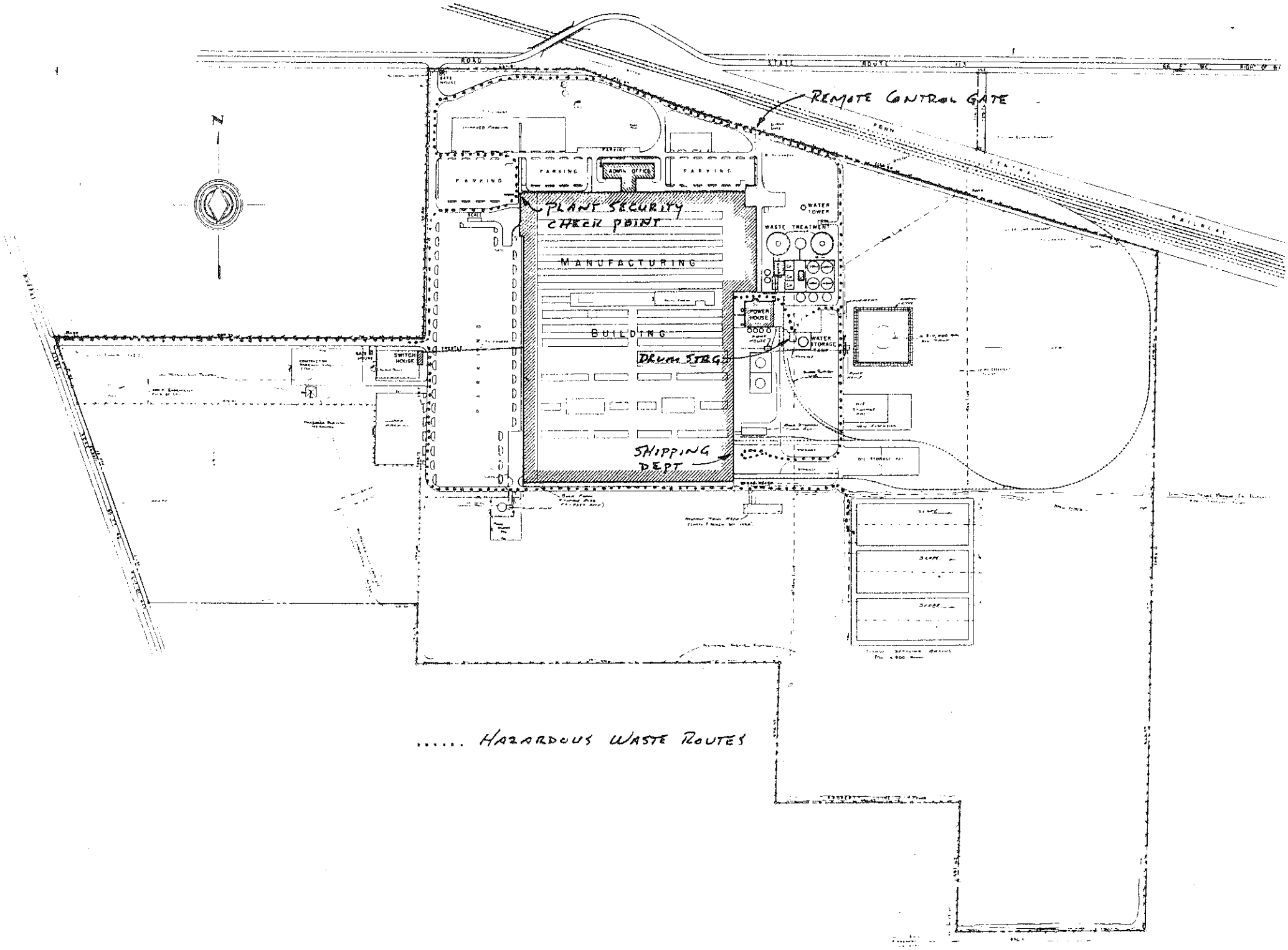
All hazardous and non-hazardous wastes accumulated in 55 gallon drums* are placed in the drum marshalling area inside the main factory building. Here they are rechecked for proper identification labelling and closure prior to being transferred to the drum storage area. Drums are secured on pallets, 4 drums to a load and transported by forklift truck from the marshalling area out the Y-8 Door, down the ramp and directly to the drum storage area east of the Powerhouse. Hazardous waste drums are stored on the concrete drum storage pad (a reserved aisle is used for TDI). Non-hazardous waste drums are stored in an asphalt paved area adjacent to the drum storage pad. When ready for final disposal, all drums are loaded at this storage

*Both liquid & solid

area directly onto transporters' trucks to be taken to the disposal site. The transporters' truck must check out at the Traffic/Shipping Office and at the Plant Security Truck check point before exiting the Plant property.

Wastewater Treatment Sludge is pumped via underground 4" pipeline directly to one or more of three surface impoundments at the southeast of the Plant. Disposal from these surface impoundments is done as required each two to four years. Dried sludge is excavated and loaded into suitable over-the-road dump trailers within the area of the surface impoundments. These trucks are routed directly off the Plant property via the south access roadway and the Murray Ridge Road exit in order to minimize interference with other Plant traffic.

A Plot Plan of the Fisher Guide Elyria Site is attached which indicates locations of storage areas and transport routings. All roadways are all weather asphalt or concrete suitable for 88,000 lb. gross highway truck traffic. Access roads to and around the surface impoundments are gravel. These gravel roads are not subjected to regular use except by the Plant Security 4-wheel drive vehicle and by traffic required during excavation. Excavation and associated traffic would be suspended during extended periods of wet weather.


REMOTE CONTROL GATE
PARKING
PARKING
PARKING
ADMIN OFFICES
PLANT SECURITY
CHECK POINT
MANUFACTURING
BUILDING
DRUM STAG
SHIPPING
DEPT
WATER TOWER
WASTE TREATMENT
POWER HOUSE
WATER STORAGE TANK
SWITCH HOUSE
N
..... HAZARDOUS WASTE ROUTES

SECTION III

FACILITY SECURITY MEASURES

The active portions of the Elyria facility are protected against unauthorized entry of persons or livestock by the following security measures:

1. 24 hour surveillance of the plant grounds by plant security personnel.

2. Controlled access to the active portions of the facility by plant security personnel.

3. Perimeter fencing around the active portions of the facility.

4. Warning signs are posted at each entrance to the active portions of the facility, and at other locations, to be seen from any approach to these areas.

Fisher Body
DIVISION OF GENERAL MOTORS CORPORATION

Elyria
PLANT

SUBJECT Monitoring of Hazardous Waste Treatment and Storage Facilities

DATE 12-1-80

FROM M. A. Husar

TO R. Fisco
M. Searles

cc: J. W. Canan, J. Milks, D. Saxton, W. Kretchman
J. Berent, R. Lakocy, R. Reinecke
T. Applegate, G. Carlson, E. Johns

In order to comply with the Environmental Protection Agency Hazardous Waste Regulations (Section 265.15 (b) 1), we must have a written schedule for inspecting all monitoring equipment, safety and emergency equipment, security devices, and operating and structural equipment (such as dikes, sump pumps, etc.) that are important to preventing, detecting, or responding to environmental or human health hazards as pertaining to waste storage, treatment, and/or disposal. At a minimum, these inspections must be done weekly and the results kept on file for at least three years from the date of inspection. These records must include the date and time of the inspection, the name of the inspector, a notation of the observations made, and the date and nature of any repairs or other remedial actions.

In terms of inspecting all monitoring equipment, the key items here are our clarifier sampler lines and our 001 (field sewer) sampler. These are monitored daily by our Waste Treatment personnel and any problems are reported and corrected immediately or alternative acceptable procedures implemented. There are no special safety or emergency equipment required for the Hazardous Wastes Areas other than those routinely used in our Plant Operations (i.e., fire alarm boxes, fire extinguishers, fire truck, etc.). These are monitored by Plant Protection weekly and the information kept for the required period of time. The same holds true for our security devices (i.e., our outside fencing). These are inspected once per week and kept on file in Plant Protection.

The attached check list is designed to meet the E.P.A. inspection requirements for our structural equipment. This check list must be filled out and signed by a Waste Treatment supervisor once a week without fail. Copies are to be sent to Plant Engineering attention M. Husar every Friday for filing and to follow-up on required repairs. Repair requests will be generated by Plant Engineering as needed.

If you have any questions on this procedure, please contact the writer (ext. 256). Your cooperation is appreciated.

M. A. Husar
Plant Engineering Dept.

MAH for JWC 12-2-80
JWC/dt

RCRA WEEKLY INSPECTION OF WASTE TREATMENT FACILITIES

Equipment	OK	Problem	Action Taken	Fixed
Process Wastewater Collection Pit (Col Z-6)				
1. Sump Pumps (Four)				
2. Check Valves (Four)				
3. High Level Alarm				
B. 36" Sewer Transfer Pumps				
1. High Speed Aisle X-13				
2. Southeast Bulk Y-18				
C. Waste Drum Storage Pad & Process Sewer				
D. TDI Neutralization Pit				
E. Blender				
F. Sludge Holding Tanks (Two)				
G. Clarifiers (Two)				
#2 Drain Valve				
H. Chrome Waste Holding System				
1. Tank Integrity (Three)				
2. Incoming Line				
3. Transfer Lines				
4. Recirculation Lines (Scrubbing)				
5. Trench Evacuating System				
J. Metal-Bearing Waste Holding System				
1. Tank Integrity (Four)				
2. Incoming Line				
3. Transfer Lines				
4. Trench Evacuation System				
K. Spillover Containment System				
1. Basin & Manhole Integrity				
2. Drain Valve at Roadside				
L. Filter Ponds (Three)				
1. Dike Conditions				
2. Sludge Levels				
3. Liquid Levels Chkd: S M T W T F S				
4. Discharge Valves				

Inspection shall include a check for the following malfunctions or deterioration: Inoperable motors, pumps, checkvalves, control valves, high level alarms, ventilation, and lighting; Leaking tanks, pumps, and piping; Evidence of past leakage; Plugged drains; Blocked or inadequate access; Bent, eroding, corroding and/or collapsing containment or tank walls; Other potential hazards.

REV. 10-10-85

Inspection By: _____ Date: _____

HAZARDOUS SUBSTANCE SPILL CONTROL PLAN*

FISHER GUIDE ELYRIA PLANT

Revision #8

*INCLUDES RCRA CONTINGENCY PLAN INFORMATION

CERTIFICATION

I have reviewed the Hazardous Substance Spill Control Plan for Fisher Guide Plant of Elyria, Ohio. The facility has been examined and being familiar with the provision of Parts 116, 117, 118, and 119, Chapter 1, Environmental Protection Agency, Subchapter D., Water Programs, Part II, as published in the Federal Register, Vol. 43, No. 49, Monday, March 13, 1978, I certify that the HSSC Plan has been prepared in accordance with the good engineering practices.

Reviewed and Approved:

L. P. Randall - Plant Engineer

Implementation Date	- 10-24-78
Revision #1	- 8-24-79
Revision #2	- 1-18-80
Revision #3	- 11-19-80
Revision #4	- 2-11-81
Revision #5	- 5-04-81
Revision #6	- 10-01-81
Revision #7	- 5-05-82
Revision #8	- 12-07-84

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SECTION V	-	IN-PLANT EQUIPMENT AND MATERIAL FOR CONTROL AND CLEANUP
SECTION VI	-	CONTRACTOR HELP FOR CLEANUP
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SECTION VIII	-	APPENDIX

GENERAL MOTORS CORPORATION

FISHER GUIDE DIVISION ELYRIA PLANT

SPILL PREVENTION CONTROL & COUNTERMEASURE PLAN *

I. INTRODUCTION

Prevention of spills of hazardous substance is far superior to cleanup. Established surveillance procedures are designed to detect, prevent, or minimize spills at their source. An accidental discharge on plant premises could occur, however, caused by operator error and/or equipment failure. These accidental discharges could not directly enter the waterways but might enter indirectly through either sanitary or storm sewer systems. Types of materials subject to reportable spillages to government agencies at this location are listed by in-plant location and quantity subject to reporting in the Appendix A.

This plan is issued by Fisher Body Elyria to establish the procedures to prevent pollution to waterways from storage and use areas, manufacturing processes, treatment systems, and/or areas for receipt of truck shipments, and to provide a guide for prompt containment and cleanup in event of a spill.

This plan also describes the actions required in response to fires, explosions or any unplanned sudden or non-sudden release of Hazardous Waste to the air, soil or surface water at Fisher Body Elyria.

RCRA EMERGENCY COORDINATOR:

Plant Engineer	L. P. Randall	Ext. 250

ALTERNATES:

Supt. Process Engineering	G. H. Carlson	Ext. 208
Supt. Maintenance	J. A. Lucas	Ext. 499

*INCLUDES RCRA CONTINGENCY PLAN DATA

II. SPILL PREVENTION

A. Training Chain of Command

A chain of command for responsibility and supervision of all aspects of the program has been developed and made known to all concerned employees and supervisory personnel.

B. Visual Outfall Inspection

Inspection of the final storm sewer outfall is conducted by continuously sampling the final storm sewer during normal plant production. This testing is performed and documented by waste plant operators and is reported monthly in accordance with NPDES guidelines.

Weekend and/or non-production day inspections are performed by Plant Security.

C. Tank Inspection

Routine visual inspection of storage tanks, sump pits within diked areas, processing tanks and piping systems are performed daily by equipment operators, tank attendants, and/or Maintenance Personnel.

D. Containment

All areas in which substances classified as hazardous are stored or in use, at the time of this writing, are being monitored daily by Production Personnel.

On a weekly basis, all Hazardous Waste Storage Facilities outside the Plant are monitored and inspected for unsatisfactory conditions. This inspection is conducted by a Waste Treatment Supervisor and the results are on file in the Plant Engineering Department.

E. Emergency Power

Failsafe piping systems and standby power systems are provided to prevent accidental discharge or spillage as a result of power failures, storm, etc. Specifically a standby emergency diesel generator set is located in the Powerhouse and can supply the emergency power requirements of the Waste Treatment Facility.

F. PCB Containing Equipment

PCB handling and disposal is covered in Appendix "B" of this report.

G. Fire Prevention

To be performed by Plant Protection in accordance with established procedures.

III. SPILL CONTAINMENT AND CLEANUP

A. Spill First Action

The first action to be taken in the event of a spill or the observation of spillage is to prevent the pollutant from entering a storm sewer or waterway. Immediate action is to be taken to prevent further spillage and to confine the material. Following are general instructions to confine spills:

1. On land, use dirt, sand, speedi-dry, or other relatively impervious materials to dam the spill to prevent the flow of the material into waterways or storm sewers.

2. Should spillage occur which may result in contamination of a public waterway either directly or indirectly, use any available means to confine the spill. Hay, straw, or boom arrangements are useful in confining the spillage if it is of a "floatable" nature (i.e. "oily").

3. ALL EFFORTS MUST BE EXPENDED TO PREVENT SPILLED MATERIAL FROM ENTERING STORM SEWERS OR SANITARY SEWERS.

B. Internal Notification

	Extension
1. L. Randall (Emergency Coordinator)	250
2. D. Saxton or C. Krukemeier	462, 262
Alternate	
D. Kunick or T. Applegate	218, 257
3. J. Berent, Acting Chief Engineer, Powerhouse & Waste Treatment	265, 249
4. J. Lucas and/or G. Carlson	499, 208
2nd Shift: C. Yekel, Foreman Maintenance	498
3rd Shift: E. Crosier, Foreman Maintenance	497

The above personnel must be notified by Plant Security if the spill occurs on weekends. Home phone numbers are kept current in Plant Security Office. (Phone 400 or 401).

Information To Be Supplied is:

a. Location of spillage
b. Type of material
c. Estimated quantity and extent of spillage
d. What measures have been taken to confine and to prevent further spillage.

C. Spill Confinement

In the event a spill cannot quickly be contained by area personnel, Maintenance is to be notified and are to immediately dispatch supervision, personnel, equipment and materials to confine the spill.

D. Manpower Assignment

The responsibility for the supervision of the spill clean-up and manpower assignments will normally be the Process Engineer in Charge provided such responsibility is not super ceded by regulatory agencies. If no Process or Maintenance supervision is in the plant, Plant Security will provide supervision until Maintenance supervision is available. The manpower for actual cleanup will be furnished by Production, Maintenance, and Plant Security (if on weekends no hourly personnel are immediately available).

E. Cleanup and Disposal of Material

Disposal and removal from plant property of contaminated material will be handled by the Waste Treatment Engineer in accordance with established procedures. Once a spillage has been contained, treatment and/or cleanup of the material must commence according to the following guidelines:

1. Receiving Dock Spills:
   a. Acid spills - neutralize with soda ash, mix with speed-dry, shovel into metal drums.
   b. Caustic spills - (will be solid or powder), shovel into metal drums, wash residue into process sewer.

2. Acid Storage (Outside,Receiving Dock Area)
   a. Acid spill - neutralize with soda ash, mix with speed-dry, shovel into metal drums.

3. Plant Floor:
   a. Acid spill - same as for Receiving Bay.
   b. Caustic - sweep and shovel up into drums, hose down residue to process sewer.
   c. Copper or nickel salts - sweep and shovel up into drums, hose down residue into process sewer using a liberal amount of water.

Note: All materials once neutralized and shoveled into drums must be tagged and transferred to the marshalling area for solid waste. The person preparing the tag must sign tag.

DO NOT CAP METAL DRUMS CONTAINING ACID.

F. Receipt of External Notification of Spill

In the event plant personnel receive notification of a spill or contaminant problem from any source external to the plant, the following information is to be requested.

1. Location of spillage
2. Nature of material
3. When did observation occur and is it continuous or an estimable quantity
4. Ask caller to identify himself so we can report on results of our investigation. Can we contact caller for further assistance if we can't locate spill etc.

This information must be forwarded to the Plant Management immediately according to the internal notification plan stated in Part III-B.

G. Emergency Evacuation

1. In all cases, the immediate vicinity of a spill of Hazardous Material or waste shall be cleared of all personnel except those engaged in its confinement, neutralization, or clean-up.

2. When significant and extensive hazard to human life or health exist during a hazardous material or waste spill, the RCRA coordinator or alternate may deem it necessary to evacuate the building. Plant Protection shall be notified and initiate alarm signals over the paging system. Evacuation will be carried out in accordance with posted fire evacuation plans.

H. Fire or Explosion Response

If a release of hazardous material or waste is accompanied by or caused by fire or explosion, the Fisher-Elyria Fire Company will respond and notify the RCRA Coordinator as soon as possible. The RCRA Coordinator will evaluate the situation and plan appropriate action, however control of the fire and elimination of that hazard shall command first priority.

IV. Notification Requirements and Procedures

A. Loss To Storm Sewer

In the event of an accidental spill of harmful quantities to the public waterway (Black River) or the storm sewer leading thereto, the Plant Manager or in his absence, the Production Manager will have the sole authority to notify the appropriate Local, State, and Federal agencies. On weekends, holidays, etc., the Sergeant of Plant Security shall notify both the Plant Engineer and Plant Manager, (or alternates) whose phone numbers are kept current in Plant Security. THE DETERMINATION OF A REPORTABLE SPILL IS TO BE MADE ACCORDING TO THE GUIDELINES OF APPENDIX "A" PRIOR TO PROCEEDING WITH NOTIFICATION EXTERNAL TO THE PLANT.

Of primary concern and urgency is notification of the U.S. Coast Guard within 20 minutes after ascertaining that the spill of reportable quantities is likely to enter the storm sewer or waterways.

Agencies and Personnel to be notified: (In order)	Ext.
1. Plant Engineer - L. Randall (Emergency Coordinator)	250
Alternate: Maintenance Supt. - J. Lucas	499
Senior Engineer - C. Krukemeier	262
2. Plant Manager - R. Bownes	200
Alternate: Production Manager - G. Kuntz	202

3. U. S. Coast Guard 9th District
   Port City - Cleveland
   Phone - 215-522-3984

OR

MUST CALL

U. S. Coast Guard
City Officer, National Response Center
400 Seventh Street, S. W.
Washington, D. C. 20590
Toll free number 800-424-8802 (24 hr number)

4. Ohio E.P.A. Emergency Spill Response
   Columbus, Ohio
   Phone 1-800-282-9378 (24 hr. number)

5. G.M. Plant & Environmental Engineering
   General Motors Technical Center
   Warren, Michigan
   P. Gerwert 8-535-8605
   M. Zdyb 8-535-8605

6. G. M. Legal Staff
   General Motors Building
   3044 W. Grand Boulevard
   Detroit, Michigan 48202
   Attn: L. Charla, J. Hollis
   Phone: 8-346-4095

7. Fisher Body General Office
   Warren, Michigan
   Phone 8-535-5662
   Attn: R. J. Phillips

B. Loss To Sanitary Sewer

In the event of a reportable spillage determined through the use of Appendix "A" to the sanitary sewer the Plant Manager, and in his absence, the Production Manager will have the sole authority to notify the appropriate local agency, in this case the Municipal Treatment Plant. On weekends, holidays, etc. the Sergeant of Plant Security shall notify the Plant Engineer and the Plant Manager, both of whose numbers are kept current in Plant Security.

Agencies and Personnel to be notified:	Ext.
1. Plant Engineer - L. Randall (Emergency Coordinator)	250
Alternate: Maintenance Supt. - J. Lucas	499
2. Plant Manager - R. Bownes	200
Alternate: Production Manager - G. Kuntz	202

3. Municipal Treatment Plant
   Gulf Road
   Elyria, Ohio
   Supt. G. Worcester
   Phone - 366-2211

4. G. M. Environmental Activities Staff
   General Motors Technical Center
   Warren, Michigan
   P. Gerwert 8-535-8605
   M. Zdyb 8-535-8605

5. G.M. Legal Staff
   General Motors Bldg.
   3044 W. Grand Blvd.
   Detroit, Michigan 48202
   Attn: L. Charla J. Hollis
   Phone: 8-356-4095

6. Fisher Body - General Offices
   Warren, Michigan
   Phone: 8-535-5662
   Attn: R. J. Phillips

C. Information Content

The information to be relayed to the contacted personnel include:

1. Name of person reporting
2. Address of facility
3. Substance spilled
4. Estimated quantity
5. Time occurred
6. Name of waterway receiving spillage

7. Person to contact and phone number at facility.
8. Answer any questions asked by agency to best of ability.

D. Written Report

After verbal notification, a written report shall be submitted within 5 days to Fisher Body General Offices for transmittal to G.M. Environmental Activities Staff. Notification to E.P.A. will be in accordance with Federal Regulation 40 CFR Parts 116, 117, 118, and 119, which allows 60 days for the filing of the written report.

E. Notification of Local Authorities*

Because of the nature of Hazardous wastes currently handled at this Plant, there normally is no need to require assistance from local authorities in handling and/or containing the materials. Therefore, no arrangements have been made at this time to familiarize police and fire departments, emergency response teams, or the local hospitals with the layout of the facility, properties of the Hazardous Wastes handled, entrances to roads inside the facility, and possible evacuation routes. Should the nature of the Hazardous Wastes handled at this location change to extent that assistance from local authorities may be required, the local authorities will be contacted and provided with the required information. Documentation of this will be inserted into the Plan at this location.

In the event that assistance should be required from local authorities, requests for this assistance will be handled in the following manner:

1. Notification of Local Fire Department. Should a fire break out that requires the assistance of the local Fire Department to bring it under control, the fire department will be contacted by either the Chief of Plant Security (or his designated representative at the site) or the Emergency Coordinator. The Fire Department is to be informed prior to proceeding to the fire of any special hazards or protective gear they may require due to the materials involved.

2. Notification of Local Hospital. In the event that injuries occur in handling, treating, or disposing of hazardous wastes that require additional medical assistance beyond that available at the Plant, the local hospital will be contacted by either the Plant Medical Department, the Chief of Plant Security, or the Emergency Coordinator. Any information available as to the cause and/or nature of the injury and any special instructions as to treatment, etc. will be supplied at this time.

*Copies of Revision 8 of this document were forwarded to local police, fire, and hospital officials in january 1985.

3. Notification of Local Police Department. If assistance is required to maintain facility security, maintain access and/or egress to the facility, or to evacuate the facility and/or its surrounding area, the local Police Department will be contacted by the Emergency Coordinator or the Chief of Plant Security.

V. In-Plant Equipment and Material for Control and Cleanup

A. Communication facilities available for use on control and cleanup operations include:

1. In-plant phone system with access to outside phone lines.
2. Portable 2-way radio system available through the Plant Security Office.
3. Maintenance one-way radio paging system with direct access by phone.
4. Plant-wide public address, fire alarm, and evacuation alert system available by contacting Plant Security. (400, 401)

B. Vehicles available for control and cleanup operations include:

1. Maintenance Department bulldozer parked at B-13 inside Manufacturing Building.
2. Cushman narrow aisle "Ambulance" parked at B-8 inside Manufacturing Building.
3. Gasoline-Powered Fire Truck complete with Fire Water Pump and 300 gallon water storage tank parked at B-8 inside Manufacturing Building.

C. Hand Tools

1. Rakes, shovels, hoes are located in oil Pumphouse adjacent to Powerhouse. Additional tools are in main Supply Stores Crib.

D. Absorbent Material

1. Speedi-Dry - In Supply Stores Crib in Manufacturing Building.
2. Sand - Stored along road east of Plant and at south end of Dyke for 300,000 gallon oil tanks.
3. Dow Imbiber Beads - stored in Waste Treatment Building (PCB Spills only)
4. Soda Ash - Stored in Crib in Manufacturing Building.
5. Gravel and Dirt - Piled at southwest corner of lagoons or use any nearby source (lawn, etc.)

E. Fire Fighting Equipment and Facilities

In addition to the communication equipment and fire truck previously mentioned, the following equipment is available:

E. Fire Fighting Equipment and Facilities (cont'd)

1. Scott Air Paks - Stored at various locations in Plant where need is most likely and at Powerhouse and Waste Treatment Facilities.
2. CO_2 Portable Fire Extinguishers - stored at various locations in Plant and at Powerhouse and Waste Treatment Facilities.
3. Fire Hydrant and Sprinklers - Plant is completely sprinklered in Manufacturing Area. System includes both diesel and electric driven fire pumps with 800,000 gallons of supply water. Fire Hydrants (some with fire hose reels) are spotted at various locations inside and outside the Plant including the southeast corner of the Powerhouse.
4. Fire Alarm Boxes - Spotted throughout the Plant and tied into an automatic fire alarm system which includes smoke and water flow alarms.

In addition, the Plant has its own fire Brigade which is periodically trained and drilled in fire fighting techniques and who respond to fire alarms immediately.

VI. Contractor Help for Cleanup

1. O.H. Materials, Inc.
   Findlay, Ohio 45840
   Phone: 419-423-3526 (24 hour number)

2. Chemtrec Division of Union Carbide
   Phone 304-744-3487 for spills involving Union Carbide Mat'ls
   Phone 800-424-0300 for any chemical emergency
   (Both are 24 hour numbers)

3. Ecology Pollution Control Services, Inc.
   Medina, Ohio
   Phone 216-579-0547 (Business hours)
   Phone 216-745-5034 (After 5:00 P.M.)

VII. Emergency Coordinator Duties (Reference 40 CFR Sub Part D)

The emergency coordinator is responsible for coordinating all emergency response measures. The coordinator must be thoroughly familiar with all aspects of this contingency plan, all operations and activities of the facility, the location and characteristics of the wastes handled, the location of all records within the facility and the facility layout. In addition, the coordinator has the authority to commit the resources needed to carry out this spill plan.

VII. Emergency Coordinator Duties (cont'd)

A. In the event of an imminent or actual emergency situation, the emergency coordinator (or his designee when the coordinator is on call) must immediately:

1. Activate internal facility alarms or communication systems, where applicable, to notify all facility personnel required to respond.

2. Notify appropriate state or local agencies with designated response roles if their help is needed.

B. Whenever there is a release, fire, or explosion, the emergency coordinator must immediately identify the character, exact source, amount, and real extent of any released materials. He may do this by observation or review of facility records and, if necessary, by chemical analysis.

C. Concurrently, the emergency coordinator must asses possible hazards to human health or the environment that may result from the release, fire, or explosion. This assessment must consider both direct and indirect effects of the release, fire, or explosion (e.g. the effects of any toxic, irritating, or asphyxiating gases that are generated, or the effects of any hazardous surface water run-offs from water or chemical agents used to control fire and heat-induced explosions.)

D. If the emergency coordinator determines that the facility has had a release, fire, or explosion which could threaten human health, or the environment, outside the facility, he <u>must</u> report his findings as follows:

1. If his assessment indicates that evacuation of local areas may be advisable, he must immediately notify appropriate local authorities. He must be available to help appropriate officials decide whether local areas should be evacuated.

2. He must immediately notify either the government official designated as the on-scene coordinator for the geographical area, or the National Response Center (using their 24-hour toll free number 800-424-8802). The report must include:

a. Name and phone number of reporter
b. Name and address of facility
c. Time and type of incident (e.g., release, fire)
d. Name and quantity of material(s) involved, to the extent known
e. Extent of injuries, if any
f. The possible hazards to human health, or the environment, outside the facility.

VII. Emergency Coordinator Duties (cont'd)

E. During an emergency, the emergency coordinator must take all reasonable measures necessary to ensure that fires, explosions, and releases do not occur, recur, or spread to other hazardous waste at the facility. These measures must include, where applicable, stopping processes and operations, collecting and containing released waste, and removing or isolating containers.

F. If the facility stops operations in response to a fire, explosion or release, the coordinator must monitor for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment, wherever this is appropriate; and determine if evacuation of the building is required due to chemical hazard.

G. Immediately after an emergency, the coordinator must provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion at the facility.

H. The emergency coordinator must ensure that, in affected area(s) of the facility:

1. No waste that may be incompatible with the released material is treated, stored, or disposed of until cleanup procedures are completed.
2. All emergency equipment listed in the contingency plan is cleaned and fit for its intended use before operations are resumed.

I. The owner or operator must notify the Regional Administrator, and appropriate state and local authorities that the facility is in compliance with paragraph (H) above before operations are resumed in the affected area(s) of the facility.

J. The owner or operator must note in the operating log the time, date, and details of any incident that requires implementing the contingency plan. Within 15 days after the incident, he must submit a written report on the incident to the Regional Administrator, the report must include:

1. Name, address and phone number of the owner or operator.
2. Name, address, and phone number of the facility.
3. Date, time, and type of incident (e.g., fire, explosion)
4. Name and quantity of material(s) involved.
5. The extent of injuries, if any
6. An assessment of actual or potential hazards to human health or the environment, where this is applicable.
7. Estimated quantity and disposition of recovered material that resulted from the incident.

APPENDIX

APPENDIX "A"

The following spread sheets contain information on all hazardous materials used in the Fisher Elyria Plant. These sheets are to be used to aid in determining if a reportable quantity of a hazardous material has exited the plant property by way of the storm and/or sanitary sewer systems. The required amount of a spill, be it in drums or inches of tank loss, at "in-use" concentration, required to exceed the legal reporting limits is tabulated in the following tables.

Once a "spill" has been contained or secured according to the spill containment procedure, the determination of the spill is reportable, must be made by:

1. Noting the plant location, tank number, or drum label identification.

2. Observing if the spill has entered or reached a storm or sanitation sewer. (If the spill has entered a process sewer, notify Waste Treatment immediately).

3. Determine the amount of the spill, i.e. number of drums or inches of tank loss.

4. Check Appendix "A" for the material in question and determine if the spill is reportable (Col. marked "R or N"), and if sufficient quantity has been spilled (Col. marked "Plant Minimum Spill Reportable").

5. If a reportable spill exists continue with the notification procedures presented previously.

   If a reportable spill does not exist continue with cleanup.

MINIMUM REPORTABLE SPILLS WHICH MAY ENTER STORM OR SANITARY SEWER

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APPENDIX "A"

Material	Plant Location	Plant Normal Concentration	Legal Spill	Min. Reptble	In. of tnk drp f/spill	Plant Min. Spill Reprtble	R or N	Plant Tank Volumes
Ammonia Hyd	T-6114 Unit P-1,	14 lbs/650 gal	1,000 lbs			46,450 gal	N	890 gal.
Ammonia Hyd	Process Lab	30% material @ 4 lbs/jug	1,000 lbs			833 jugs	N	20 jugs max.
Calcium Hypo.	Buff Crib	100 lbs/drum	10 lbs			10 lbs	R	1 drum
Calcium Hyp	Process Lab	100 lbs/drum	10 lbs.			10 lbs	R	1 drum
* ~~Calcium Hyp~~	~~Buffing Centrisprays~~	2-30/centr	10 lbs			53 centri.	N	10 centri
Deleted 1-25-80 - M ~~Calcium Oxide~~	Husar ~~Wst Treatment~~	Michigan Lime Receipt = 30%	5,000 lbs.		11.5	2,000 gal	~~R~~	2 tanks @ 15,000 gal. ea.
* ~~Chromic Acid~~	~~Unit 1 Tank 11~~	280 g/1	1,000 lbs		4.9	430 gal	R	5,215 gal.
* ~~Chromic Acid~~	~~Unit 1 Floor~~	100 lbs/can	1,000 lbs			10 cans	R	24 cans
* ~~Chromic Acid~~	~~Unit 1 Chrome Strip Tank~~	3.7 g/1	1,000 lbs			32,400 gal.	N	3,200 gal.
* ~~Chromic Acid~~	~~Unit 4 Tank 34~~	400 g/1	1,000 lbs		4.2	300 gal	R	5,088 gal.
* ~~Chromic Acid~~	~~Unit 4 Floor~~	100 lbs/can	1,000 lbs			10 cans	R	24 cans
* ~~Chromic Acid~~	~~Unit 4 Chrome Strip Tank~~	3.7 g/1	1,000 lbs			32,400 gal.	N	10,845 Gal.
* ~~Chromic Acid~~	~~Unit 5 Tank 504~~	200 g/1	1,000 lbs			600 gal.	N	400 gal.
* ~~Chromic Acid~~	~~Unit 5 Tank 514~~	1,080 g/1	1,000 lbs		3.9	111 gal.	R	1,841 gal.
* ~~Chromic Acid~~	~~Unit 5 Floor~~	100 lb/can	1,000 lbs			10 cans	R	27 cans
Chromic Acid	Buff Crib	100 lb/can	1,000 lbs			10 cans	R	100-150 cans
Chromic Acid	Courtyard Tank 5Cr-2	400 g/1	1,000 lbs		1.9	300 gal	R	14,500 gal.
Chromic Acid	Wst Treatment Cr Tmt Tanks	Max. of 1,500 ppm	1,000 lbs		79	79,965 gal.	R	3 tanks @ 150,000 gal. ea.
Chrome	Wst Treatment Metal Brng Tk	100 ppm	1,000 lbs (as CrO_3)			625,000 gal	R	4 tanks @ 220,000 gal. ea.
Aluminum Sulfate	Wst Treatment	50 lb/bag	5,000 lgs			100 bags	R	Maximum of 320 bags

*R = Reportable spill theoretically possible, N = Not theoretically possible

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MINIMUM REPORTABLE SPILLS WHICH MAY ENTER STORM OR SANITARY SEWER

APPENDIX "A"

Material	Plant Location	Plant Concentration	Normal	Legal Min. Reptble Spill (as CuCl2)	In of tnk drp f/spill	Plant Min. Spill Reprtble	R or N	Plant Tank Volumes
Copper	Wst Treatment Metal Brng Tnk	50 ppm(as cu)		10 lbs	7.6	11,338 gal.	R	4 tanks at 220,000 gal. ea.
*~~Copper Chloride~~	~~Unit 5~~ ~~Tank 536~~	1.8 g/1(as cu)		10 lbs	9.5	3/5 gal	R	1,931 gal.
*~~Copper Chloride~~	~~Unit 5 Floor~~	55 gal drum @ 170.8 g/1		10 lbs		1/8 drum 7 gal	R	4 drums
*~~Copper Chloride~~	~~Buff Crib~~	55 gal drum @ 170.8 g/1		10 lbs		1/8 drum 7 gal	R	16 drums
*~~Copper Sulfate~~	~~Unit 4 Tank 40~~	210 g/1		10 lbs	.07	5.7 gal	R	5,789 gal
*~~Copper Sulfate~~	~~Unit 4 Tank 41~~	180 g/1		10 lbs	.02	6.7 gal	R	23,983 gal.
*~~Copper Sulfate~~	~~Unit 4 Floor~~	100 lbs/bag		10 lbs		1/10 bag 10 lbs	R	30 bags maximum
*~~Copper Sulfate~~	~~Unit 4 Storage Tanks~~	210 g/1		10 lbs	.08	5.7 gal	R	2 tanks at 14,000 gal. ea.
*~~Copper Sulfate~~	~~Buff Crib~~	100 lbs/bag		10 lbs		1/10 bag 10 lbs	R	100-150 bags
Copper	Wst Treatment Copper-EDTAtnks	Maximum of 800 ppm (AsCu)		10 lbs($AsCuCl_2$)	7 in	709 gal	R	3 tanks at 22,000 gal. ea.
EDTA	Wst Treatment Copper-EDTAtnks	Max. of 13,000 ppm		5,000 lbs		46,300 gal	R	3 tanks at 22,000 gal ea
*~~EDTA (7921)~~	~~Unit 5 T-536~~	0.25 lb/gal		5,000 lbs		20,000 gal	N	1,931 gal.
*~~EDTA (7921)~~	~~Unit 5 Floor~~	55 gal drum @ 2.28 lb/gal		5,000 lbs		40 drums 2,193 gal	N	4 drums
*~~EDTA (7921)~~	~~Buff Crib~~	55 gal drum @ 2.28 lb/gal		5,000 lbs		40 drums 2,193 gal	N	20 drums
*~~Ferrous Sulfate~~	~~Unit 4 Tank 40~~	20 g/1		1,000 lbs	17.5	6,000 gal	N	5,789 gal.
*~~Ferrous Sulfate~~	~~Unit 4 Tank 41~~	20 g/1		1,000 lbs	88	6,000 gal	R	23,983 gal.
*~~Ferrous Sulfate~~	~~Unit 4 Storage Tanks~~	20 g/1		1,000 lbs		6,000 gal	R	2 tanks at 14,000 gal. ea.
*~~Ferrous Sulfate~~	~~Unit 4 Floor~~	50 lbs/bag		1,000 lbs		20 bags	R	Max. of 40 bags
Ferrous Sulfate	Buff Crib	50 lbs/bag		1,000 lbs		20 bags	R	Max. of 40 bags
Ferrous Sulfate	Wst Treatment	50 lbs/bag		1,000 lbs		20 bags	R	Max. of 40 bags
*~~Formaldehyde~~	~~Unit 5 T-536~~	0.046 lb/gal		1,000 lbs		21,750 gal	N	1,931 gal.

*R = Reportable spill theoretically possible N = Not theoretically possible

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MINIMUM REPORTABLE SPILLS WHICH MAY ENTER STORM OR SANITARY SEWER

APPENDIX "A"

Material	Plant Location	Plant Concentration	Normal	Legal Spill	Min. Reptble	In of tnk drp f/spill	Plant Min. Spill Reprtble	R or N	Plant Tank Volumes
*~~Formaldehyde~~	~~Unit 5 Floor~~	55 gal @ 1.32	drum lb/gal	1,000 lbs			14 drums 758 gal	N	4 drums
*~~Formaldehyde~~	~~Buff Crib~~	55 gal @ 1.32	drum lb/gal	1,000 lbs			14 drums 758 gal	R	20 drums
*~~Formaldehyde~~	~~Unit 5 Floor~~	55 gal @ 3.39	drum lb/gal	1,000 lbs			5.5 drums 295 gal	N	4 drums
*~~Formaldehyde~~	~~Buff Crib~~	55 gal @ 3.39	drum lb/gal	1,000 lbs			5.5 drums 295 gal	R	Maximum of 8 carboys
Hydrochloric Acid	DI Units	13 gal Carboy	= 140 lbs of 37%	5,000 lbs			97 carboys	N	Maximum of 80 carboys
Hydrochloric Acid	Acid Crib	"	"	5,000 lbs			97 carboys	N	Maximum of 80 carboys
*~~Hydrochloric Acid~~	~~Unit 5 T-520~~	0.5 N =	0.152	lb/gal	5,000 lbs		32,900 gal	N	845 gal
*~~Hydrochloric Acid~~	~~Unit 5 T-529~~	1.5N =	0.456	lb/gal	5,000 lbs		10,950 gal	N	400 gal
*~~Hydrochloric Acid~~	~~Unit 5 T-530~~	1.4N = lb/gal	0.425	5,000 lbs			11,750 gal	N	812 gal
*~~Hydrochloric Acid~~	~~Unit 5 T-533~~	0.6N = lb/gal	0.182	5,000 lbs			27,470 gal	N	818 gal
*~~Hydrochloric Acid~~	~~Unit 5 Floor~~	55 gal @ 3.46	drum lb/gal	5,000 lbs			1,445 gal 26 drums	N	6 drums
Hydrochloric Acid	Buff Crib	55 gal @ 3.46	drum lb/gal	5,000 lbs			1,445 gal 26 drums	N	20 drums
Hydrochloric Acid	Inj. Molding Chillers	150 ppm		5,000 lbs			667 Systems	N	2 systems @ 6,000 gal ea.
Hydrochloric Acid	Mldg Floor	293 lb. 23 lb.	drum @ HCL/Drum	5,000 lbs			217 systems	N	20 drums
Hydrochloric Acid	Buff Crib	293 lb. @ 23 lb.	drum HCL/Drum	5,000 lbs			217 drums	N	5 drums
Nickel	Waste Treatment Mtl Brng Tnk	200 ppm		5,000 lbs			1,138,952 gal	N	4 tanks at 220,000 gal. ea.
*~~Nickel Chloride~~	~~Unit 4 T-14A~~	40 g/l		5,000 lbs		47	15,000 gal	R	22,329 gal.
*~~Nickel Chloride~~	~~Unit 4 T-14B~~	90 g/l		5,000 lbs		56.3	6,650 gal	R	8,270 gal.
*~~Nickel Chloride~~	~~Unit 4 T-14C~~	90 g/l		5,000 lbs			6,650 gal	N	2,800 gal
*~~Nickel Chloride~~	~~Durni Storage~~	90 g/l		5,000 lbs		46	6,650 gal	N	5,800 gal
*~~Nickel Chloride~~	~~Courtyard Tank Dull Nickel~~	40 g/l		5,000 lbs			15,000 gal	R	28,000 gal

*R - Reportable Spill Theoretically Possible. N = Not Theoretically Possible

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MINIMUM REPORTABLE SPILLS WHICH MAY ENTER STORM OR SANITARY SEWER

APPENDIX "A"

Material	Plant Location	Plant Concentration	Normal	Legal Spill	Min. Reptble	In of tnk drp f/spill	Plant Min. Spill Reprtble	R or N	Plant Tank Volumes
*~~Nickel Chloride~~	~~Courtyard tank bright nickel~~	90	g/1	5,000	lbs	32	6,650 gal	R	15,000 gal
*~~Nickel Chloride~~	~~Unit 4 floor~~	100	lbs/bag	5,000	lbs		50 bags	N	Maximum of 30 bags
*~~Nickel Chloride~~	~~Buff Crib~~	100	lbs/bag	5,000	lbs		50 bags	R	Maximum of 200 bags
*~~Nickel Chloride~~	~~Mask Room Tank MR-2~~	85	g/1	5,000	lbs		7,062 gal	N	450 gal
Nickel Chloride	Mask Room Tank MR-3	25	g/1	5,000	lbs		24,000 gal	N	550 gal
*~~Nickel Sulfate~~	~~Buff Crib~~	100	lbs/bag	5,000	lbs		50 bags	R	Maximum of 200 bags
*~~Nickel Sulfate~~	~~Unit 4 Floor~~	100	lbs/bag	5,000	lbs		50 bags	R	Maximum of 50 bags
*~~Nickel Sulfate~~	~~Unit 4 T-14A~~	355	g/1	5,000	lbs	5.3	1,690 gal	R	22,329 gal
*~~Nickel Sulfate~~	~~Unit 4 T-14B~~	325	g/1	5,000	lbs	15.7	1,850 gal	R	8,270 gal
*~~Nickel Sulfate~~	~~Unit 4 T-14C~~	325	g/1	5,000	lbs	46.3	1,850 gal	R	2,800 gal
*~~Nickel Sulfate~~	~~Dur-Ni Strge tank~~	325	g/1	5,000	lbs	38.6	1,850 gal	R	5,800 gal
*~~Nickel Sulfate~~	~~Courtyard tank Dull Nickel~~	355	g/1	5,000	lbs	5.2	1,690 gal	R	28,000 gal
*~~Nickel Sulfate~~	~~Courtyard tank Bright Nickel~~	325	g/1	5,000	lbs	10.6	1,850 gal	R	15,000 gal
*~~Nickel Sulfate~~	~~Mask Room Tank MR-2~~	330	g/1	5,000	lbs		1,818 gal	N	450 gal
Nickel Sulfate	Mask Room Tank MR-3	355	g/1	5,000	lbs		1,689 gal	N	550 gal
*~~Nitric Acid~~	~~Unit 5 Strip Sol~~	10%	(vol)	1,000	lbs	90	1,100 gal	R	2,000 gal
*~~Nitric Acid~~	~~Unit 5 Floor~~	55 gal drum @ 7.88	lb/gal	1,000	lbs		127 gal 2.3 drums	R	Maximum of 4 drums
Nitric Acid	Acid Crib	55 gal drum @ 7.88	lb/gal	1,000	lbs		127 gal 2.3 drums	R	Maximum of 16 drums
Phosphoric Acid	Unit P-1,T-6112	0.21	lb/gal	5,000	lbs		23,800 gal	N	5,840 gal
Phosphoric Acid	Unit P-1 Floor	122.5	lb/drum	5,000	lbs		41 drums	N	Maximum of 8 drums
Phosphoric Acid	East Crib	122.6	lb/drum	5,000	lbs		41 drums	N	Maximum of 40 drums

* R = Reportable Spill Theoretically Possible, N = Not Theoretically Possible

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MINIMUM REPORTABLE SPILLS WHICH MAY ENTER STORM OR SANITARY SEWER

APPENDIX "A"

Material	Plant Location	Plant Concentration	Normal	Legal Spill	Min. Reptble	In of tnk drp f/spill	Plant Min. Spill Reprtble	* R or N	Plant Tank Volumes
Phosphoric Acid	Unit P-3T-7212	0.052	lb/gal	5,000	lbs		96,000 gal	N	3,000 gal
Phosphoric Acid	Unit P-3 Floor	725 lb drum @ 142 lb/drum		5,000	lbs		35 drums	N	Maximum of 4 drums
Phosphoric Acid	Buff Crib	725 lb drum @131 lb/drum		5,000	lbs		35 drums	N	Maximum of 12 drums
Sodium Bisulfite	Wst Trtment	400 lb/drum		5,000	lbs		12 drums	R	Maximum of 130 drums
Sodium Hydroxide	DI Units	500 lb/drum		1,000	lbs		2 drums	R	Maximum of 2 drums
*~~Sodium Hydroxide~~	~~Unit 5 T-536~~	1.6 g/l		1,000	lbs		75,000 gal	N	1,931 gal
*~~Sodium Hydroxide~~	~~Unit 5 Floor~~	55 gal drum @ 3.22 lb/gal		1,000	lbs		311 gal 5.7 drums	N	Maximum of 5 drums
*~~Sodium Hydroxide~~	~~Buff Crib~~	55 gal drum @ 3.22 lb/gal		1,000	lbs		311 gal 5.7 drums	R	Maximum of 20 drums
Sodium Hydroxide	Buff Crib	500 lb/drum		1,000	lbs		2 drums	R	Maximum of 20 drums
Sodium Hydroxide	Wst Trtment	2.5 lb/gal 25% Solution		1,000	lbs	22.2	400 gal	R	1 tank @ 2,500 gal
Sodium Hydroxide	Wst Trtment Cleaner Tmt Tk	0.0166	lb/gal	1,000	lbs	54.5	60,000 gal	R	1 tank @ 170,000 gal
*~~Sodium Hydroxide~~	~~Unit 1 Chrome Strip Tank~~	85 g/l		1,000	lbs	19.7	1,400 gal	R	3,200 gal
*~~Sodium Hydroxide~~	~~Unit 4 Chrome Strip Tank~~	85 g/l		1,000	lbs	14.9	1,400 gal	R	10,845 gal.
*~~Sodium Hydroxide~~	~~Unit 1 T-3225~~	12.8 g/l NaOH		1,000	lbs		9,375 gal	N	675 gal
*~~Sodium Hydroxide~~	~~Unit 1 T-3226~~	14.9 g/l NaOH		1,000	lbs		8,054 gal	N	4,725 gal
*~~Sodium Hydroxide~~	~~Unit 1 T-3226~~	5.7 g/l NaOH		1,000	lbs		21,050 gal	N	1,410 gal
*~~Sodium Hydroxide~~	~~Unit 1 T-3227~~	49.2 g/l NaOH		1,000	lbs	39	2,439 gal	R	3,375 gal
*~~Sodium Hydroxide~~	~~Unit 5 T-508~~	42.4 g/l NaOH		1,000	lbs		2,830 gal	N	400 gal
Sodium Hydroxide	Unit P-1T-6110	61.5 g/l NaOH		1,000	lbs		1,951 gal	N	680 gal
Sodium Hydroxide	Unit P-1 T-6111	61.5 g/l NzOH		1,000	lbs		1,951 gal	N	680 gal

*R = Reportable Spill Theoretically Possible N = Not Theoretically Possible

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APPENDIX "A"

Material	Plant Location	Plant Concentration	Normal	Legal Spill	Min. Reptble	In of tnk drp f/spill	Plant Min. Spill Reprtble	* R or N	Plant Tank Volumes
Sodium Hydroxide									
* ~~*~~	~~Unit 4 T-422~~	76.8 g/1		1,000	lbs	44.1	1,563 gal	R	2,481 gal.
* ~~*~~	~~Unit 4 T 423~~	40.0 g/1		1,000	lbs		3,000 gal	N	1,654 gal.
* ~~*~~	~~Unit 4 T-424~~	51.6 g/1		1,000	lbs	49.2	2,325 gal	R	3,308 gal.
"	Unit P-2 T-8110	7.4 g/1		1,000	lbs		16,200 gal	N	900 gal.
"	Unit P-3 T-7210	16.0 g/1		1,000	lbs		7,500 gal	N	2,700 gal.
* ~~*~~	~~Unit 1~~ ~~Floor Stock~~	325 lb drum @ 69 lb.		1,000	lbs		14.5 drums	R	Maximum of 40 drums
* ~~*~~	~~Buff Crib~~	325 lb. drum @ 69 lb.		1,000	lbs		14.5 drums	R	Maximum of 40 drums
* ~~*~~	~~Unit 1~~ ~~Floor Stock~~	425 lb. drum @ 202 lb.		1,000	lbs		5 drums	N	1 drum
* ~~*~~	~~Buff Crib~~	425 lb. drum @ 202 lb.		1,000	lbs		5 drums	R	Maximum of 12 drums
* ~~*~~	~~Floor Stock~~	460 lb .drum @ 377 lb.		1,000	lbs		2.7 drums	R	Maximum of 4 drums
* ~~*~~	~~Buff Crib~~	460 lb. drum @ 377 lb.		1,000	lbs		2.7 drums	R	Maximum of 20 drums
* ~~*~~	~~Unit 5~~ ~~Floor Stock~~	350 lb. drum @ 165 lb.		1,000	lbs		6 drums	N	Maximum of 4 drums
* ~~*~~	~~Buff Crib~~	350 lb. drum @ 165 lb.		1,000	lbs		6 drums	R	Maximum of 6 drums
* ~~*~~	~~Unit 4~~ ~~Floor Stock~~	450 lb. drum @ 407 lb.		1,000	lbs		2.5 drums	R	Maximum of 6 drums
* ~~*~~	~~Buff Crib~~	450 lb drum @ 407 lb		1,000	lbs		2.5 drums	R	Maximum of 24 drums
* ~~*~~	~~Unit 4~~ ~~Floor Stock~~	450 lb drum @ 300 lb.		1,000	lbs		3.3 drums	R	Maximum of 24 drums
* ~~*~~	~~Buff Crib~~	450 lb drum @ 300 lb		1,000	lbs		3.3 drums	R	Maximum of 20 drums
* ~~*~~	~~Unit 4~~ ~~Floor Stock~~	450 lb. drum @ 387 lb.		1,000	lbs		2.6 drums	R	Maximum of 4 drums
* ~~*~~	~~Buff Crib~~	450 lb. drum @ 387 lb.		1,000	lbs		2.6 drums	R	Maximum of 20 drums
"	Unit P-2 Floor Stock	350 lb drum @ 104 lb.		1,000	lbs		9.6 drums	N	Maximum of 4 drums

* R = Reportable Spill Theoretically Possible N = Not Theoretically Possible

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MINIMUM REPORTABLE SPILLS WHICH MAY ENTER STORM OR SANITARY SEWER

APPENDIX "A"

Material	Plant Location	Plant Normal Concentration	Legal Spill	Min. Reptble	In of tnk drp f/spill	Plant Min. Spill Reprtble	* R or N	Plant Tank Volumes
Sodium Hydroxide	Buff Crib	350 lb. drum @ 104 lb.	1,000 lbs			9.6 drums	N	Maximum of 8 drums
Sodium Hydroxide	Unit P-3 Floor Stock	400 lb drum @ 213 lb.	1,000 lbs			4.7 drums	R	Maximum of 5 drums
Sodium Hydroxide	Buff Crib	400 lb drum @ 213 lb.	1,000 lbs			4.7 drums	R	Maximum of 20 drums
Sodium Hydroxide	Detroit area Floor Stock	350 lb drum @ 50 lb.	1,000 lbs			20 drums	N	1 drum
Sodium Hydroxide	Buff Crib	350 lb. drum @ 50 lb.	1,000 lbs			20 drums	N	Maximum of 16 drums
Sodium Hypochlorite	Waste Treatment	16% available chlorine		100 lbs	1.5	30 gal.	R	1 tank @ 2,500 gal
Sodium Nitrite	Process Lab	100 lb./bag		100 lbs		1 bag	R	Maximum of 10 bags
* ~~Tri-Basic Sodium Phosphate~~	~~Unit 1 T-3225~~	14 g/1 phos	5,000 lbs			43,000 gal	N	675 gal
* "	~~Unit 1 T-3226~~	14 g/1 phos	5,000 lbs			43,000 gal	N	4,725 gal
* "	~~Unit 1 T-3227~~	8 g/1 phos	5,000 gal			75,000 gal	N	3,375 gal
* "	~~Unit P-1 T-6110~~	8 g/1 phos	5,000 gal			75,000 gal	N	680 gal
* "	~~Unit P-1 T-6111~~	8 g/1 phos	5,000 gal			75,000 gal	N	680 gal
* "	~~Unit 1 Floor Stock~~	325 lb. drum @ 61 lb. phos	5,000 gal			82 drums	N	Maximum of 7 drums
* "	~~Buff Crib~~	325 lb. drum @ 61 lb. phos	5,000 lbs			82 drums	N	Maximum of 40 drums
* "	~~Unit 1 Floor Stock~~	460 lb. drum @ 49 lb phos	5,000 lbs			102 drums	N	Maximum of 4 drums
* "	~~Unit P-1 Floor Stock~~	460 lb. drum @ 49 lb phos	5,000 lbs			102 drums	N	Maximum of 4 drums
* "	~~Buff Crib~~	460 lb. Drum @ 49 lb. phos	5,000 lbs			102 drums	N	Maximum of 20 drums
Sulfuric Acid	Waste Treatment	15.5 lb/gal	1,000 lbs		.02	65 gal	R	1 tank @ 6,000 gal
"	Acid Crib	225 lb/carboy	1,000 lbs			4.4 carboys	R	Maximum of 48 carboys
Sodium Nitrite	Unit P-3 T-7212	19 g/1		100 lbs	8.9	635 gal	R	3,000 gal

* R = Reportable Spill Theoretically Possible N = Not Theoretically Possible

CP 153 Rev.
Prtd. U.S.A.

MINIMUM REPORTABLE SPILLS WHICH MAY ENTER STORM OR SANITARY SEWER

APPENDIX "A"

Material	Plant Location	Plant Concentration	Normal Legal Spill	Min. Reptble	In of tnk drp f/spill	Plant Min. Spill Reprtble	R or N	Plant Tank Volumes
* ~~Sulfuric Acid~~	~~Unit 4, T-40~~	75 g/1	1,000	lbs	19.3	1,600 gal **	R	5,789 gal.
* "	~~Unit 4 T-41~~	75 g/1	1,000	lbs	4.7	1,600 gal **	R	23,983 gal.
* "	~~Unit 1 T-3230~~	3% (vol)	1,000	lbs		3,705 gal	N	2,025 gal.
* "	~~Unit 1 Floor Stock~~	225 lb/carboy	1,000	lbs		4.4 carboys	R	Maximum of 8 carboys
* "	~~Unit 4 T-430~~	2% (vol)	1,000	lbs		5,500 gal	N	1,654 gal.
* "	~~Unit 4 T-432~~	0.6 % (vol)	1,000	lbs		18,300 gal	N	827 gal.
* "	~~Unit 4 T-433~~	1.5 % (vol)	1,000	lbs		7,300 gal	N	1,654 gal.
* "	~~Unit 4 Floor Stock~~	225 lb/carboy	1,000	lbs.		4.4 carboys	R	Maximum of 8 carboys
Toluene	Mixed Paint in pots	15 gal pots @ 19% toluene	1,000	lbs		44 pots	N	Maximum of 25 pots
Toluene	Solvent Crib	55 gal drums @ 10% toluene	1,000	lbs		25 drums	R	Maximum of 25 drums

* 12-7-84 DELETED AS RESULT of PLATER SHUTDOWN & REMOVAL T. B. Applegate

* R = Reportable Spill Theoretically Possible N = Not Theoretically Possible

INTER-ORGANIZATION LETTER

FISHER BODY DIVISION

GENERAL MOTORS CORPORATION

Elyria
PLANT

SUBJECT PCB Regulations - Appendix "B" Of H.S.S.C. Plan

DATE October 24, 1978

FROM R. E. Pietch

TO J. W. Canan

cc:

J. Anton	J. Galea	E. Wammes
G. Carlson	W. Girardin	J. Wright
W. Connelly	E. Johns	
J. Dickson	J. Milks	
R. Fisco	R. Oliver	

In recent months several changes in PCB labeling and disposal have been communicated to the Elyria Plant, via Works Engineering Reference Letters #954-a,b, Solid Waste Management Letters SWM-78-3,4 and E.P.A. Title 40 Part 761.

Through examination of these letters three changes are indicated for the Elyria Plant. Change one, labeling outside power factor capacitors, was completed 10-6-78. Change two involves creating a shipping storage area. The construction order for this area is under consideration by Management at this time (S.W.O. X-1947).

Change three involves the administration of the required shipping procedures as mandated by Fisher G.O. and the E.P.A. Attached are proposed instructions for implementing these changes.

1. Instructions For Shipment - Revision #2

2. Storage Area Instructions.
   (To be posted at storage area).

3. Examples Of PCB Containing Items.
   (To be posted at storage area).

4. Federally approved PCB label example.
   (To be posted at storage area).

The final administrative function will be clerical job of monthly checks of the storage area for content or leakage. A written record of these checks is to be maintained and saved for five years. The LS06 Program will be the instrument of inspection.

It should be noted that the Oil Spill Procedure has had the PCB Control portion deleted effective 10-6-78.

Prepared by:

Richard E. Pietch
Plant Engineering Dept.

Approved by:

James W. Canan
Plant Engineer

REP/c
Attachments

PCB STORAGE INSTRUCTIONS

1. Place any out-of-service item containing PCB or leaking PCB into this storage chamber.

   A. Power factor capacitors from 25 KVAR at 480 v up.

   B. Groups of capacitors exceeding 25 KVAR.

   C. Rags or debris used to clean up liquid PCB (place debris in 55 gal drum).

   D. Any other object(s) known to contain PCB, or contaminated with PCB.

2. Install a dating tag on the item with this information:

   A. Date placed into storage.

   B. Name (clock No.) of individual entering device.

   C. Description of item.

   D. Plant column where used.

   E. Equipment using item:

   F. Tag No. of equipment.

3. Notify Maintenance Shift General Foreman or Plant Engineering extension 250, 255.

4. Do not remove item from storage for shipment until a glue-on serialized label is attached by Plant Engineering.

   This includes the debris barrel.

5. NOTIFY THE PLANT ENGINEER IMMEDIATELY if any device is leaking PCB or has a dating tag older than one year.

   Proper decontamination of leaks requires flushing with solvent (3 applications) and "after-use" storage in a 55 gallon drum along with all rags etc. Drum becomes a PCB item (Steps 1-4).

EXAMPLES OF PCB CONTAINING ITEMS

(Requiring Storage & Labels)

1. Individual capacitors buss mounted in racks of 4,8, 12 for 480 v power factor correction.

2. Capacitor units rack mounted in outdoor substation for 13.8 kv power factor correction.

3. Capacitor units machine-mounted on various large equipment for power factor correction.

4. Lamp ballasts from various fluorescent fixtures.

FEDERALLY APPROVED FISHER BODY SERIALIZED PCB LABEL

(As shown except yellow background)

CAUTION

CONTAINS

PCBs

(Polychlorinated Biphenyls)

A toxic environmental contaminant requiring special handling and disposal in accordance with U.S. Environmental Protection Agency Regulations 40 CFR 761—For Disposal Information contact the nearest U.S. E.P.A. Office.

In case of accident or spill, call toll free the U.S. Coast Guard National Response Center: 800:424-8802

Also Contact
Tel. No.

PC-6 LABELMASTER CHICAGO, IL 60660

FIRE PREVENTION

AND

EVACUATION PLAN

INTER-ORGANIZATION LETTER

FISHER GUIDE DIVISION

GENERAL MOTORS CORPORATION

Elyria
PLANT

SUBJECT FIRE PROCEDURE DATE April 8, 1985

FROM E. D. Johns

TO All Concerned

The following Fire Procedure is in effect at Fisher Guide Elyria Plant:

I. When a fire is reported by means of a Fire Alarm Box, an automatic signal giving the location will be sounded. This signal will be repeated four (4) times.

II. In the event of a Water Flow Alarm, an automatic signal giving the location will be sounded. This signal will be repeated four (4) times.

III. When either of the above two (2) signals are sounded, the Fire Company only will respond to the alarm. All employes other than those in immediate proximity of the fire, if any, will continue working.

IV. Within a period of three (3) minutes following the above alarm, one of three actions will take place:

A. An automatic Fire Alarm will be sounded consisting of a fifteen (15) second blast of the oscillating whistle,

or

B. The Departmental Superintendent, General Supervisor, Chief of Plant Security or a Sergeant of Plant Security will notify the Console that the fire is under control and that the automatic fire alarm should be cancelled.

or

C. Prior to the expiration of the three (3) minute period, the Departmental Superintendent, General Supervisor, Chief of Plant Security or a Sergeant of Plant Security will notify the Console to manually sound the Fire Alarm and to cancel the automatic alarm.

V. In the event the Fire Alarm (15 second blast of the oscillating whistle) is not sounded there will be no further alarm.

VI. In the event the Fire Alarm is sounded (15 second blast of the oscillating whistle), employes will shut off their machinery and line up at the edge of the aisleway awaiting further instructions.

VII. All other Plant whistles will be discontinued until after the "All Clear" is sounded.

VIII. Following the Fire Alarm (15 second blast of the oscillating whistle), one (1) of two (2) signals will be sounded:

A. When a fire is brought under control the "ALL CLEAR" signal will be sounded upon instructions given by the Departmental Superintendent, General Supervisor, Chief of Plant Security or Sergeant of Plant Security. The "ALL CLEAR" signal will consist of one (1) long 15 second blast of the shop whistle.

B. In the event the fire is not brought under control, and it is necessary to evacuate the Plant personnel, the "Evacuation Signal" will be given upon instruction of the Departmental Superintendent, General Supervisor, Chief of Plant Security or Sergeant of Plant Security.

The "Evacuation Signal" will consist of a verbal message given over the Plant Paging System.

The message below will be given continuously until the buildings are evacuated:

<u>"EMERGENCY - EVACUATE THE BUILDING, IMMEDIATELY"</u>

The "Evacuation Signal" will be given by the Officer on duty at the Console. He will be notified by calling Extension 400. If this number should be busy, Extensions 401 or 402 can be used.

Plant paging from the Lobby will be discontinued from the time a Fire Signal is given until approval to resume is given by Plant Security.

FIRE DUTIES OF SUPERVISION AND MEN AND WOMEN ASSIGNED TO FIRE BRIGADES

1. FLOOR CHIEFS AND ASSISTANT FLOOR CHIEFS

   Responsible for their departments and areas.

2. FLOOR CAPTAINS

   When fire alarm sounds take charge and see that all employes line up, that Extinguisher Men, Order Men and Women take their staions promptly. Instruct people to return to their work after all clear signal is given.

3. ORDER MEN AND WOMEN

   When fire alarm sounds take your assigned station promptly. Assist the Captains of the Brigades in maintaining order and get all employes lined up. See that rest rooms and toilets are cleared. Open exit doors from Plant to permit employes to leave if necessary. Prevent unauthorized persons from entering the Plant. Do not permit running or disorder. Maintain order and await orders from your Captain.

4. EXTINGUISHER MEN

   When fire is in your work area take your station at the nearest unmanned fire extinguisher, ready for action. If fire is in your department, assist in fighting it until Fire Companies arrive. If fire is not in your department, line up with the other employes.

INFORMATION ABOUT FIRE FIGHTING

1. Become familiar with the location of: All doors from your department, fire alarm boxes, extinguishers, hoses, fire blankets, emergency showers, stretchers, and the proper use of them.

2. Become familiar with the general layout of the building so the number and letter system on the columns will give you general locations. On each fire box is a coded alarm chart to let you know the location of the fire. Also, you are given herewith a page of fire alarm codes.

3. Become familiar enough with the fire extinguishers available, so you can use one correctly if necessary.

   A. Pressurized Water Extinguishers are for use on paper, wood, textiles, rubbish, etc. (Stainless steel or Copper with Pressure gauge).

   B. Dry Chemical Extinguishers are for flammable liquids and electrical fires. (RED with pressure gauge or cylinder on side)

   C. CO^2 (Carbon Dioxide) Extinguishers are for electrical fires and fires in flammable liquids. (PAINTED ALL RED WITH BLACK NOZZLE)

NOTE: NO WATER EQUIPMENT (PRESSURIZED WATER EXTINGUISHERS AND HOSE LINES) SHOULD BE USED ON ELECTRICAL FIRES UNLESS THE CURRENT HAS BEEN CUT OFF.

4. If you are responsible for the movements of people after a signal has been sounded, know where the fire is and that it is safe before sending them back to work. In case of personal injuries to any of your people, get the names of the injured, how injuries were received and any other information that may be important under the circumstances, or know that this has been secured. Cooperate with Plant Security who will investigate the fire.

5. Above all, think through just what your job or any other special assignments that make you responsible to do in case of a fire, so you can do them automatically when the time comes. Then there will be no confusion.

6. Do not ring Plant Security's phone to find out where the fire is. Use the chart on each fire box. The desk attendant is instructed to do other things than answer such phone calls.

NOTICE

Be sure you know where the closest fire alarm is in your work area. Locations of fire alarm boxes are as follows:

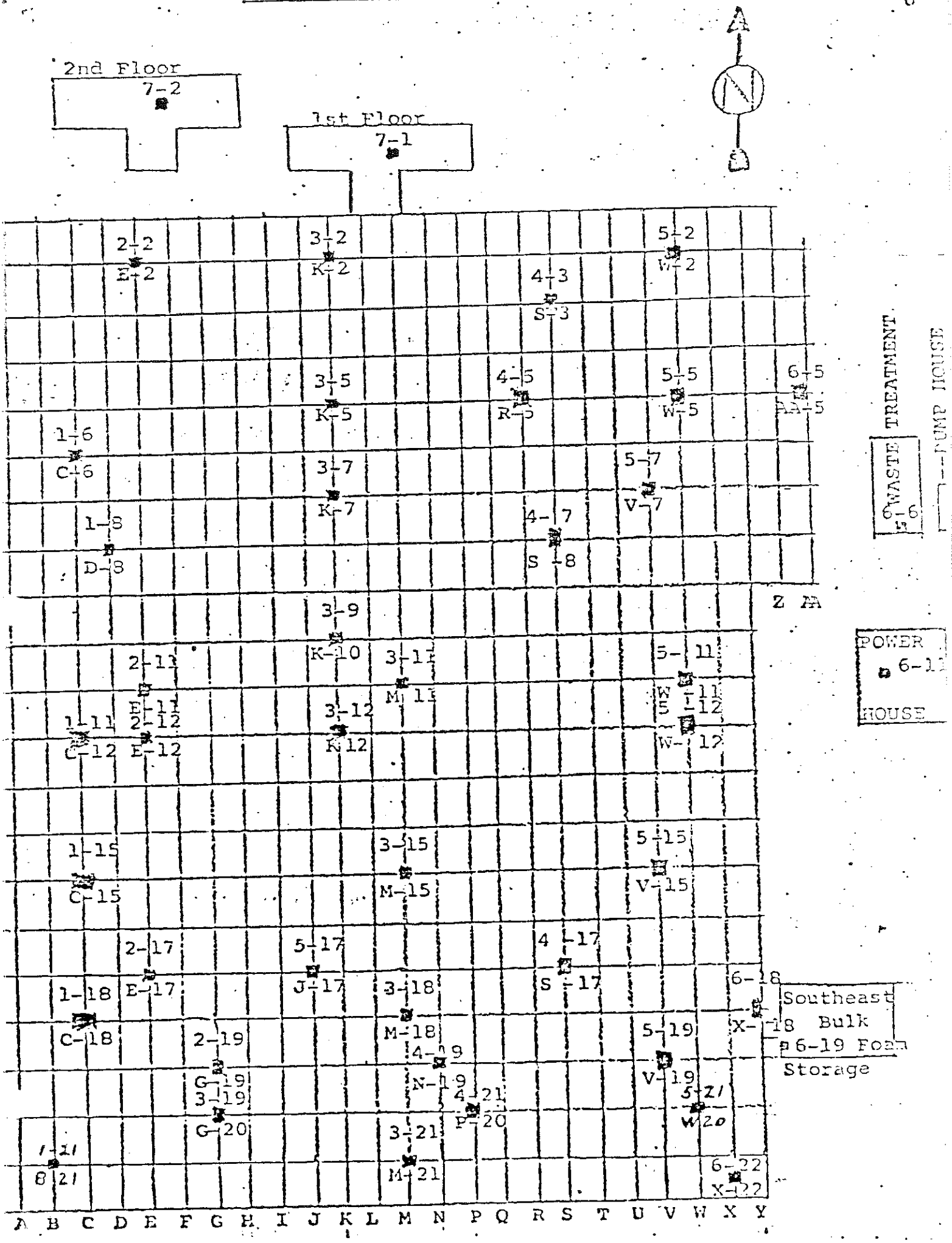
Administration Bldg., FIRST FLOOR	East wall center stairway
Administration Bldg., SECOND FLOOR	East wall center stairway
Powerhouse	Rear of #1 Boiler
Wastewater	South wall next to South door
Pump House Wastewater	East Wall
East Foam Bulk Storage Bldg.	West Wall

Column AA-5
Column C-6
Column D-8
Column C-12
Column C-15
Column B-21
Column E-2
Column E-11
Column E-12
Column E-17
Column G-19
Column K-2
Column K-5
Column K-7
Column K-10
Column M-11
Column K-12
Column M-15

Column J-17
Column M-18
Column G-20
Column M-21
Column S-3
Column R-5
Column S-8
Column S-17
Column N-19
Column P-20
Column W-2
Column W-5
Column V-7
Column W-11
Column W-12
Column V-15
Column V-18
Column V-19
Column W-20
Column X-22

(See other sheet for diagram of Plant showing location of fire alarm boxes)

LOCATION OF FIRE ALARM BOXES



FIRE INSTRUCTIONS

1. Before a Fire Alarm is sounded: Small fires are not uncommon in in ducts, dust collectors and other limited areas and are usually soon under control by the use of extinguishers in the hands of nearby persons. Supervision should maintain order and keep unaffected employes on their jobs. If a fire is under control, do not pull a fire alarm. However, Plant Security should be notified by telephone. If you think the fire cannot be immediately controlled by those at hand, pull a fire alarm box.

2. Pull any Fire Alarm Box to get the following results:
   A. An automatic signal is sounded throughout the Administration and Manufacturing building, coding the location of the box you pulled.
   B. This calls Fisher Guide Fire Company and Plant Security to help you.
   C. All employes other than those in area will continue working.
   D. If fire cannot be controlled there will be a 15 second blast of the oscillator; this is the signal to stop work and line up in designated areas.

3. Responsibility for people lies directly with departmental supervision. They are the Brigade Officers and the natural leaders of their working forces. They do not fight fire after an alarm is sounded, even if the fire is in their own department. Their primary job is care of their employes.

   Too many people go to a fire. Unless you have been given the responsibility of fighting it, you can help most by getting away and helping others get away from the fire. The greatest possible fire damage is the injury of people. Those who get far away will not be hurt. Also, Plant Security and Firemen are handicapped by people standing about a fire.

   If it becomes necessary to evacuate the building, a verbal message will be given over the paging system - "EMERGENCY, EVACUATE THE BUILDING IMMEDIATELY". Take people out through the nearest exit and don't block doors or driveways for incoming fire fighting trucks and firemen. When employes are taken from a building, the order men and order women, before leaving must make sure that no one has been left in the Locker Rooms, Toilets, or other isolated rooms, or left unconscious on the floor due to fainting or injury.

4. Study the layout of your department so that you will know the safest way to take employes out of the building in case of an evacuation signal. Know what to do before a fire and be sure that all employes under your supervision know the fire instructions.

CAFETERIA

FIRE ALERT PROCEDURE

When a fire alarm is sent over the public adress system, the following procedure has developed for employes:

1. The general fire alarm consists of a 15 second blast of the oscillating whistle. Cafeteria employes and employes who are eating will remain and wait for either the all clear signal or the evacuation signal.

2. The Order men who have been assigned will have cafeteria employes check restrooms, walk-in coolers and training rooms and supply rooms to make sure all are informed and, if the situation arises avacuate in a safe orderly manner.

   A. All clear signal is a 15 second blast of the shop whistle over the public adress system.

   B. Avacuation will be announced over the public adress system: " EMERGENCY- EVACUATE THE PLANT IMMEDIATELY".

ORDER MEN ASSIGNED TO CAFETERIA

1st shift	
Dave Young	Maintenance Supervisor
Jim Milchen	Maintenance Supervisor
2nd shift	
Joe Potocsnak	Maintenance Supervisor
3rd shift	
Elmer Crosier	Maintenance Supervisor

MAINTENANCE SUPERVISORS ASSIGNED TO SOUTHWEST FIRE PUMP HOUSE

1st shift	Gene Fresch
2nd shift	Conrad Yekel
3rd shift	Robert Graves

TORNADO ALERT PROCEDURE

In the event a Tornado Alert is received at this plant, the following Assembly Procedure has been developed for the protection of our employes:

I. The general Fire Alarm, which consists of a 15 second blast of the oscillating whistle, will be given. This will alert all employes to line up in the same manner as if a fire was reported in the building. Order Men and Women will check all isolated places so no one is left behind.

II. When employes have been given reasonable time to line up, the Public Address system will announce "THIS IS A TORNADO ALERT, PROCEED TO SHELTER AREA." This announcement will be repeated continuously until employes are properly assembled.

III. Floor Captains will be responsible for leading employes to the Assembly area which is the Male and Female Locker Rooms, designated restrooms and the Receiving Office.

IV. Listed are eleven in-plant bulletin board locations containing instructions and routes to Tornado Assembly areas and the designated safe exit for plant evacuation:

Column U-4	North Side of Restroom
Column U-5	South Side of Restroom
Column G-4	North Side of Restroom
Column A-B-2	Aisleway by Receiving Dock
Column L-8	North Side Locker Room
Column L-10	South Side Locker Room
Column G-8	North Side Locker Room
Column G-10	South Side Locker Room
Column S-T-17	South Side of Restroom
Column F-G-17	South Side of Restroom
Column W-20	North wall of truck dock

V. Administration Building for Tornado Alert

A. All female employes will assemble in the women's restroom located on the first floor.

B. All male employes from Data Processing - Dept. #42 and Accounting - Dept. #40, will assemble in men's restroom on first floor.

C. All other department male employes assemble in the lobby.

VI. Powerhouse employes for tornado alert will assemble in locker room of Powerhouse.

VII. Waste Treatment employes will assemble under the stairway on first floor.

VIII. Employes who may be in cafeteria shall report to restrooms on first floor complex area.

IX. All visitors, or employes who are out of their regular department, when a emergency arises, will stay in the department they are in at the time it occurs, and abide by that departments emergency procedures.

X. The "ALL CLEAR" signal will be the 15 second blast of the whistle that is used for the "All Clear" after a fire alarm.

XI. All Supervisors should instruct their employes on Tornado Alert Procedure and where their designated assembly area is.

DEPARTMENTAL INSTRUCTIONS FOR LINE UP AND EVACUTATION OF

FOR ADMINISTRATION BUILDING

EMPLOYES

ALL ACCOUNTING AND PRODUCTION CONTROL PERSONNEL use east aisle, line up facing east and leave by southeast exit. Furnish Order men to open southeast door, check men's restroom on first floor and janitor's closet, east of the women's restroom.

DATA PROCESSING use aisle west of Data Processing office, line up facing north and leave by lobby doors. Security Officer in lobby chech lobby restroom.

PURCHASING use aisleway east of Purchasing Office and leave through Lobby Doors. Purchasing Department assign Order Woman for women's restroom on first floor.

LABOR RELATION AND SALARY PERSONNEL will line up in west aisle facing west and leave by southwest exit. Furnish Order Man for southwest door. Check Conference so nobody is left behind.

EMPLOYMENT AND INSURANCE will line up in Employment Office Lobby and exit by northwest door. Take any visitors or applicants in Employment out with you. Furnish Order Man for Employment Office Exit Door.

PLANT MANAGER, FACTORY, RELIABILITY, GENERAL SUPERINTENDENT AND THEIR SECRETARIES are to use aisleway outside their office, facing west and exit down stairway and through the lobby.

PRODUCTION ENGINEERING AND PROCESS ENGINEERING line up in aisle east end of department, facing south and exit down stairway and southeast door. Production Engineering furnish Order man for Plant Manager's Conference Room and Plant Manager's closet and restroom, men's restroom and an Order Woman for checking women's restroom.

STANDARDS AND METHODS AND QWL line up in north aisle and exit down stairway and through lobby. Furnish Order man for Air Condition room and Executive Conference Room and Lobby Doors.

MAILROOM line up in center aisle outside room, furnish Order man for Vault, south janitor's closet and exit down center stairs and out lobby doors.

PLANT LAYOUT, PLANT ENGINEERING AND BLUE PRINT line up in south aisleway facing west and exit by stairway and southwest door. Layout furnishes Order Woman for women's restroom; second floor and Order man for north janitor's closet east of stairwell on second floor.

All order men assigned for exit doors will remain at the door to hold them open for emergency entrance (these doors locks from the outside when shut). Also, these order men will relay to Captin when "ALL CLEAR" is given.

INSTRUCTIONS FOR DEPARTMENTS

THE LOBBY OFFICER AND NURSES will remain on duty until directed by their Supervisor or Plant Security to leave the building. Any employes in for first aid will remain in the Dispensary and will exit through the emergency door on the west side of dispensary when notified to do so by Supervisor and/or Plant Security.

Any visitors, salesmen, repair men, etc., in the building and employes out of their department will line up with the department they are in and exit with same group.

GUIDE LINE FOR AN ORDERLY EMERGENCY EXIT

1. Know where the exits are located.
2. Keep cool -- Obey all orders.
3. Get in line quickly and quietly.
4. Do not attempt to carry anything.
5. Follow the Leader.
6. Keep in single line.
7. Walk rapidly - Do NOT RUN.
8. Do not call or shout to others.
9. Keep driveways clear around the building.
10. Do not panic or become frightened.
11. Employes who leave by lobby doors assemble near flag pole.
12. Employes who leave by south doors assemble in parking lots.

Plant Security Department

Fisher Guide Division
General Motors Corporation
P.O. Box 4025
Elyria, Ohio 44036-0760

Elyria Plant

SUBJECT: Hazardous Wastes Summary September 1, 1985

FROM: Charles E.Singer, Secretary H.M.C.

TO: Members of Hazardous Materials Committee

J. Berent	J. Lucas	A. Young
J. Friedl	F. Pascual M.D.	
R. Gaydosh	L. Ransom	
E. Johns	J. Wright	

The purpose of this document is to record past efforts to reduce, detoxify or eliminate hazardous wastes and to establish a formal procedure to review all wastes periodically and determine that all practial methods to minimize hazardous wastes are implemented and that storage, treatment, and disposal of such wastes are the most environmentally effective, economically available. This is required of all hazardous waste generators to comply with Section 3002 (6) of the Reauthorization of the Resource Conservation and Recovery Act.

A summary of the hazardous waste streams regularly generated at the present time at Fisher-Guide Elyria is given in Appendix A on page 3. Other hazardous activities such as demolition, construction, or unusual circumstances will be dealt with as the special cases that they are.

A record of the hazardous wastes that have been considered for reduction, detoxification, or elimination along with results of such action determined to be practicable is included in Appendix B on page 4.

It will be the responsibility of the Hazardous Materials Committee as a part of its function and at its regularly scheduled meetings to consider hazardous wastes pursuant to Section 3002 (6) and the General Motors Corporation "Hazardous Materials Control Program Guidelines". This is, in fact, a continuation of activity the commitee has been involved with for some time.

Appendix A will be updated at any time that new or significantly different hazardous wastes are generated. Appendix B will be updated as appropriate, but not less frequently than annually.

Finally, as a statement of general policy and in accordance with past and present practice, Fisher-Guide Elyria will use only on-site or off-site hazardous waste facilities and transporters that are properly permitted by the appropriate local, state, and/or federal agencies.

Charles E Singer

Charles E. Singer
Secretary
Hazardous Materials Committee

APPENDIX "A"

WASTE "STREAMS"	HAZARDOUS
WWT Sludge	Yes
TDI	Yes
Polyol	No
Paint Waste	Yes
Solvent Waste	Yes
1,1,1 Trichloroethane	Yes (Recycled)
Oil	No
Paint Sludge	Not presently
Pyrolytic Ash	Not presently
Lumber (pallets, etc.)	No
Scrap Metal	No
General Trash (paper, lint)	No
Empty Drums	No
Foam Buns	No
Adhesive	Yes
Mold Release	Yes
Methylene Chloride	Yes (if any)
Hydraulic Fluid	No

APPENDIX "B"

HAZARDOUS WASTE	DESCRIPTION OF MINIMIZATION EFFORT	SUCCESSFUL
Scrap TDI U-223	Formerly neutralized on site and landfilled as a waste, ~~No~~ no longer hazardous. It has been determined that there is less employe exposure hazard, less reactivity hazard, and a smaller volume of ultimate waste to be disposed by using the present method of off-site incineration.	Yes
Paint Sludge D007	Paint booth skimmings exhibited EP toxic concentrations of chromium due to solids in the paint formulation. The paint formulation was altered to eliminate objectionable chromate compounds so that the sludge was no longer EP toxic. Confirmed by independent laboratory tests.	Yes
Paint Ash D007	Ash Residue from pyrolytically cleaning paint racks. Problem and solution as described immediately above.	Yes
1,1,1 Trichloroethane F001	Fisher-Guide Elyria previously operated its own in-plant reclaim still for this solvent. Solvent usage has been reduced by using solvent-less hot alkali mask washers for some operations.	Yes
1,1,1 Trichloroethane F002 (Sludge)	In conjunction with reduced solvent usage described above, our still has been eliminated and reclaim is now handled by an outside vendor thus eliminating our still bottom disposal.	Yes

Chrome Solution D007	Approximately 20,000 gallons of used, concentrated (and ~~presently~~ good) chrome plating solution was on hand after Fisher-Guide Elyria discontinued plating operations. This solution was advertised for sale, but there were no offers to buy at any price. This solution was sent to an outside disposal firm for treatment and disposal.	No
WWT Sludge F006	A delisting petition was submitted to the U.S. EPA based on chemical chemical retreatment of our plating wastewater treatment sludge by the "Chemfix" process. The U.S. EPA has not yet acted on the delisting petition.	TBD
WWT Sludge F006	A project is currently underway to install a plate-frame filter press and refurbish two existing sludge thickners at the WWT Plant. Additional studies are being made of WWT Plant operations, chemicals, etc. to reduce sludge, water content, and volume.	TBD
Boiler Residue	Residue in the bottom of boiler No. 4 at the time of its conversion from ~~gas~~ oil to coal fired operation was tested and found to be non-hazardous.	Yes
Mixed Solvents D001	It has been determined that incineration of scrap solvents (Hydrocarbon and chlorinated) from paint mixing and related operations is an environmentally sound method of disposal. All such incineration is performed by Ross Incineration Services, Inc.	Yes

FISHER BODY DIVISION
GENERAL MOTORS CORPORATION
ELYRIA PLANT

PLANT HAZARDOUS WASTE ANALYSIS PLAN

PROCESS SPECIFICATION: EP #135
DATE: February 4, 1981

GENERAL

The regulations promulgated in Paragraph 265.13 of the May 19, 1980 Federal Register require an owner or operator of a hazardous waste treatment, storage, and disposal facility (or TSD) to develop and follow a written waste analysis plan. The purpose of this plan is to insure that owners or operators of a TSD facility possess sufficient information on the properties of the wastes which they manage.

LIQUID WASTES

A. Liquid Wastes Treated Internally at Waste Treatment:

Process Specification EP #103 specifies all liquid and solid wastes which will be pumped or transported to Waste Treatment for internal disposal. Waste treatment will maintain total records of the analysis of effluent streams as required by the Clean Water Act.

B. Liquid Wastes Sent Out For Incinceration:

On an annual basis, F.B. Elyria goes out for bids to outside vendors to obtain a yearly contract for the disposal of specific liquid wastes. These wastes are scheduled for incineration. Thus, EP Leachate type analyses are not a requirement.

At the time bid information is tendered to outside vendors, stream profiles for each liquid waste are prepared and included with the bid information. Attached to this procedure is a form which shows the information required by the outside vendor on each liquid waste stream profile.

SOLID WASTES

Sludges generated at Fisher Body Elyria will be handled as follows:

1. The nature of the sludge generating process will be evaluated. In light of Federal Regulations, it will immediately become clear if the sludge might fall under any "hazardous" classification.

Solid Wastes: - continued

2. Any potentially "hazardous" sludges will be sampled, and sent out for total analysis. This will include the EP Leachate test.

3. This analytical data will then be used to determine the correct disposal procedure for each sludge.

Prepared by R. A. Reinecke
Process Engineering Dept.

Approved D. F. Saxton
Process Engineering Dept.

G. H. Carlson, Supt.
Process Engineering Dept.

RAR/br
attachment

LOG NO. _____

WASTE GENERATOR GENERATOR NO. _____

Name: _____

Address: _____

City: _____ Tel: _____

Person verifying waste contents

(Attach lab analysis if available)

Name: _____

Phone: _____ Date: _____

Signature: _____

WASTE HAULER *HAULER NO. _____

Co. Name: _____

Address: _____

City: _____ Tel: _____

DISPOSAL METHOD & FACILITY TO BE USED

_____ Incineration _____ Landfill _____ Reclaimed

_____ Other: _____

Facility No: _____

Name: _____

Address: _____

City: _____ Tel: _____

DEFINE MATERIAL

_____ Flammable: _____ Flash Point

_____ Sludge: _____ % Solid

_____ Odor _____ Chemically Active _____ Toxic

_____ Liquid _____ Solid _____ % Gas

_____ Volatility (if greater than acetone)

_____ Corrosive _____ Irritant _____ pH

_____ Leachate extraction (attached) _____ Infectious

_____ Explosive _____ Other

GENERAL DESCRIPTION OF WASTE AND PROCESS GENERATING WASTE

_____

_____

_____

VOLUME OF WASTE MATERIAL

_____ Gallons or _____ Cubic Yards Per:

___ Week _____ Month _____ Year ___ Only hauled once

*Attach supplemental sheet if needed (see #4, over)

(Instructions: Over) April 16, 1980

IDENTIFY MAJOR COMPONENTS: 1% (10,000 mg/kg) OR GREATER OF WASTE CONTENT

Compound or Element	Concentration(%)

MINOR COMPONENTS (Concentration) in mg/kg, mg/l, or ppm, OF WASTE CONTENT (Element and/or Compound)

INORGANIC METALS:

1. _____ Lead 5. _____ Beryllium
2. _____ Zinc 6. _____ Cadmium
3. _____ Nickel 7. _____ Chromium
4. _____ Copper 8. _____ Mercury

INORGANIC NON-METALS:

9. _____ Chlorine 12. _____ Phosphorus
10. _____ Bromine 13. _____ Sulfur
11. _____ Arsenic 14. _____ Cyanide
15. _____ % Noncombustable Ash

DOES THE WASTE MATERIAL CONTAIN ANY OF THE FOLLOWING?

Class of Compound	YES	NO
16. Halogenated aromatics (e.g. PCB, PBB)	___	___
17. Other Halogenated organics	___	___
18. Aromatic Amines	___	___
19. Pesticides	___	___
20. Aromatic Ureas or Thioureas	___	___
21. Cyclic Nitrogen (toxic) (e.g. Pyridine)	___	___
22. Phenols, to include nitro & halogenated phenols & salt	___	___
23. Quinones	___	___
24. Phosphorus containing compounds	___	___
25. Polycyclic organics	___	___
26. Asbestos	___	___
27. Any other materials listed on Mich. Critical Materials Reg.	___	___

NOTE: State what methods were utilized to derive the data for major and minor compounds (Analysis, Materials Balance, etc.)

INDICATE THE SPECIFIC NAME AND CONCENTRATION FOR THE COMPOUND(S) IN EACH CLASS LISTED ABOVE (16 - 27) THAT HAVE A CONCENTRATION LESS THAN 1%.

Compound	Concentration (mg/kg)

You (generator) are not required to complete and submit this Generator Waste Analysis Form to the Michigan Department of Natural Resources (MDNR) if:

a) A, B and C (below) are all marked yes, and if;

b) You (generator), your proposed hauler and disposal facility have: met all environmental requirements, received all necessary licenses (license addendums required for Act 136 Licenses), permits and approvals pursuant to applicable state and federal statutes.

YES	NO	
☐	☐	A. HAVE YOU PRODUCED THIS WASTE PRIOR TO JAN. 1, 1980?
☐	☐	B. HAVE YOU USED THIS HAULER FOR THIS WASTE PRIOR TO JAN. 1, 1980? PREVIOUS HAULER: _____
☐	☐	C. HAVE YOU USED THIS DISPOSAL FACILITY FOR THIS WASTE PRIOR TO JAN. 1, 1980? PREVIOUS DISPOSAL FACILITY: _____
☐	☐	D. DO YOU DECLARE THIS WASTE HAZARDOUS ACCORDING TO P.A. 64, MICHIGAN'S HAZARDOUS WASTE ACT? (For information on Act 64, contact Office of Hazardous Waste Management 517/373-2730.)

INSTRUCTIONS FOR WASTE ANALYSIS FORM

1. Please return all Generator Waste Analysis Forms to:
   Department of Natural Resources; Office of Hazardous Waste Management
   P.O. Box 30038; Lansing, Michigan 48909

2. This form must be completely filled out. All spaces should be filled in if applicable or completed with a N/A (not applicable).

3. No substitute forms will be accepted. Additional Laboratory Analysis may be used to supplement the form, if available.

*4. Please attach additional sheets to this form, if more space is necessary. Please identify any additional sheets with the name of the waste generator. *(An example is when the generator wants to request more than one hauler on one form.)

5. Indicate your ranges of waste variability using "± percentage of amount indicated". Whenever wastes do not conform to specifications outlined on this form a revised form must be submitted.

6. Under Michigan's Act 64, P.A. of 1979, the generator is responsible for its hazardous waste until receipt of a certificate of disposal. Therefore, if the information submitted on this form is incomplete or inadequate, the DNR will contact the generator of the waste to obtain a completed form.

7. When approved, the activity described on this form will be added to the proposed hauler's Liquid Industrial Waste Hauler License as an addendum, if applicable.

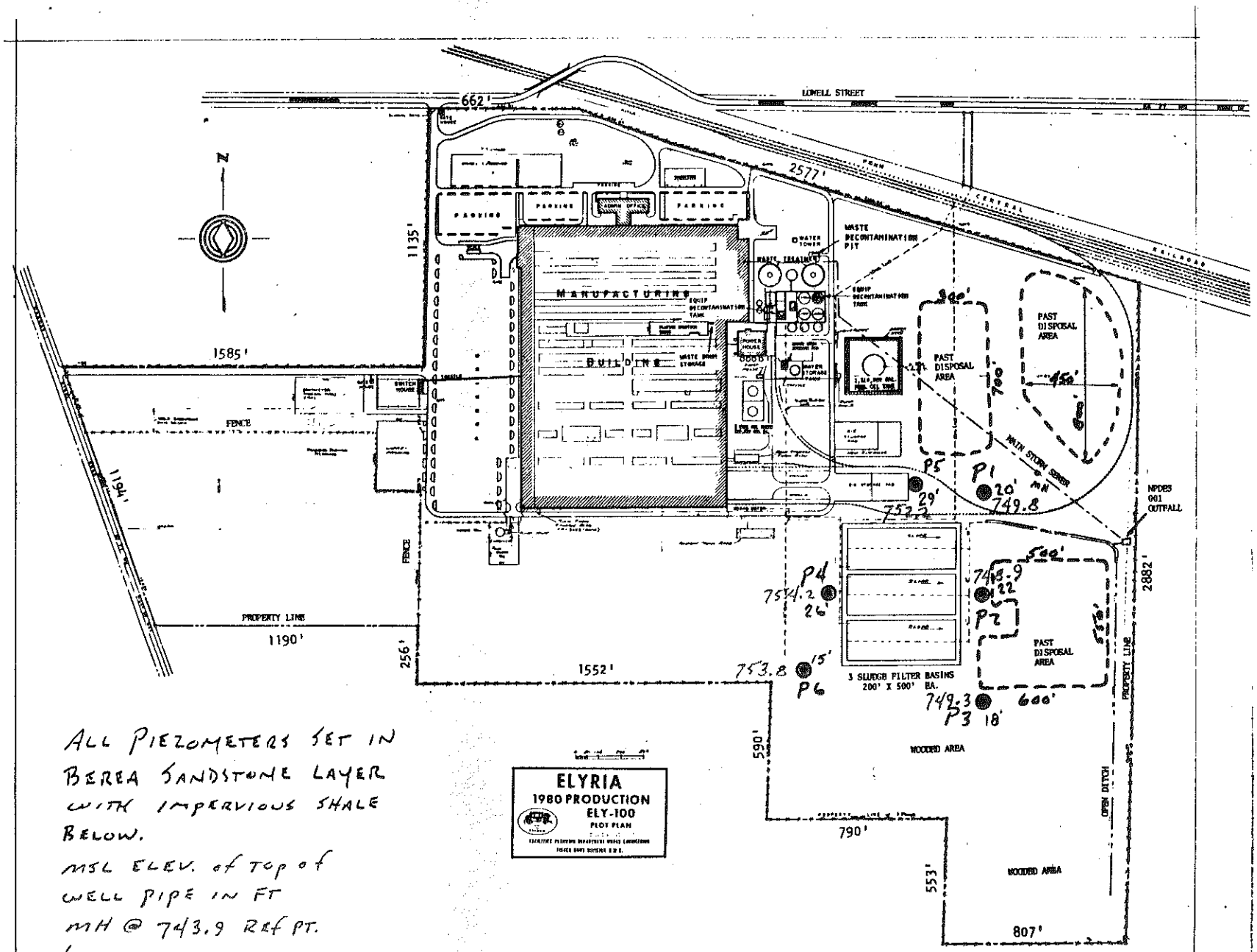
8. For information regarding waste management, contact the following:
   Incineration - Air Quality Division: (517) 322-1339
   Landfilling - Resource Recovery Division: (517) 322-1315
   Other Disposal/Treatment - Water Quality Division, Oil & Hazardous Materials Control Section: (517) 373-2794

To the best of my knowledge, the Waste Analysis and the above information is accurate and complete.

_____ / _____

Signature of Generator Date

PIEZOMETER LOCATIONS



ALL PIEZOMETERS SET IN BEREA SANDSTONE LAYER WITH IMPERVIOUS SHALE BELOW.

MSL ELEV. of TOP of WELL PIPE IN FT

MH @ 743.9 REF PT.

RCRA PERMIT "MAP" FP-INT-151

General Motors Corporation
Fisher Body Division
Elyria, Ohio

Report Containing Geological/Hydrological Investigations, Groundwater Monitoring Program, and Outline of Groundwater Assessment Plan

September 1981

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II. EPA-Approved Analytical Methods
III. t-Test Levels of Significance
IV. EPA's RCRA Regulations

SECTION 1: INTRODUCTION AND SUMMARY

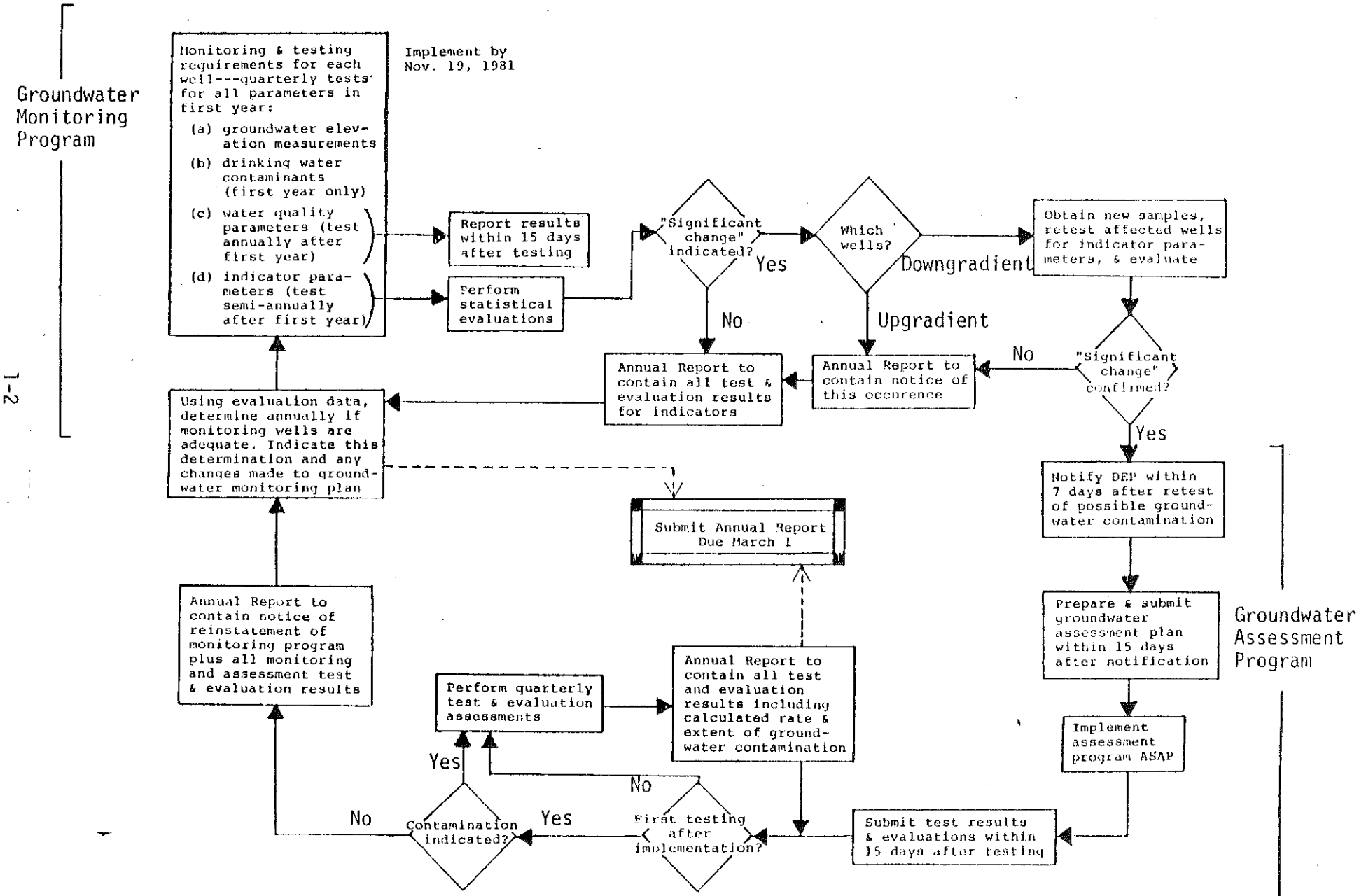
Resource Conservation and Recovery Act (RCRA) regulations concerning hazardous waste generation, transportation, treatment and disposal are being issued by the U. S. Environmental Protection Agency (EPA) in three phases. The first phase, in which "interim status" rules were established for existing facilities involved in activities that generate hazardous wastes, is now in effect until more stringent regulations are published.

General Motors Fisher Body Division has been issued an interim status permit for its sludge facility in Elyria, Ohio. Among the planning, monitoring and reporting requirements mandated by RCRA, a groundwater monitoring (GWM) program for Fisher Body's permitted sludge settling basins is required, and it must be in effect by November 19, 1981. By that same date, Fisher Body must have submitted, in outline form, its groundwater assessment (GWA) plan in response to monitoring results that indicate groundwater contamination may have occurred.

The groundwater monitoring program is a fairly involved sequence of regular well sampling, laboratory analyses, statistical evaluations of anlaytical results, recordkeeping and reporting of results. This report contains detailed plans and procedures concerning all the above.

A sequential review of the RCRA-based groundwater monitoring program is presented in summary form in Figure 1. The groundwater assessment plan is also included.

Figure 1: RCRA Groundwater Monitoring Requirements for Landfills (Interim Status)*



* All reports and notices are to be submitted to EPA

SECTION 2

Geological/Hydrological
Investigation
General Motors Corporation
Fisher Body Plant
Elyria, Ohio

Written By:

Ross Overby

Reviewed By:

Charles T. Govin

June and September 1981

2.1 Introduction

Between May 13 and May 19, 1981 four borings were abvanced to varying depths around the active sludge disposal area at the Fisher Body Division, General Motors Corporation in Elyria, Ohio. Each of the borings was constructed into a groundwater observation well. These observation wells will be utilized as part of a groundwater monitoring program as required in The Federal EPA Hazardous Waste Regulations, Part 265, Subpart F. Data from these wells was used to define the geologic and hydrologic characteristics in the vicinity of the sludge disposal ponds as well as to determine the need for additional wells.

After review of the initial findings of the geotechnical investigation, General Motors Corporation, Fisher Body Division, elected to install two (2) additional groundwater monitoring wells in the vicinity of the three sludge lagoons located on the Fisher Body Division property. During the week of July 26, 1981, CDM installed the two additional observation wells.

Figure 2a shows a site layout indicating the active sludge settling basins. Each well has been assigned an identification number (P-1, P-2, etc.). The location of each well is indicated on Figure 2d. All borings referenced in this report are referred to by their corresponding well number. The remainder of this report details the findings of the drilling program, the positioning of each well, and the hydrologic characteristics in the immediate vicinity of the sludge disposal ponds.

2.2 Drilling Program

Drilling was accomplished utilizing auger and rotary methods. Drill logs and geologic profiles are contained in Appendix A of this Section.

Soft light brown to greenish gray clay till deposited by the Wisconsin glacial advance comprises the first 9 to 12 feet of the surficial materials.[1] In the vicinity of boring P-3 and to a lesser degree in boring P-2 a soft light greenish gray shale underlies the glacial deposits. This shale is approximately 5 feet thick in the vicinity of P-3 and approximately 2.5 feet thick near boring P-2. This shale may be an isolated deposit or may possibly correlate with the Orangeville shale, Mississippian in age. A very hard light greenish gray fine grained sandstone with very thin shale interbeds underlies the shale east and southeast of the disposal ponds and underlies the glacial material west and northeast of the ponds. This sandstone probably correlates with the Berea sandstone, Lower Mississippian in age. Based on the six widely spaced borings, the sandstone appears to thin to the east and south ranging in thickness from 14 feet west of the ponds and five feet southeast and southwest of the ponds. The sandstone encountered in boring P-5 and P-6 was found to be highly weathered which is in great contrast to the extreme hardness of the sandstone encountered in the other borings. How the sandstone behaves beyond the borings could not be determined from this investigation; however, regional data obtained in a literature review indicates that the Berea sandstone is discontinuous owing its discontinuity to preglacial erosion and in some cases non-deposition. A unit that probably correlates with the Bedford shale, lower Mississippian in age, underlies the sandstone. East of the ponds, this shale is bluish gray. West of the ponds, the shale was found to be red. The depth to the shale was found to be approximately 15 to 22 feet. A geologic column identifying the units encountered in the boring program is shown in Figure 2b.

2.3 Piezometer Installation

A piezometer was installed in each boring. The tip of each piezometer was placed at the Berea sandstone - (Bedford) shale contact. Each piezometer

---

[1] Soil Survey of Lorain Co., U.S. Department of Agriculture Soil Conservation Service, July, 1976.

was installed utilizing the following criteria:

1) Five foot slotted PVC pipe
2) PVC riser pipe
3) Pea gravel pack around slotted section
4) At least one foot of sand above gravel pack
5) Bentonite seal above sand
6) Grout to ground level
7) Security protective casing

An idealized drawing of an installed piezometer is shown in Figure 2c. After installation, each piezometer was thoroughly flushed with fresh water. Complete piezometer installation data is contained in Appendix B of this Section.

The relative elevations of the top of the PVC riser pipe of each piezometer were surveyed. A manhole cover was used as a Bench Mark and was assigned an arbitrary datum of 100 feet. This arbitrary datum appears to correspond to an approximate elevation of 755 MSL. Figure 2d shows the location of the manhole. The relative elevations of each piezometer are found in Table 2a.

2.4 Hydrologic Characteristics

Approximately two weeks after the installation of the piezometers, water levels were obtained. The piezometric levels referenced to the arbitrary datum are shown in Table 2a. Figure 2d depicts the piezometric levels on the boring location map. As shown on this figure, the groundwater flow direction as indicated by the piezometric levels is toward the northeast.

2.5 Conclusions

Article 265.91(A)1 of the Resource Conservation and Recovery Act (RCRA) regulations requires one upgradient and three downgradient groundwater

observation wells. The piezometric levels of the six borings as shown on Figure 2d indicate that boring P-6 has been located upgradient and borings P-1, P-2 and P-5 have been located downgradient. The northeast groundwater flow corresponds with the expected regional groundwater flow direction.

Table 2a

Piezometer Elevation Data

Piezometer	Elevation*	Depth to Water**	Piezometric Level
P-1	105.9	10.5	95.4
P-2	105.0	4.0	101.0
P-3	105.4	5.0	100.4
P-4	110.3	7.0	103.3
P-5	108.3	9.2	99.1
P-6	109.9	9.0	100.9

* Top of PVC Riser

** From top of Riser

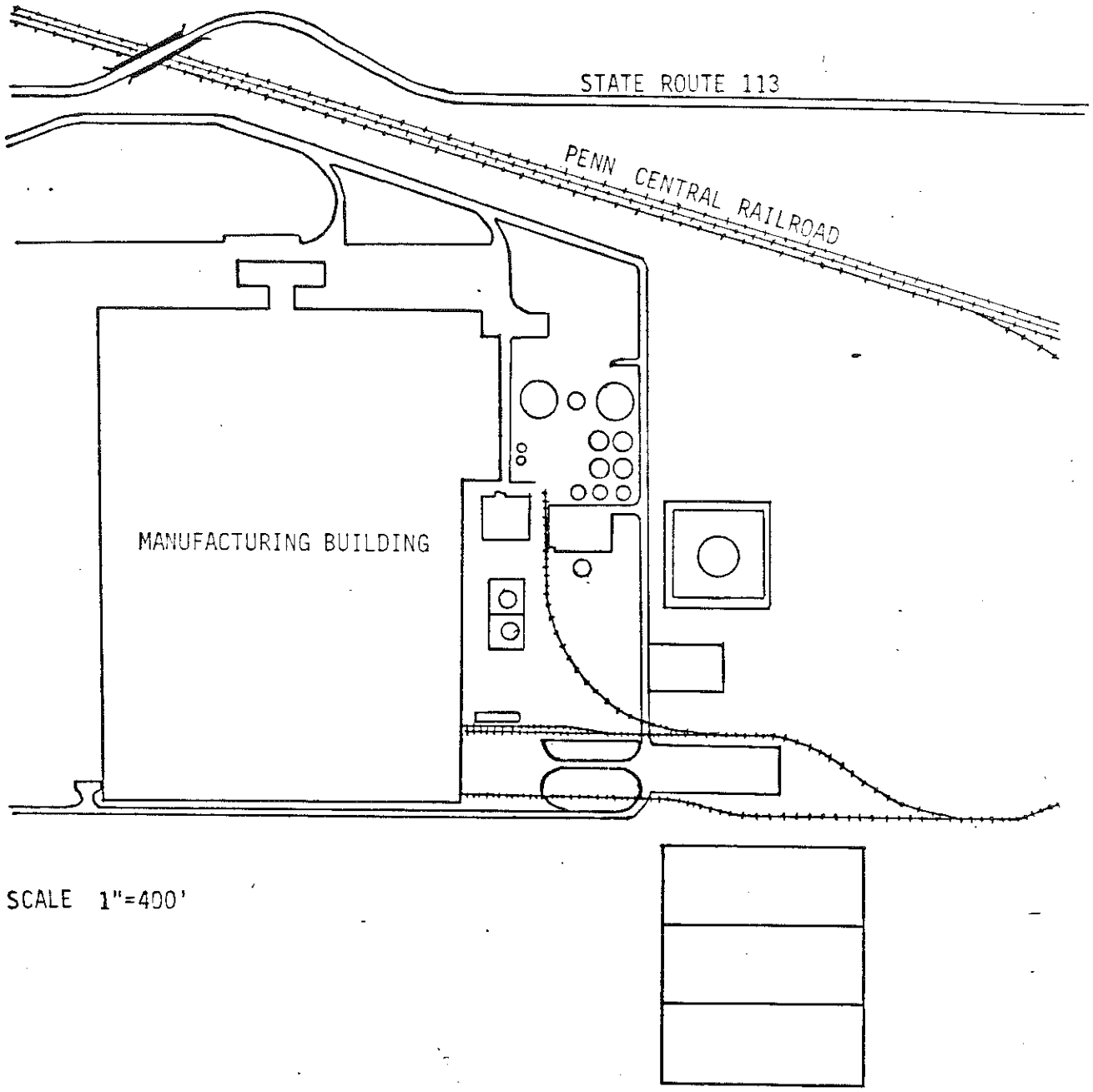
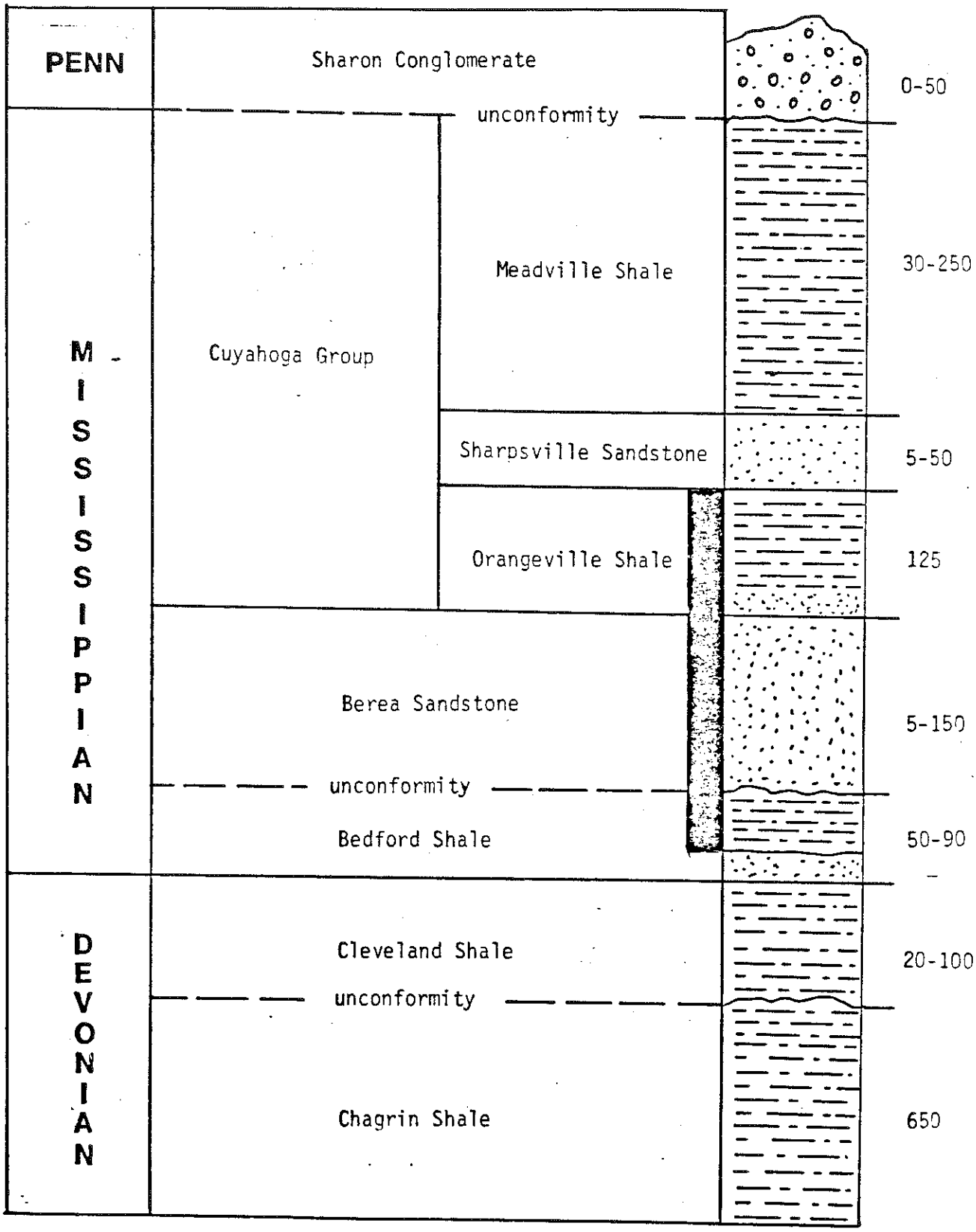


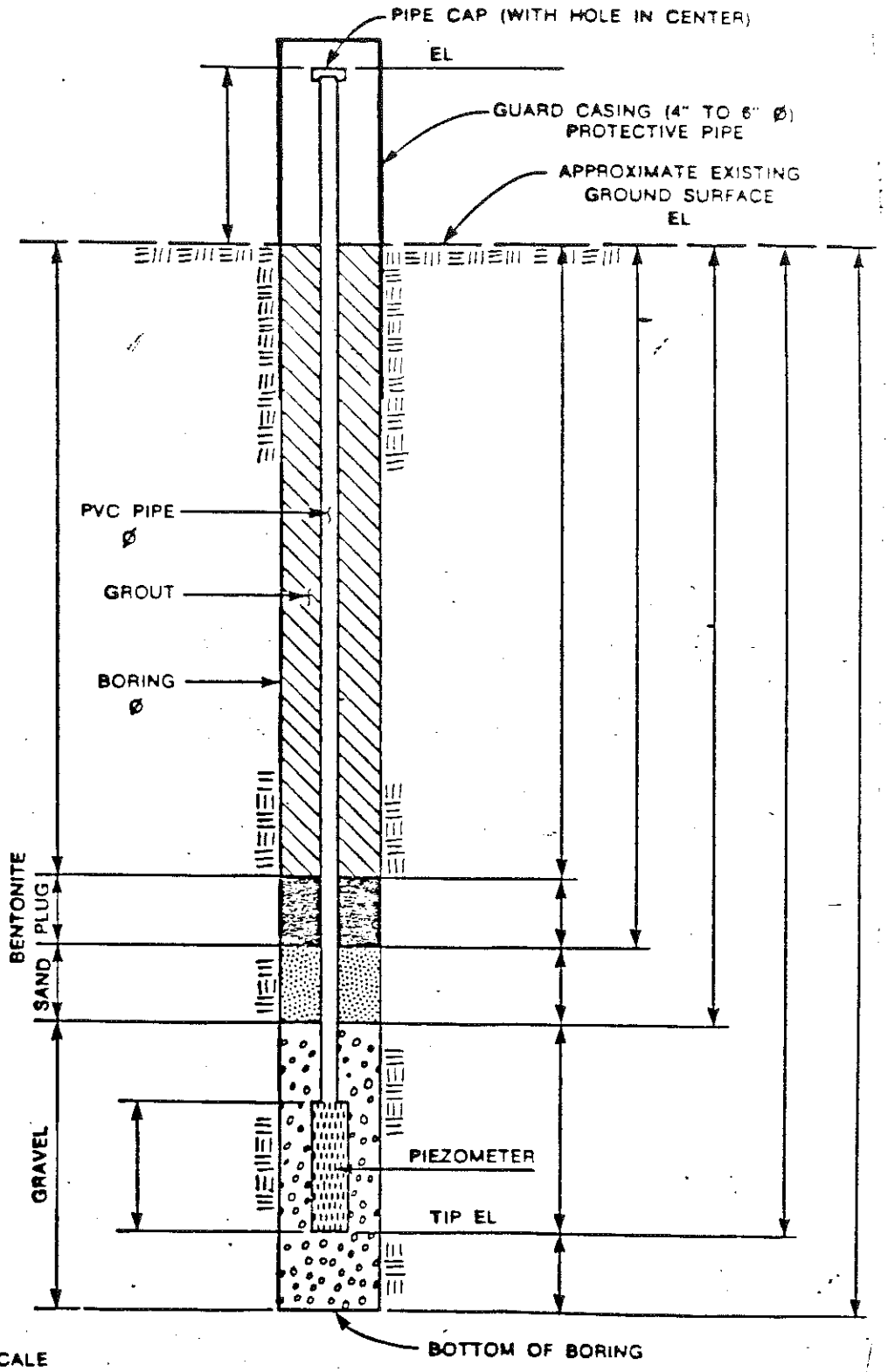
FIGURE 2a
SLUDGE SETTLING BASIN LOCATION



UNITS ENCOUNTERED IN DRILLING PROGRAM

FIGURE 2b

PARTIAL GEOLOGIC COLUMN FOR LORAIN COUNTY



NOTE: FIGURE NOT TO SCALE

FIGURE 2c

IDEALIZED PIEZOMETER PROFILE

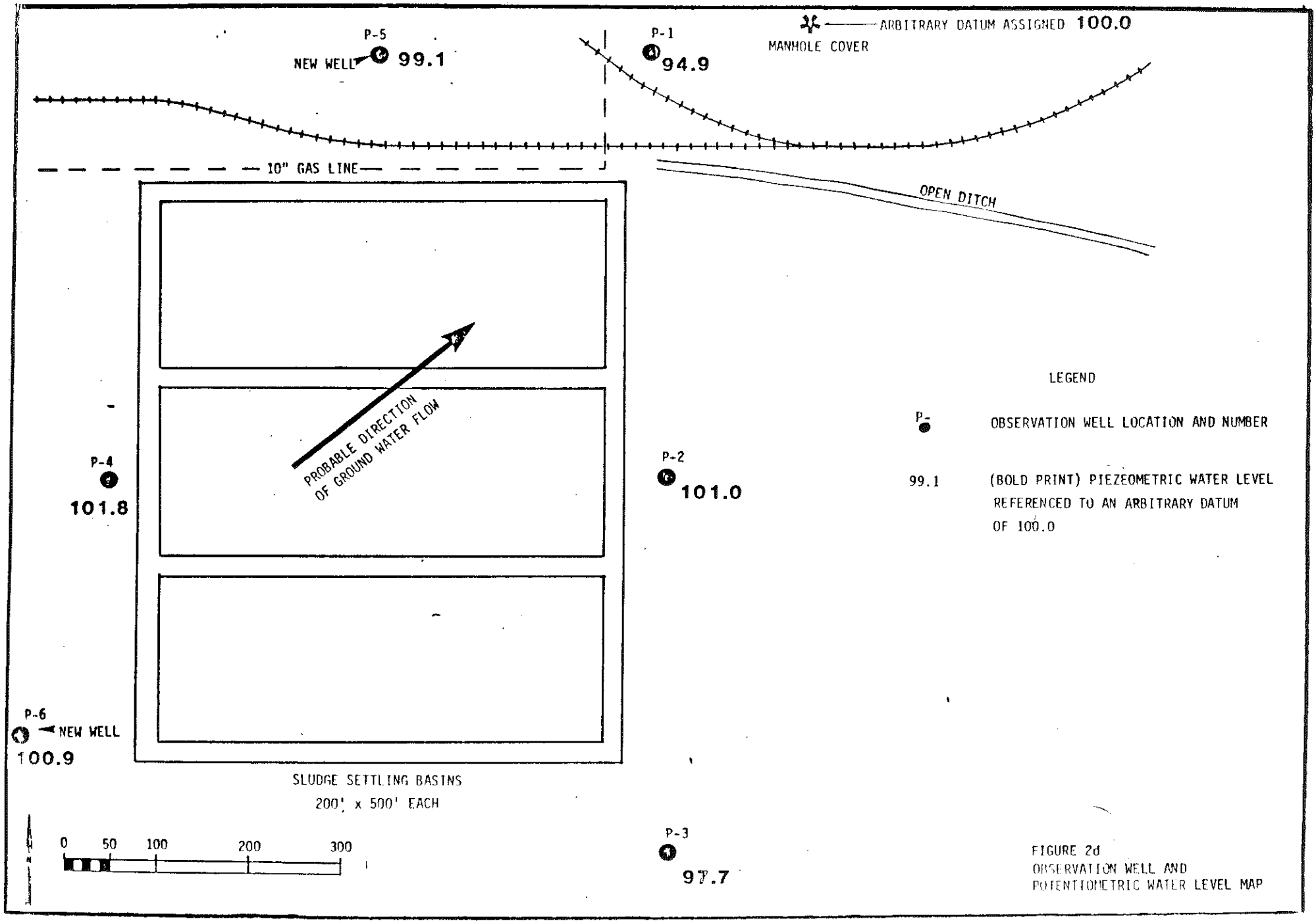


FIGURE 2d
OBSERVATION WELL AND
POTENTIOMETRIC WATER LEVEL MAP

APPENDIX A

SOIL BORING LOGS

Boring Number	Interval (ft)	Description
P-1	0-3	Gray brown silty clay
	3-10	Light brown silty sand and gravel
	10-12	Weathered redish brown sandstone
	12-19	Very hard find grained greenish gray sandstone, very thin shale interbeds
	19-29	Gray shale
P-2	0-8	Brown silty clay trace sand
	8-11	Gray silty clay trace sand
	11-13.5	Gray shale sandy interbeds
	13.5-22	Sandstone, medium fine gravel, thin shale interbeds
	22-23	Gray shale, some silt
P-3	0-9	Gray brown silty clay trace sand
	9-12	Weathered shale, gray
	12-14	Gray shale
	14-19	Fine grained sandstone, light gray with shale streaks
	19-23	Gray silty shale
P-4	0-4	Silty clay - fill?
	14-13	Brown to gray brown silty clay trace sand
	13-25	Very hard greenish gray sandstone
	27-28	Red shale

SOIL BORING LOGS

Boring Number	Interval (ft)	Description
P-5	0-3	Brown silty clay, trace sand
	8-23	Weathered light gray sandstone
	23-29	Light gray sandstone, medium fine grain
P-6	0-10	Brown silty clay, trace sand
	10-15	Weathered light gray sandstone
	15-18.5	Weathered red shale

APPENDIX B

FILE NO _____
PAGE 1 OF 2

CDM

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fisher Body (GM) FIELD ENG/GEO Ross Overby DATE 5/14/81
PROJECT NO. 1211 CHECKED BY Ross Overby DATE 5/14/81
BORING NO. P-1 COORDINATES _____
PIEZOMETER NO. P-1 DATE OF INSTALLATION 5/14/81

BOREHOLE DRILLING

DRILLING METHOD Auger/Rotary
DRILLING FLUID(S) USED
FLUID Water FROM _____ TO _____
FLUID _____ FROM _____ TO _____

TYPE OF BIT Roller/ Tricone
CASING SIZE(S) USED None
SIZE _____ FROM _____ TO _____
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE PVC
DIAMETER OF PERFORATED SECTION 2" ID
PERFORATION TYPE
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS _____
TOTAL PERFORATED AREA _____

RISER PIPE MATERIAL PVC
RISER PIPE DIAMETERS 2" ID
O.D. _____ I.D. _____
LENGTH OF PIPE SECTIONS _____
JOINING METHOD GLUE ASTM 2564

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 3'
PROTECTIVE PIPE O.D _____

OTHER PROTECTION _____

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (ft)	
TOP OF RISER PIPE	1.1		105.9	
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE				
BOREHOLE FILL MATERIALS				
GROUT/SLURRY	TOP 0	BOTTOM 13	TOP 104.8	BOTTOM 91.8
BENTONITE	TOP 0	BOTTOM 13	TOP 104.8	BOTTOM 91.8
SAND	TOP 13	BOTTOM 14	TOP 91.8	BOTTOM 90.8
GRAVEL	TOP 14	BOTTOM 20	TOP 90.8	BOTTOM 84.8
PERFORATED SECTION	TOP 15	BOTTOM 20	TOP 89.8	BOTTOM 84.8
PIEZOMETER TIP	20		84.8	
BOTTOM OF BOREHOLE				
GWL AFTER INSTALLATION	10.5		95.4	

WAS THE HOLE FLUSHED BEFORE INSTALLATION? YES ☒ NO ☐
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☒ NO ☐
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS _____

FILE NO _____
PAGE 1 OF 2

CDM

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fisher Body (GM) FIELD ENG/GEO Ross Overby DATE 5/15/81
PROJECT NO. 1211 CHECKED BY Ross Overby DATE 5/15/81
BORING NO. P-2 COORDINATES _____
PIEZOMETER NO. P-2 DATE OF INSTALLATION 5/15/81

BOREHOLE DRILLING

DRILLING METHOD Rotary/Auger
DRILLING FLUID(S) USED Water
FLUID _____ FROM _____ TO _____
FLUID _____ FROM _____ TO _____

TYPE OF BIT Roller/Tricone
CASING SIZE(S) USED
SIZE _____ FROM _____ TO _____
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE PVC
DIAMETER OF PERFORATED SECTION 2" ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS _____
TOTAL PERFORATED AREA _____

RISER PIPE MATERIAL PVC
RISER PIPE DIAMETERS 2" ID
O.D. _____ I.D. _____
LENGTH OF PIPE SECTIONS _____
JOINING METHOD Glue ASTM 2564

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 3'
PROTECTIVE PIPE O.D _____

OTHER PROTECTION _____

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (ft)	
TOP OF RISER PIPE	1.8		105.0	
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE				
BOREHOLE FILL MATERIALS				
GROUT/SLURRY	TOP 0	BOTTOM 14	TOP 103.2	BOTTOM 89.2
BENTONITE	TOP 0	BOTTOM 14	TOP 103.2	BOTTOM 89.2
SAND	TOP 14	BOTTOM 15	TOP 89.2	BOTTOM 88.2
GRAVEL	TOP 15	BOTTOM 22	TOP 88.2	BOTTOM 81.2
PERFORATED SECTION	TOP 17	BOTTOM 22	TOP 86.2	BOTTOM 81.2
PIEZOMETER TIP	22		81.2	
BOTTOM OF BOREHOLE				
GWL AFTER INSTALLATION	4.0		101.0	

WAS THE HOLE FLUSHED BEFORE INSTALLATION? YES ☒ NO ☐
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☒ NO ☐
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS _____

FILE NO. _____
PAGE 1 OF 2

CDM

PIEZOMETER INSTALLATION SHEET

PROJECT NAME: Fisher Body (GM)
PROJECT NO.: 1211
BORING NO.: P-3
PIEZOMETER NO.: P-3

FIELD ENG/GEO: Ross Overby DATE: 5/18/81
CHECKED BY: Ross Overby DATE: 5/18/81
COORDINATES: _____
DATE OF INSTALLATION: 5/18/81

BOREHOLE DRILLING

DRILLING METHOD: Auger/Rotary
DRILLING FLUID(S) USED: Water
FLUID _____ FROM _____ TO _____
FLUID _____ FROM _____ TO _____

TYPE OF BIT: Roller/Tricone
CASING SIZE(S) USED:
SIZE _____ FROM _____ TO _____
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE: PVC
DIAMETER OF PERFORATED SECTION: 2" ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS: _____
TOTAL PERFORATED AREA: _____

RISER PIPE MATERIAL: PVC
RISER PIPE DIAMETERS: 2" ID
O.D. _____ I.D. _____
LENGTH OF PIPE SECTIONS: _____
JOINING METHOD: Glue ASTM 2564

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH: 3'
PROTECTIVE PIPE O.D.: _____

OTHER PROTECTION: _____

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (ft)	
TOP OF RISER PIPE	2.0		105.4	
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE				
BOREHOLE FILL MATERIALS				
GROUT/SLURRY	TOP 0	BOTTOM 12	TOP 103.4	BOTTOM 91.4
BENTONITE	TOP 0	BOTTOM 12	TOP 103.4	BOTTOM 91.4
SAND	TOP 12	BOTTOM 14	TOP 91.4	BOTTOM 89.4
GRAVEL	TOP 14	BOTTOM 18	TOP 89.4	BOTTOM 85.4
PERFORATED SECTION	TOP 13	BOTTOM 18	TOP 90.4	BOTTOM 85.4
PIEZOMETER TIP	18		85.4	
BOTTOM OF BOREHOLE				
GWL AFTER INSTALLATION	5.0		100.4	

WAS THE HOLE FLUSHED BEFORE INSTALLATION? YES ☒ NO ☐
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☒ NO ☐
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS _____

FILE NO _____
PAGE 1 OF 2

CDM

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fisher Body (GM) FIELD ENG/GEO Ross Overby DATE 5/19/81
PROJECT NO. 1211 CHECKED BY Ross Overby DATE 5/19/81
BORING NO. P-4 COORDINATES _____
PIEZOMETER NO. P-4 DATE OF INSTALLATION 5/19/81

BOREHOLE DRILLING

DRILLING METHOD Auger/Rotary
DRILLING FLUID(S) USED Water
FLUID _____ FROM _____ TO _____
FLUID _____ FROM _____ TO _____

TYPE OF BIT Roller/Tricone
CASING SIZE(S) USED
SIZE _____ FROM _____ TO _____
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE PVC
DIAMETER OF PERFORATED SECTION 2" ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS _____
TOTAL PERFORATED AREA _____

RISER PIPE MATERIAL PVC
RISER PIPE DIAMETERS 2" ID
O.D. _____ I.D. _____
LENGTH OF PIPE SECTIONS _____
JOINING METHOD Glue ASTM 2564

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 3'
PROTECTIVE PIPE O.D _____

OTHER PROTECTION _____

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (ft)	
TOP OF RISER PIPE	1.3		110.3	
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE				
BOREHOLE FILL MATERIALS				
GROUT/SLURRY	TOP 0	BOTTOM 18	TOP 109.0	BOTTOM 91.0
BENTONITE	TOP 0	BOTTOM 18	TOP 109.0	BOTTOM 91.0
SAND	TOP 18	BOTTOM 19	TOP 91.0	BOTTOM 90.0
GRAVEL	TOP 19	BOTTOM 26	TOP 90.0	BOTTOM 83.0
PERFORATED SECTION	TOP 21	BOTTOM 26	TOP 88.0	BOTTOM 83.0
PIEZOMETER TIP	26		83.0	
BOTTOM OF BOREHOLE				
GWL AFTER INSTALLATION	7.0		103.3	

WAS THE HOLE FLUSHED BEFORE INSTALLATION? YES ☒ NO ☐
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☒ NO ☐
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS _____

FILE NO _____
PAGE 1 OF 2

CDM®

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fisher Body (GM) FIELD ENG/GEO Ross Overby DATE 7-28-81
PROJECT NO. 1211 CHECKED BY Ross Overby DATE 7-28-81
BORING NO. P-5 COORDINATES _____
PIEZOMETER NO. P-5 DATE OF INSTALLATION 7-28-81

BOREHOLE DRILLING

DRILLING METHOD Auger/Rotary
DRILLING FLUID(S) USED
FLUID Water FROM _____ TO _____
FLUID _____ FROM _____ TO _____

TYPE OF BIT Roller/Tricone
CASING SIZE(S) USED
SIZE _____ FROM _____ TO _____
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE PVC
DIAMETER OF PERFORATED SECTION 4" OD
PERFORATION TYPE
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS _____
TOTAL PERFORATED AREA _____

RISER PIPE MATERIAL PVC
RISER PIPE DIAMETERS 4" OD
O.D. _____ I.D. _____
LENGTH OF PIPE SECTIONS _____
JOINING METHOD GLUE ASTM 2564

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 3'
PROTECTIVE PIPE O.D. _____

OTHER PROTECTION _____

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	1.4		108.3	
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE				
BOREHOLE FILL MATERIALS				
GROUT/SLURRY	TOP 0	BOTTOM 18	TOP 106.9	BOTTOM 90.3
BENTONITE	TOP 18	BOTTOM 21	TOP 90.3	BOTTOM 87.3
SAND	TOP 21	BOTTOM 23	TOP 87.3	BOTTOM 85.3
GRAVEL	TOP 23	BOTTOM 29	TOP 85.3	BOTTOM 79.3
PERFORATED SECTION	TOP 24	BOTTOM 29	TOP 84.3	BOTTOM 79.3
PIEZOMETER TIP	29'		79.3	
BOTTOM OF BOREHOLE				
GWL AFTER INSTALLATION	9.2'		99.1	

WAS THE HOLE FLUSHED BEFORE INSTALLATION? YES ☒ NO ☐
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☒ NO ☐
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS _____

FILE NO _____
PAGE 1 OF 2

CDM®

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fisher Body (GM) FIELD ENG/GEO Ross Overby DATE 7-29-81
PROJECT NO. 1211 CHECKED BY Ross Overby DATE 7-29-81
BORING NO. P-6 COORDINATES _____
PIEZOMETER NO. P-6 DATE OF INSTALLATION 7-29-81

BOREHOLE DRILLING

DRILLING METHOD Auger
DRILLING FLUID(S) USED.
FLUID _____ FROM _____ TO _____
FLUID _____ FROM _____ TO _____

TYPE OF BIT Auger
CASING SIZE(S) USED
SIZE _____ FROM _____ TO _____
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE PVC
DIAMETER OF PERFORATED SECTION 4" OD
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS _____
TOTAL PERFORATED AREA _____

RISER PIPE MATERIAL PVC
RISER PIPE DIAMETERS 4" OD
O.D. _____ I.D. _____
LENGTH OF PIPE SECTIONS _____
JOINING METHOD GLUE ASTM 2564

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 3'
PROTECTIVE PIPE O.D _____

OTHER PROTECTION _____

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (ft)	
TOP OF RISER PIPE	1.5		109.9	
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE				
BOREHOLE FILL MATERIALS				
GROUT/SLURRY	TOP 0	BOTTOM 7	TOP 109.9	BOTTOM 102.9
BENTONITE	TOP 7	BOTTOM 8	TOP 102.9	BOTTOM 101.9
SAND	TOP 8	BOTTOM 10	TOP 101.9	BOTTOM 99.9
GRAVEL	TOP 10	BOTTOM 15	TOP 99.9	BOTTOM 94.9
PERFORATED SECTION	TOP 10	BOTTOM 15	TOP 99.9	BOTTOM 94.9
PIEZOMETER TIP	15		94.9	
BOTTOM OF BOREHOLE				
GWL AFTER INSTALLATION	9.0		100.9	

WAS THE HOLE FLUSHED BEFORE INSTALLATION? YES ☐ NO ☒
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS _____

SECTION 3: GROUNDWATER MONITORING (GWM) PROGRAM: SAMPLING AND TESTING REQUIREMENTS

3.1 Introduction

A fundamental goal of the groundwater monitoring (GWM) program is the establishment and maintenance of a consistent groundwater sampling and analytical program. All activities must follow a well-defined schedule and conform to standardized, EPA-approved procedures.

This section describes the GWM sampling and testing requirements with respect to well location and standardized sample collection, handling and analytical techniques. The schedules included present the minimal RCRA requirements: Fisher Body may, by election or EPA stipulation, increase sampling and testing frequency scope.

3.2 Well Location and Sampling Methods

EPA's minimum monitoring requirements call for one well to be located hydraulically upgradient of the hazardous waste management area and three wells to be located downgradient from the area. Therefore, based on available data, we recommend that Fisher Body use the following new wells in its GWM program:

1. for upgradient sampling - well P-6
2. for downgradient sampling - wells P-1, P-2, and P-5

Modifications to these existing wells may be made if necessary to meet EPA standards--the wells must be permanently cased screened or perforated as appropriate, and packed with sand or gravel where necessary; the annular space between the well casing and the boring hole must be sealed with grout or other suitable material to prevent contamination of samples and groundwater.

The wells to be used are shallow (i.e., less than 30 feet deep) and are 2" diameter piezometric-type. The schedule below specifies appropriate apparatus recommended for obtaining groundwater samples.

1. all wells: peristaltic pump (portable or permanent) or bailer;

In the collection of samples, contamination between wells must be minimized. The use of peristaltic pumps, after prepumping to remove stagnant water, and permanent submersible pumps provide the best assurance of good samples. When using a bailer, however, thorough flushing with clean water is required before sampling each well. Submersible pumps which are used for more than one well must also be decontaminated by careful flushing.

A sketch of the landfill area indicating groundwater monitoring wells is included in Section 2 as Figure 2a.

3.3 Water Elevation Measurements

Before drawing any groundwater samples, the depth to groundwater should be measured in all monitoring wells. This figure, when subtracted from the land elevation at the well, will provide the water table elevation required as part of the GWM plan.

There are several available methods to measure the water depth. A common procedure involves lowering a steel tape (such as a measuring tape with a weight on the lower end) coated with chalk or dry soil into the well. The depth to groundwater is found by subtracting the length of tape immersed in water, as indicated by the wet chalk, from the reading at the top of the well. Other equipment which can be used to measure the depth includes electric sounders, and "popper" devices.

When measuring groundwater depth, the following information should be recorded in the field log book discussed in Section 3.6: date; well number and location; elevation of ground surface; measured depth to water; computed elevation of the water table; and, note of whether the well was being pumped when measured, was pumped recently, or whether a nearby well was pumping during the measurement. Because any pumping, including removal of water samples, can affect the water table height, water level measurements of all wells should be taken prior to sampling.

3.4 Sampling and Testing Schedule

Groundwater samples are to be collected, preserved and analyzed according to the following schedule:

1. First year: quarterly sampling on each well for all parameters - drinking water contaminants, water quality parameters, and indicator parameters (four replicates);

2. Second year on:

   a. Semi-annual sampling on each well for indicator parameters only, with four replicate tests per parameter per sample;

   b. Annual sampling on each well for water quality parameters.

The drinking water contaminants are listed in Table 3a along with their maximum allowable concentrations. The water quality and indicator parameters are listed in Tables 3a and 3b, respectively.

Table 3a: Drinking Water Contaminants

Parameter	Maximum concentration, mg/l
Arsenic (As)	0.05
Barium (Ba)	1.0
Cadmium (Cd)	0.01
Chromium (Cr)	0.05
Fluoride (F)	1.4 - 2.4
Lead (Pb)	0.05
Mercury (Hg)	0.002
Nitrate (as N) (NO_3-N)	10
Selenium (Se)	0.01
Silver (Ag)	0.05
Endrin	0.0002
Lindane	0.004
Methoxychlor	0.1
Toxaphene	0.005
2,4-D	0.1
2,4,5-TP Silver	0.01
Radium	5 pCi/l
Gross Alpha	15 pCi/l
Gross Beta	4 millirem/yr
Coliform Bacteria	1/100 ml

Table 3b: Groundwater Quality Parameters

Iron (Fe)	Chloride (Cl)
Manganese (Mn)	Sulfate (SO_4)
Sodium (Na)	Phenols

Table 3c: Indicator Parameters

pH	Total Organic Carbon (TOC)
Specific Conductance	Total Organic Halides (TOX)

3.5 Sample Collection: Volumes and Preservation

The following table indicates the collection volumes, bottles, and preservation required for each groundwater monitoring sequence, assuming one laboratory will perform all analyses.

Table 3d: Sample Volume Requirements for Each Monitoring Well

I. Quarterly sampling (all parameters, first year only)**

Item No.	Sample Volume	Bottle Type	Special Instructions	Tests to be Done
1	1 liter (l)	Plastic	add HNO_3 to pH < 2	metals (As, Ba, Cd, Cr, Pb, Fe, Mn, Ag, Na, Se, Hg)
2	5 l	Glass	hexane-washed bottle, teflon cap	pesticides (6), TOX (x 4)
3	2 l	Plastic	sterile	miscellaneous: Cl, SO_4, F, pH (x 4), coliform, radioactivity (3), specific conductance (x 4)
4	500 ml	Glass	(Add H_3PO_4 to pH=4; (add 0.5 g $CuSO_4$	phenols
5	500 ml	Glass	add H_2SO_4 to pH < 2	nitrate, TOC (x 4)

Total Volume = 9 l = 2.5 gallons

**Keep all samples at 4^oC

Table 3d(continued)

II. Semi-Annual Sampling (indicator parameters only; begin second year)**

Item No.	Sample Volume	Bottle Type	Special Instructions	Tests to be Done
1	100 ml	Plastic		pH (x 4), specific conductance (x 4)
2	100 ml	Glass	add H_2SO4 to pH < 2	TOC (x 4)
3	1 l	Glass	hexane-washed, teflon cap	TOX (x 4)

Total Volume = 1.2 l = 0.3 gallon

**Keep all samples at 4^oC (40^oF)

III. Annual Sampling (indicator and water quality parameters; begin second year)**

Item No.	Sample Volume	Bottle Type	Special Instructions	Tests to be Done
1	250 ml	Plastic		miscellaneous: Cl, SO_4, pH (x 4), specific conductance (x 4)
2	250 ml	Plastic	add HNO_3 to pH < 2	Fe, Mn, Na
3	500 ml	Glass	(add H_3PO4 to pH = 4; (add 0.5 g $CuSO_4$	phenols
4	100 ml	Glass	add H_2SO4 to pH < 2	TOC (x 4)
5	1 l	Glass	hexane washed, teflon cap	TOX (x 4)

Total Volume = 2.1 l = 1/2 gallon

**Keep all samples at 4^oC (40^oF)

If more than one laboratory is to analyze the samples, the minimum volumes required can be obtained from Table 3e on the following page.

Table 3e: Minimum Volume Requirements for Individual Tests**

	Test	Volume	Bottle Type	Special Instructions
1.	Each metal (As, Ba, Cd, Cr, Fe, Pb, Mn, Ag, Na, Se, Hg)	100 ml	Plastic or Glass	add HNO_3 to pH < 2
2.	Nitrate	250 ml	Plastic or Glass	add H_2SO_4 to pH < 2
3.	Chloride or Sulfate	100 ml	Plastic or Glass	
4.	Fluoride	300 ml	Plastic	
5.	Phenols	500 ml	Glass	add H_3PO_4 to pH = 4 and add 0.5 g $CuSO_4$
6.	Pesticides (total of 6 tests)	500-1000 ml	Glass	hexane-washed bottle, teflon-lined cap
7.	TOC (4 replicates)	100 ml	Glass	add H_2SO_4 to pH < 2
8.	TOX (4 replicates)	1000 ml	Glass	hexane-washed bottle, teflon-lined cap
9.	pH (4 replicates)	100 ml	Plastic or Glass	
10.	Specific Conductance (4 replicates)	100 ml	Plastic or Glass	
11.	Coliform	100 ml	Plastic or Glass	sterile bottle
12.	Radioactives (total of 3 tests)	250 ml	Plastic or Glass	

3.6 Handling, Recordkeeping and Chain of Custody Considerations

RCRA regulations indicate that, in order to minimize contamination, loss or mistreatment, the groundwater samples are to be collected, handled, labeled and transferred in accordance with strict recordkeeping procedures.

1. Sample bottles should be sealed with a label indicating well number, time and date, sample number and name of person collecting sample.

2. A second label should be attached to the sample bottle and should contain the above information, plus note of preservative used, field conditions and any other pertinent remarks.

3. A bound field log book should be used to record sample volumes, preservatives, sample numbers, time and date, field conditions, etc. The same log book can be used continuously throughout the monitoring program.

4. Chain of custody is controlled using standard carbon-copy transfer forms. Each person receiving and relinquishing the sample must sign and date the form. The transfer form should indicate the sample number(s), date and time of collection, and sample description in addition to the signatures and dates.

Excerpts from several EPA manuals addressing these topics, along with label and record sheet examples, are included in Appendix I of Section 7.

3.7 Analytical Procedures

The EPA analytical methods approved or tentatively approved for most of the parameters to be tested for are listed in Appendix II, Section 7. Additional analytical methods for TOX and for two pesticides are listed below:

1. TOX: EPA Method 450.1, published in November 1980

2. Pesticides/Herbicides

3. a. Methoxychlor

   ASTM Part 31, Section D-3088
   USGS Methods Chapter A5, pg. 24-39
   Standard Methods (14th ed.) Test 509A

   b. 2,4,5-TP Silver (Silvex)

   ASTM Part 31, Section D-3478
   USGS Methods Chapter A5, pg. 24-39
   Standard Methods (14th ed.) Test 509B

Also, approved methods for testing these and other pesticides/herbicides can be found in the EPA publication entitled, "Methods for Testing Organochlorine Pesticides and Chlorophenoxy Herbicides in Drinking Water and Raw Source Water", available from EPA's Office of Research and Development (ORD) in Cincinnati, Ohio.

SECTION 4: GROUNDWATER MONITORING PROGRAM: EVALUATION PROCEDURES

4.1 Introduction

Further standardized procedures in the GWM program must be followed in order to consistently evaluate analytical data obtained from well sampling. These evaluations, based upon statistical methods, are detailed in this section.

4.2 Establishing Background Concentrations

During the first year of monitoring, drinking water contaminants, and water quality and indicator parameters are to be tested for on a quarterly basis. The results for this year only are for use in:

1. Determining the suitability of the local groundwater as drinking water, and determining if the groundwater entering the sludge settling basin area is already contaminated;

2. Establishing background (initial) data for the water quality parameters, for later comparisons in the groundwater assessment program if implemented;

3. Establishing background data for indicator parameters, for later statistical evaluations.

The background value for each well is the mean (average) of the four sets of quarterly tests--4 analytical results for the water quality parameters, and 16 (4 samples at 4 replicate tests) for the indicator parameters.

4.3 Statistical Evaluation Procedures

The groundwater monitoring requirements include testing each well for the four indicator parameters: pH, total organic carbon (TOC), total organic halogen (TOX), and specific conductance. Each monitoring well will be used to obtain one groundwater sample, but the sample must be tested four times (i.e., four replicate tests) for each indicator parameter to ensure accuracy.

An increase in TOC, TOX and/or specific conductance indicates the possibility of groundwater contamination; an increase or decrease in pH may also suggest potential groundwater problems. The statistical evaluations required by the EPA, therefore, utilize a "one-tailed" t-distribution test for TOC, TOX and specific conductance, and a "two-tailed" test for pH only. The procedures to perform these evaluations and to determine "significant change" levels are outlined below. Note that these evaluations commence only after the first year of testing has been completed.

1. One tailed t-test (TOX,TOC specific conductance)--perform this for each parameter, for each well and for each test date.

   a. Obtain all analytical results from first year's quarterly testing; there should be at least 16 values for each parameter and for each well (four replicates at four times during the year). Calculate the mean (average) background, or $\bar{Z}$ value.

b. Calculate the mean of the four replicates being evaluated for this date, or $\underline{X}$.

Set n equal to the number of replicates, i.e., n = 4 (if more than four replicate tests were done, then set n appropriately; EPA requires <u>at least</u> four replicates).

c. Calculate the variance (v) of the replicates using the following formula:

$$v = \frac{1}{n-1} \sum_{i=1}^{n} (X_i - \underline{X})^2$$

where X_i = value of 1st replicate (X_1), (X_2), etc.

and

$$\sum_{i=1}^{n} (X_i - \underline{X})^2 = (X_1 - \underline{X})^2 + (X_2 - \underline{X})^2 + (X_3 - \underline{X})^2$$

$$+ (X_4 - \underline{X})^2 + \ldots (X_n - \underline{X})^2$$

and $\underline{X}$ and n are determined in step b.

b. Calculate the t statistic using the following formula:

$$t = \frac{X - Z}{\sqrt{\frac{v}{n}}}$$

For n = 4, if t is greater than 4.541, then there is a "significant increase" indicated. For other values of n, use the table in Appendix III to find the cutoff t-value.

2. Two-tailed t-test (pH only)--perform this for <u>each</u> well and <u>each</u> test date.

   Calculate all values as in the one-tailed test; however, for n = 4, if t is greater than 5.841 <u>or</u> less than - 5.841, then a "significant change" is indicated. Again, if n is greater than 4, see Appendix III.

If significant change is indicated in the <u>upgradient</u> monitoring well, state this occurrence in the Annual Report. If the change occurs in <u>downgradient</u> wells, the following must be performed:

1. Immediately obtain a new sample from the affected well(s). Retest this sample, performing two replicate tests each for the parameter(s) showing "significant change" as calculated above.

2. Add these values to those used in the initial t-tests, and reevaluate with the appropriate test: use $n = 6$ for the one-tailed test; significance is indicates at $t > 3.365$; for the two-tailed test, when $t > 4.032$ or $t < -4.032$.

3. Notify the EPA-Region V Office in Chicago within 7 days after retesting, if "significant change" is indicated. Submit detailed groundwater assessment plan within 15 days after this notification. If "significant change" is not confirmed, include notification of this occurrence in the Annual Report, and continue regular monitoring.

SECTION 5: GROUNDWATER MONITORING PROGRAM: REPORTS, NOTICES AND RECORDS

5.1 Introduction

The final requirements of the GWM program involve recordkeeping and notification. The major output in this section will probalbly be the inclusion of collected data and evaluation results in the Annual Report, of which a groundwater monitoring report is only a part. Other notices may be required, most notably the drinking water contaminant levels, and reports of special incidents or changes in results or testing schedules. All reports and notices should be submitted to U.S. EPA Region V Office.

5.2 Annual Report Requirements

As part of the Annual Report required of most hazardous waste facilities, a section describing groundwater monitoring activities must be included. The report should contain laboratory test values, calculated statistical evaluations of the water samples obtained over the period, and notices of actual or possible groundwater contamination. The requirements are detailed below.

1. For the regular monitoring program, submit:

    a. All lab test results and statistical evaluations, for tests and retests, of the indicator parameters (pH, TOC, TOX, and specified conductance);

    b. An evaluation of groundwater surface elevation data and notice of any modifications made in number, location or depth of any monitoring well(s);

    c. Separate notice if the upgradient well(s) show a "significant change" in concentration of the indicator parameters;

    d. Separate notice if the downgradient well(s) initially showed a "significant change", but retesting indicated laboratory error during the initial testing.

2. If the assessment program has been implemented, submit:

   a. All lab test results and evaluations determined during assessment testing;

   b. or, notice that no hazardous waste has entered the groundwater and that the regular monitoring and evaluation program has been reinstated.

The Annual Report must be submitted by March 1 for the previous calendar year.

5.3 Other Required Notices

Several notices, in addition to those required in the Annual Report, must be submitted at various times. The requirements are described below.

1. For the regular monitoring and evaluation program, submit:

   a. Concentration values for the 20 drinking water parameters obtained from all wells, within 15 days of testing; separately identify those wells which exceed the EPA limits--see Testing Requirements (Note: these parameters are to be tested for on a quarterly basis for the first year only);

   b. Notice, within 7 days after retesting and if "significant changes" in indicator parameters have been confirmed, that the facility may be affecting groundwater quality;

   c. A complete, detailed groundwater assessment plan, within 15 days after submitting the possible contamination notice above.

2. If the assessment program has been implemented, submit:

   a. All test and evaluation results determined during the initial assessment, and if no contamination is found to be present, notice that the regular monitoring program has been reinstated.

5.4 Recordkeeping

The following records must be kept on-site throughout the active life of the facility and through the post-closure period:

1. Regular monitoring and evaluation program

   a. All laboratory test results
   b. All statistical evaluation results (calculations)
   c. All groundwater surface (water table) elevation measurements;

2. Assessment Program

   a. All laboratory test results
   b. All statistical or other evaluation results
   c. All groundwater surface (water table) elevation measurements
   d. All calculated or measured data concerning the rate and extent of hazardous waste migration in the groundwater.

In addition, records identifying personnel involved in the monitoring program (sample collection, analysis, and evaluation) should be maintained.

SECTION 6: OUTLINE OF GROUNDWATER ASSESSMENT PROGRAM

This section contains an outline of a groundwater assessment (GWA) program Fisher Body must implement in the event that the regular groundwater monitoring results indicate the need for a more comprehensive program. A detailed GWA plan, certified by a qualified geologist or geotechnical engineer, must be submitted to the EPA for approval within 15 days after notification of possible groundwater contamination, if so indicated by regular monitoring and evaluation results.

The detailed GWA program must be capable of determining (1) if hazardous waste constituents have entered the groundwater, and (2) the rate, extent and concentration of those constituents in the groundwater. The final plan must include specification on monitoring well number, depth and location, sampling and analytical methods, evaluation procedures, and a schedule of implementation. An outline of the plan is described below.

I. Sampling and Analytical Procedures

Sampling should be performed in the same manner as in the monitoring program. However, the water samples obtained should be tested for copper, chromium, nickel and other metals or hazardous components which may be present in the sludge. Parameters, such as pH, specific conductance, and other indicator and groundwater quality parameters should be tested for, as well, for evaluation and comparison purposes.

Elevation measurement of the groundwater surface should be continued during this program.

II. Schedule of Implementation

The EPA requires that the GWA plan be:

A. Submitted 15 days after notification of possible groundwater contamination.

B. Implementation "as soon as technically feasible", however, tests can be performed immediately on wells already used in the monitoring program.

III. Location of Wells

Sampling shall be performed on all wells, including background (upgradient) wells, which have been installed and/or utilized as part of the monitoring program. These wells will primarily serve to determine contamination, as well as to establish the initial direction of movement of mercury throughout the groundwater. Additional wells, however, will be needed to assess the rate and extent of contamination. The exact location of these additional wells should be determined or approved by a hydrogeologist.

IV. Evaluations

Comparisons of GWA analytical results can be made with both previous monitoring program data, and with results of individual wells tested under the GWA program. This may include (1)

comparison with background concentrations to determine presence of contaminant and direction of movement in the groundwater and (2) comparisons with each GWA well to determine significant rate and extent of contamination changes with respect to both time and distance from the landfill area. Statistical evaluations as described in the monitoring program should be used to determine significant changes.

APPENDIX I:

SELECTED EXCERPTS FROM EPA MANUALS

Appendix I: Selected Exerpts from EPA Manuals

Rules for Sample Collection (see also pages 7 and 8)

An agency or laboratory engaged in sample study activities should follow these rules:

a. Involve a minimum number of trained persons in sample collection and handling.

b. Establish guidelines for particular procedures to be used for each type of sample collection, preservation, and handling.

c. Handle samples as little as possible.

d. Obtain stream and effluent samples using the appropriate sampling techniques.

e. Attach sample tag or label securely (see fig.) to the sample container at the time the sample is collected. The tag should contain the following items as a minimum: the serial number of the tag, the station number and location, the date and time taken, the type of sample, the sequence number (e.g., first sample of the day—sequence No. 1), the preservative used, the analyses required, and the name of the sample collector. Tags should be completed legibly in waterproof ink.

f. Use bound field notebooks to record field measurements and other pertinent information necessary to reconstruct the sample collection processes in the event of a later enforcement proceeding. Maintain a separate set of field notebooks for each study and store them in a safe place where they can be protected and accounted for at all times. Establish a sample log sheet with a standard format to minimize field entries and include the serial number of the sheet, the date, time, survey, type of samples taken, volume of each sample, type of analyses, (unique) sample numbers, sampling location, field measurements (such as temperature, conductivity, dissolved oxygen (DO), and pH), and any other pertinent information or observation. (See fig.) The entries should be signed by the sample collector. The responsibility for preparing and retaining field notebooks during and after a study should be assigned to a study coordinator or his designated representative.

g. The sample collector is responsible for the care and custody of the samples until the samples are properly dispatched to the receiving laboratory or given to an assigned custodian. The sample collector must insure that each container is in his physical possession or in his view at all times, or stored in a locked place where no one can tamper with it.

h. Take color slides or photographs of the sample locations and any visible water pollution. Sign and indicate time, date, and site location on the back of the photo. To prevent alteration, handle such photographs according to the established chain-of-custody procedures.

OFFICIAL SAMPLE LABEL

Collector_____ Collector's Sample No._____

Place of Collection_____

_____

Date Sampled_____ Time Sampled_____

Field Information_____

_____

Example of official sample label.

OFFICIAL SAMPLE SEAL

Collected by_____ Collector's Sample No._____
(signature)

Date Collected_____ Time Collected_____

Place Collected_____

_____

Example of official sample seal

FOR _____ SURVEY SAMPLE LOG SHEET NO. _____ DATE _____

TYPE OF SAMPLE _____ SAMPLER: (Signature) _____

ANALYSES REQUIRED

STATION NUMBER	STATION DESCRIPTION	TOTAL VOLUME	TYPE CONTAINER	PRESERVATIVE	NUTRIENTS	BOD	COD	TOC	TOTAL SOLIDS	SUSPENDED SOLIDS	ALKALINITY	DO	pH*	CONDUCTIVITY*	TEMPERATURE*	TOTAL COLIFORM	FECAL COLIFORM	TURBIDITY	OIL AND GREASE	METALS	BACTI	PESTICIDES	HERB	TRACE ORGANICS	PHENOL	CYANIDE

REMARKS

*Field Measurements

US EPA, NEIC Denver

Example of sample log sheet.

Transfer of Custody and Shipment (see also page 7)

In transfer-of-custody procedures, each custodian or sampler must sign, record, and date the transfer. Most environmental regulatory agencies develop chain-of-custody procedures tailored to their needs. These procedures may vary in format and language but contain the same essential elements. Historically, sample transfer under chain of custody has been on a sample-by-sample basis, which is awkward and time consuming. However, the EPA National Enforcement Investigation Center (NEIC) at Denver has set precedent with its bulk transfer of samples. Bulk transfer is speedier and reduces paperwork and the number of sample custodians. The following description of bulk transfer of custody is essentially that of the Office of Enforcement (2).

a. Samples must be accompanied by a chain-of-custody record that includes the name of the study, collectors' signatures, station number, station location, date, time, type of sample, sequence number, number of containers, and analyses required. (See fig.) When turning over possession of samples, the transferor and transferee sign, date, and time the record sheet. This record sheet allows transfer of custody of a group of samples in the field to the mobile laboratory or to the central laboratory. When a custodian transfers a portion of the samples identified on the sheet to the mobile laboratory, the individual samples must be noted in the column with the signature of the person relinquishing the samples. The laboratory person receiving the samples acknowledges receipt by signing in the appropriate column.

b. If the custodian has not been assigned, the field custodian or field sampler has the responsibility of packaging and dispatching samples to the laboratory for analysis. The dispatch portion of the chain-of-custody record must be filled out, dated, and signed.

c. To avoid breakage, samples must be carefully packed in shipment containers such as ice chests. The shipping containers are padlocked for shipment to the receiving laboratory.

d. Packages must be accompanied by the chain-of-custody record showing identification of the contents. The original must accompany the shipment. A copy is retained by the survey coordinator.

e. If sent by mail, register the package with return receipt requested. If sent by common carrier, a Government bill of lading should be obtained. Receipts from post offices and bills of lading will be retained as part of the permanent chain-of-custody documentation.

f. If delivered to the laboratory when appropriate personnel are not there to receive them, the samples must be locked in a designated area within the laboratory, so that no one can tamper with them or must be placed in a secure area. The recipient must return to the laboratory, unlock the samples, and deliver custody to the appropriate custodian.

CHAIN OF CUSTODY RECORD

				SAMPLERS (Signature)					
STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE			SEQ NO.	NO OF CONTAINERS	ANALYSIS REQUIRED
				Water		Air			
				Comp	Grab				

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Received by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) / Date/Time	Received for Laboratory by:	Date/Time
Method of Shipment:		

Distribution. Orig.—Accompany Shipment
1 Copy—Survey Coordinator Field Files

Example of chain-of-custody record.

Laboratory Custody Procedures

Suitable laboratory procedures during custody of samples include the following:

a. The laboratory shall designate a sample custodian and an alternate custodian to act in his absence. In addition, the laboratory shall set aside a sample storage security area. This should be a clean, dry, isolated room with sufficient refrigerator space that can be securely locked from the outside.

b. Samples should be handled by the minimum possible number of persons.

c. Incoming samples shall be received only by the custodian who will indicate receipt by signing the chain-of-custody record sheet accompanying the samples and retaining the sheet as a permanent record. Couriers picking up samples at the airport or post office shall sign jointly with the laboratory custodian.

d. Immediately upon receipt, the custodian places the samples in the sample room, which will be locked at all times except when samples are removed or replaced by the custodian. To the maximum extent possible, only the custodian shall be permitted in the sample room.

e. The custodian shall insure that microbiological samples are properly stored and maintained at 4°C.

f. Only the custodian will distribute samples to personnel who are to perform tests.

g. The analyst records in his laboratory notebook or analytical worksheet, identifying information describing the sample, the procedures performed, and the results of the testing. The notes shall be dated, shall indicate who performed the tests, and should include any abnormalities that occurred during the testing procedure. The notes shall be retained as a permanent record in the laboratory. In the event that the person who performed the tests is not available as a witness at the time of a trial, the Government may be able to introduce the notes in evidence under the Federal Business Records Act.

h. Approved methods of laboratory analyses shall be used as required by Public Laws 92-500, 93-523, 92-532, and amendments.

i. Laboratory personnel are responsible for the care and custody of a sample once it is handed to them and should be prepared to testify that the sample was in their possession and view or secured in the laboratory at all times from the moment it was received from the custodian until the tests were run.

j. The laboratory area shall be maintained as a secured area and shall be restricted to authorized personnel.

k. Once the sample analyses are completed, the unused portion of the sample, together with identifying labels and other documentation, must be returned to the custodian. The returned, tagged sample should be retained in the custody room until permission to destroy the sample is received by the custodian.

l. Samples should be destroyed only upon the order of the laboratory director, in consultation with previously designated enforcement officials, or when it is certain that the information is no longer required, or that the samples have deteriorated. The same destruction procedure is true for tags and laboratory records.

Chain of Custody Record

To establish the documentation necessary to trace sample possession from the time of collection, a chain of custody record must be filled out and accompany every sample. This record becomes especially important when the sample is to be introduced as evidence in a court litigation. An example of a chain of custody record is illustrated in Figure 2.0-3.

The record must contain the following minimum information:

- Collector's sample number.
- Signature of collector.
- Date and time of collection.
- Place and address of collection.
- Waste type.
- Signatures of persons involved in the chain of possession.
- Inclusive dates of possession.

IDENTIFICATION OF SAMPLE

Each sample must be labeled and sealed properly immediately after collection.

Sample Labels

Sample labels (Figure 11) are necessary to prevent misidentification of samples. Gummed paper labels or tags are adequate. The label must include at least the following information:

- Name of collector.
- Date and time of collection.
- Place of collection.
- Collector's sample number, which uniquely identifies the sample.

Sample Seals

Sample seals are used to preserve the integrity of the sample from the time it is collected until it is opened in the laboratory. Gummed paper seals can be used as official sample seals. The paper seal must carry information such as:

Collector's name

Date and time of sampling

Collector's sample number. (This number must be identical with the number on the sample label).

The seal must be attached in such a way that it is necessary to break it in order to open the sample container. An example of a sample seal is shown in Figure 12.

FIELD LOG BOOK

All information pertinent to a field survey and/or sampling must be recorded in a log book. This must be a bound book, preferably with consecutively numbered pages that are 21.6 by 27.9 cm(8½ by 11 in.). Entries in the log book must include at least the following:

Purpose of sampling (e.g., surveillance, etc.)

Location of sampling (e.g., hauler, disposal site, etc.) and address

Name and address of field contact

Producer of waste and address

Type of process (if known) producing waste

Type of waste (e.g., sludge, wastewater, etc.)

Declared waste components and concentrations

Number and volume of sample taken

Description of sampling point

Date and time of collection

Collector's sample identification number(s)

Sample distribution (e.g., laboratory, hauler, etc.)

References such as maps or photographs of the sampling site

Field observations

Any field measurements made such as pH, flammability, explosivity, etc.

Sampling situations vary widely. No general rule can be given as to the extent of information that must be entered in the log book. A good

APPENDIX II:

EPA-APPROVED ANALYTICAL METHODS

75028 Federal Register / Vol. 44, No. 244 / Tuesday, December 18, 1979 / Proposed Rules

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 136

[FRL 1323-D]

Guidelines Establishing Test Procedures for the Analysis of Pollutants

Correction

In FR Doc. 79-36871, appearing at page 69464 in the issue for Monday, December 3, 1979, Table I—*List of Approved Test Procedures* (pages 69568—69573) and Table II—*Containers, Preservation, and Holding Times* (pages 69574—69575), contained numerous printing errors. Tables I and II should have read as set forth below:

BILLING CODE 1505-01-M

TABLE I. LIST OF APPROVED TEST PROCEDURES

Parameter and units	Method	Reference (Page Nos.) 1974 EPA Methods	14th Ed. Standard Methods	Part II 1975 ASTM	USGS Methods[1]	Other Approved Methods
1. Acidity, as $CaCO_3$, milligrams per liter	Electrometric end point (pH of 8.2) or phenolphthalein end point	1	273(4d)	116	40	(607)[2]
2. Alkalinity, as $CaCO_3$ milligrams per liter	Electrometric titration (only to pH 4.5) manual or automated, or equivalent automated methods	3 5	278 -	111 -	41 -	(607)[2] -
3. Ammonia (as N), milligrams per liter	Manual distillation[3] (at pH 9.5) followed by nessslerization, titration, electrode, automated phenolate	- 159 165 168	410 412 - 616	- 237 - -	- 116 - -	- (614)[2] - -
Bacteria						
4. Coliform (fecal)[4] number per 100 ml	MPN;[5] membrane filter	- -	922 937	- -	- (45)[6]	(132)[42] (124)[42]
5. Coliform (fecal)[4] in presence of chlorine, number per 100 ml	MPN;[5] membrane filter[5,7]	- -	922 928,937	- -	- -	- -
6. Coliform (total)[4], number per 100 ml	MPN;[5] membrane filter	- -	916 928	- -	- (35)[6]	(117)[42] (108)[42]
7. Coliform (total)[4] in presence of chlorine, number per 100 ml	MPN;[5] membrane filter with enrichment	- -	916 933	- -	- -	- -
8. Fecal streptococci[4], number per 100 ml	MPN;[5] membrane filter; plate count	- - -	943 944 947	- - -	- (50)[6] -	- (136)[42] (143)[42]
9. Biochemical oxygen demand, 5-day (BOD_5) milligrams per liter	Winkler (Azide Modification) or electrode method	- -	543 -	- -	(50)[6] -	- (17)[9]
10. BOD_5 Carbonaceous		-	-	-	-	(507)[28]
11. Bromide, milligrams per liter	Titrimetric, iodine-iodate	14	-	323	58	-
12. Chemical oxygen demand (COD), milligrams per liter	Dichromate reflux	20 -	550 -	472 -	124 -	(610)[2] (17)[9]

TABLE I. LIST OF APPROVED TEST PROCEDURES (Cont.)

Parameter and units	Method	Reference (Page Nos.) 1974 EPA Methods	14th Ed. Standard Methods	Part 31 1975 ASTM	USGS Methods[1]	Other Approved Methods
13. Chloride, milligrams per liter	Silver nitrate;	-	303	267	-	-
	mercuric nitrate; or	29	304	265	-	(615)[2]
	automated colorimetric-ferricyanide	31	613	-	(46)[10]	-
14. Chlorinated organic compounds (except pesticides), milligrams per liter	Gas chromatography[11]	-	-	-	-	-
15. Chlorine—total residual, milligrams per liter	Iodometric titration, amperometric or	-	318	-	-	-
	starch-iodine end-point;	35	322	278	-	-
	DPD colorimetric or	-	332	-	-	-
	Titrimetric methods (These last two are interim methods pending laboratory testing.)	-	329	-	-	-
16. Color, platinum cobalt units or dominant wave length, hue, luminance, purity	Colorimetric;	36	64	-	82	-
	spectrophotometric; or	39	66	-	-	-
	ADMI procedure[12]	-	-	-	-	-
17. Cyanide, total[13], milligrams per liter	Distillation followed by silver nitrate titration or pyridine pyrazolone (or barbituric acid) colorimetric	40	361	503	85	(22)[9]
18. Cyanide amenable to chlorination, milligrams per liter	Distillation followed by silver nitrate titration or pyridine pyrazolone (or barbituric acid) colorimetric	49	376	503	-	-
19. Dissolved oxygen, milligrams per liter	Winkler (Azide modification) or	51	443	368	126	(609)[2]
	electrode method	56	450	-	-	-
20. Fluoride, milligrams per liter	Distillation[3] followed by	-	389	-	-	-
	ion electrode;	65	391	307	93	-
	SPADNS; or	59	393	305	-	-
	automated complexone	61	614	-	-	-
21. Hardness—total, as $CaCO_3$, milligrams per liter	EDTA titration;	68	202	161	94	(617)[2]
	automated colorimetric; or	70	-	-	-	-
	atomic absorption (sum of Ca and Mg as their respective carbonates)	-	-	-	-	-

TABLE I. LIST OF APPROVED TEST PROCEDURES (Cont.)

Parameter and units	Method	Reference (Page Nos.) 1974 EPA Method's	14th Ed. Standard Methods	Part 31 1975 ASTM	USGS Methods[1]	Other Approved Methods
22. Hydrogen ion (pH), pH units	Electrometric measurement	239	460	178	129	(606)[2]
23. Kjeldahl nitrogen (as N), milligrams per liter	Digestion and distillation followed by nesslerization, titration, or	175	437	-	122	(612)[2]
	electrode;	165	-	-	-	-
	automated digestion automated phenolate	152	-	-	-	-
Metals						
24. Aluminum—total, milligrams per liter	Digestion[14] followed by	92	152	-	(19)[10]	-
	atomic absorption[15] or by					
	colorimetric (Eriochrome Cyanide R)	-	171	-	-	-
	or by ICP[27]	-	-	-	-	-
25. Aluminum—dissolved, milligrams per liter	0.45 micron filtration[16] followed by referenced methods for total aluminum					
26. Antimony—total, milligrams per liter	Digestion[14] followed by atomic absorption[15]	94	-	-	-	-
27. Antimony—dissolved, milligrams per liter	0.45 micron filtration[16] followed by referenced method for total antimony	-	-	-	-	-
28. Arsenic—total, milligrams per liter	Digestion followed by	-	285	-	-	-
	silver diethyldithiocarbamate; or	9	283	-	(31)[10]	-
	atomic absorption[15, 17]	95	159	-	(37)[10]	-
	or by ICP[27]	-	-	-	-	-
29. Arsenic—dissolved, milligrams per liter	0.45 micron filtration[16] followed by referenced method for total arsenic	-	-	-	-	-
30. Barium—total, milligrams per liter	Digestion[14] followed by atomic	97	152	-	52	-
	absorption[15] or by ICP[27]	-	-	-	-	-
31. Barium—dissolved, milligrams per liter	0.45 micron filtration[16] followed by referenced method for total barium	-	-	-	-	-
32. Beryllium—total, milligrams per liter	Digestion[14] followed by atomic	99	152	-	53	-
	absorption[15] or by colorimetric	-	177	-	-	-
	(Aluminon) or by ICP[27]	-	-	-	-	-

TABLE 1. LIST OF APPROVED TEST PROCEDURES (Cont.)

Parameter and units	Method	Reference (Page Nos.) 1974 EPA Methods	14th Ed. Standard Methods	Part 31 1975 ASTM	USGS Methods[1]	Other Approved Methods
33. Beryllium—dissolved, milligram per liter	0.45 micron filtration[16] followed by referenced method for total beryllium	-	-	-	-	-
34. Boron—total, milligrams per liter	Colorimetric (Curcumin),	13	287	-	-	-
	or by ICP[27]	-	-	-	-	-
35. Boron—dissolved, milligrams per liter	0.45 micron filtration[16] followed by referenced method for total boron	-	-	-	-	-
36. Cadmium—total milligrams per liter	Digestion[14] followed by atomic absorption[15] or by	101	148	345	62	(619)[2] (37)[9]
	colorimetric (Dithizone)		182			
	or by ICP[27]	-	-	-	-	-
37. Cadmium—dissolved, milligrams per liter	0.45 micron filtration[16] followed by referenced method for total cadmium	-	-	-	-	-
38. Calcium—total, milligrams per liter	Digestion[14] followed by atomic absorption; or	103	148	345	66	-
	EDTA titration	-	189	-	-	-
	or by ICP[27]	-	-	-	-	-
39. Calcium—dissolved, milligrams per liter	0.45 micron filtration[16] followed by referenced method for total calcium	-	-	-	-	-
40. Chromium VI, milligrams per liter	Extraction and atomic absorption;	89, 105	-	-	76	-
	colorimetric (Diphenylcarbazide)	-	192	-	75	-
41. Chromium VI—dissolved, milligram per liter	0.45 micron filtration[16] followed by referenced method for chromium VI	-	-	-	-	-
42. Chromium—total, milligrams per liter	Digestion[14] followed by atomic absorption[15] or by	105	148	345	78	(619)[2]
	colorimetric (Diphenylcarbazide)	-	192	286	77	-
	or by ICP[27]	-	-	-	-	
43. Chromium—dissolved, milligrams per liter	0.45 micron filtration[16] followed by referenced method for total chromium	-	-	-	-	
44. Cobalt—total, milligrams per liter	Digestion[14] followed by atomic absorption[15]	107	148	345	80	(37)
	or by ICP[27]	-	-	-	-	-

TABLE I. LIST OF APPROVED TEST PROCEDURES (Cont.)

Parameter and units	Method	Reference (Page Nos.) 1974 EPA Methods	14th Ed. Standard Methods	Part 31 1975 ASTM	USGS Methods[1]	Other Approved Methods
45. Cobalt—dissolved, milligrams per liter	0.45 micron filtration[16] followed by referenced method for total cobalt	-	-	-	-	-
46. Copper—total, milligrams per liter	Digestion[14] followed by	108	148	345	83	(619)[2] (37)[9]
	atomic absorption[15] or by					
	colorimetric (Neocuproine)	-	196	293	-	-
	or by ICP[27]	-	-	-	-	-
47. Copper—dissolved,	0.45 micron filtration[16] followed by referenced method for total copper	-	-	-	-	-
48. Gold—total, milligrams per liter	Digestion[14] followed by atomic absorption[18]	-	-	-	-	-
		-	-	-	-	-
49. Iridium—total, milligrams per liter	Digestion[14] followed by atomic absorption[18]	-	-	-	-	-
		-	-	-	-	-
		-	-	-	-	-
50. Iron—total, milligrams per liter	Digestion[14] followed by atomic absorption[15] or by	110	148	345	102	(619)[2]
	colorimetric (Phenanthroline)	-	208	326	-	-
	or by ICP[27]	-	-	-	-	-
51. Iron—dissolved, milligrams per liter	0.45 micron filtration[16] followed by referenced method for total iron	-	-	-	-	-
52. Lead—total, milligrams per liter	Digestion[14] followed by atomic absorption[15] or by	112	148	345	105	(619)[2]
	colorimetric (Dithizone)	-	215	-	-	-
	or by ICP[27]	-	-	-	-	-
53. Lead—dissolved, milligrams per liter	0.45 micron filtration[16] followed by referenced method for total lead	-	-	-	-	-
54. Magnesium—total, milligrams per liter	Digestion[14] followed by atomic absorption; or	114	148	345	109	(619)[2]
	gravimetric	-	221	-	-	-
	or by ICP[27]	-	-	-	-	-
55. Magnesium—dissolved, milligrams per liter	0.45 micron filtration[16] followed by referenced method for total magnesium	-	-	-	-	-
56. Manganese—total, milligrams per liter	Digestion[14] followed by atomic absorption[15] or by	116	148	345	111	(619)[2]
	colorimetric (Persulfate or periodate)	-	225, 227	-	-	-
	or by ICP[27]	-	-	-	-	-

TABLE I. LIST OF APPROVED TEST PROCEDURES (Cont.)

Parameter and units	Method	Reference (Page Nos.) 1974 EPA Methods	14th Ed. Standard Methods	Part 11 1975 ASTM	USGS Methods[1]	Other Approved Methods
57. Manganese—dissolved, milligrams per liter	0.45 micron filtration[16] followed by referenced method for total manganese	-	-	-	-	-
58. Mercury—total, milligrams per liter	Flameless atomic absorption	118	156	338	(51)[10]	-
59. Mercury—dissolved, milligrams per liter	0.45 micron filtration[16] followed by referenced method for total mercury	-	-	-	-	-
60. Molybdenum—total, milligrams per liter	Digestion[14] followed by atomic absorption[15] or by ICP[27]	139 -	- -	850 -	- -	- -
61. Molybdenum—dissolved, milligrams per liter	0.45 micron filtration[16] followed by referenced method for total molybdenum	-	-	-	-	-
62. Nickel—total, milligrams per liter	Digestion[14] followed by atomic absorption[15] or by colorimetric (Heptoxime) or by ICP[27]	141 - -	148 232 -	345 - -	115 - -	- - -
63. Nickel—dissolved, milligrams per liter	0.45 micron filtration[16] followed by referenced method for total nickel	-	-	-	-	-
64. Osmium—total, milligrams per liter	Digestion[14] followed by atomic absorption[18]	-	-	-	-	-
65. Palladium—total, milligrams per liter	Digestion[14] followed by atomic absorption[18]	-	-	-	-	-
66. Platinum—total, milligrams per liter	Digestion[14] followed by atomic absorption[18]	-	-	-	-	-
67. Potassium—total, milligrams per liter	Digestion[14] followed by atomic absorption, colorimetric (Cobaltinitrite), or by flame photometric or by ICP[27]	143 - -	- 235 234	- - 403	134 - -	(620)[2] - -

TABLE I. LIST OF APPROVED TEST PROCEDURES (Cont.)

Parameter and units	Method	Reference (Page Nos.) 1974 EPA Methods	14th Ed. Standard Methods	Part 31 1975 ASTM	USGS Methods[1]	Other Approved Methods
68. Potassium—dissolved, milligrams per liter	0.45 micron filtration [16] followed by referenced method for total potassium	-	-	-	-	-
69. Rhodium—total, milligrams per liter	Digestion [14] followed by atomic absorption [18]	-	-	-	-	-
70. Ruthenium—total, milligrams per liter	Digestion [14] followed by atomic absorption [18]	-	-	-	-	-
71. Selenium—total, milligrams per liter	Digestion [14] followed by atomic absorption [17, 18]	145	159	-	-	-
	or by ICP [27]	-	-	-	-	-
72. Selenium—dissolved, milligrams per liter	0.45 micron filtration [16] followed by reference method for total selenium	-	-	-	-	-
73. Silica—dissolved, milligrams per liter	0.45 micron filtration [16] followed by colorimetric (Molybdosilicate)	274	-	398	139	-
	or by ICP[27]	-	487	-	-	-
		-	-	-	-	-
74. Silver-total [19], milligrams per liter	Digestion [14] followed by atomic absorption [15] or by	146	148	-	142	(619)[2] (37)[9]
	colorimetric (Dithizone)	-	243	-	-	-
	or by ICP [27]	-	-	-	-	-
75. Silver-dissolved [19], milligrams per liter	0.45 micron filtration [16] followed by referenced method for total silver	-	-	-	-	-
76. Sodium—total, milligrams per liter	Digestion [14] followed by atomic absorption or by	147	-	-	143	(621)[2]
	flame photometric	-	250	403	-	-
	or by ICP [27]	-	-	-	-	-
77. Sodium—dissolved, milligrams per liter	0.45 micron filtration [16] followed by referenced method for total sodium	-	-	-	-	-
78. Thallium—total, milligrams per liter	Digestion [14] followed by atomic absorption [15]	149	-	-	-	-

TABLE 1. LIST OF APPROVED TEST PROCEDURES (Cont.)

Parameter and units	Method	Reference (Page Nos.) 1974 EPA Methods	14th Ed. Standard Methods	Part 31 1975 ASTM	USGS Methods[1]	Other Approved Methods
79. Thallium—dissolved, milligrams per liter	0.45 micron filtration[16] followed by referenced method for total thallium	-	-	-	-	-
80. Tin—total, milligrams per liter	Digestion[14] followed by atomic absorption[15]	150	-	-	(65)[10]	-
81. Tin—dissolved, milligrams per liter	0.45 micron filtration[16] followed by referenced method for total tin	-	-	-	-	-
82. Titanium—total, milligrams per liter	Digestion[14] followed by atomic absorption[15]	151	-	-	-	-
83. Titanium—dissolved, milligrams per liter	0.45 micron filtration[16] followed by referenced method for total titanium	-	-	-	-	-
84. Vanadium—total, milligrams per liter	Digestion[14] followed by atomic absorption[15] or by	153	152	-	-	-
	colorimetric (Gallic acid)	-	260	441	(67)[10]	-
	or by ICP[27]	-	-	-	-	-
85. Vanadium—dissolved milligrams per liter	0.45 micron filtration[16] followed by referenced method for total vanadium	-	-	-	-	-
86. Zinc—total, milligrams per liter	Digestion[14] followed by atomic absorption[15] or by	155	148	345	159	(619)[2] (37)[9]
	colorimetric (Dithizone)	-	265	-	-	-
	or by ICP[27]	-	-	-	-	-
87. Zinc—dissolved, milligrams per liter	0.45 micron filtration[16] followed by referenced method for total zinc	-	-	-	-	-
88. Nitrate (as N), milligrams per liter	Cadmium reduction	201	423	-	-	-
	brucine sulfate;	197	427	358	119	(614)[2] (28)[9]
	automated cadmium or hydrazine reduction[20]	207	620	-	-	-
89. Nitrite (as N), milligrams per liter	Manual or automated colorimetric (Diazotization)	215	434	-	121	-
90. Oil and grease, milligrams per liter	Liquid-liquid extraction with trichlorotrifluoroethane-gravimetric	229	515	-	-	-

TABLE I. LIST OF APPROVED TEST PROCEDURES (Cont.)

Parameter and units	Method	Reference (Page Nos.) 1974 EPA Methods	14th Ed. Standard Methods	Part 31 1975 ASTM	USGS Methods[1]	Other Approved Methods
91. Organic carbon, total (TOC), milligrams per liter	Combustion--infrared method[2]	236	532	467	(4)[22]	-
92. Organic nitrogen (as N), milligrams per liter	Kjeldahl nitrogen minus ammonia nitrogen	175,159	437	-	122	(612,614)[2]
Organic Compounds						
93. Acenaphthene, micrograms per liter	GC or HPLC method (610)[38]	-	-	-	-	-
	GC/MS method(625)[26]	-	-	-	-	-
94. Acenaphthylene, micrograms per liter	GC or HPLC method (610)[38]	-	-	-	-	-
	GC/MS method(625)[26]	-	-	-	-	-
95. Acrolein, micrograms per liter	GC method (603)[31]	-	-	-	-	-
	GC/MS, method(624)[26]	-	-	-	-	-
96. Acrylonitrile, micrograms per liter	GC method (603)[31]	-	-	-	-	-
	GC/MS, method(624)[26]	-	-	-	-	-
97. Aldrin, micrograms per liter	GC method (608)[36]	-	-	-	-	-
	GC/MS, method (625)[26]	-	-	-	-	-
98. Anthracene, micrograms per liter	GC or HPLC method (610)[38]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
99. Benzene, micrograms per liter	GC method (602)[30]	-	-	-	-	-
	GC/MS method (624)[26]	-	-	-	-	-
100. Benzidine, milligrams per liter	HPLC method (605)[33]	-	-	-	-	-
	Oxidation-colorimetric[3]	-	-	-	-	-
micrograms per liter	GC/MS method(625)[26]	-	-	-	-	-
101. Benzo(a)anthracene, micrograms per liter	GC or HPLC method (610)[38]	-	-	-	-	-
	GC/MS, method (625)[26]	-	-	-	-	-
102. Benzo(a)pyrene, micrograms per liter	GC or HPLC method (610)[38]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
103. Benzo(b)fluoranthene micrograms per liter	GC or HPLC method (610)[38]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
104. Benzo(g,h,i)perylene, micrograms per liter	GC or HPLC method (610)[38]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-

TABLE 1. LIST OF APPROVED TEST PROCEDURES (Cont.)

Parameter and units	Method	Reference (Page Nos.) 1974 EPA Methods	14th Ed. Standard Methods	Part 31 1975 ASTM	USGS Methods[1]	Other Approved Methods
105. Benzo(k)fluoranthene,	GC or HPLC method (610)[38]	-	-	-	-	-
micrograms per liter	GC/MS method, (625)[26]	-	-	-	-	-
106. a-BHC,	GC method (608)[36]	-	-	-	-	-
micrograms per liter	GC/MS method (625)[26]	-	-	-	-	-
107. b-BHC,	GC method (608)[36]	-	-	-	-	-
micrograms per liter	GC/MS method (625)[26]	-	-	-	-	-
108. d-BHC,	GC method (608)[36]	-	-	-	-	-
micrograms per liter	GC/MS method (625)[26]	-	-	-	-	-
109. g-BHC Lindane	GC method (608)[36]	-	-	-	-	-
micrograms per liter	GC/MS method (625)[26]	-	-	-	-	-
110. Bis(2-chloroethyl) ether	GC method (611)[39]	-	-	-	-	-
micrograms per liter	GC/MS method (625)[26]	-	-	-	-	-
111. Bis(2-chloroethoxy) methane	GC method (611)[39]	-	-	-	-	-
micrograms per liter	GC/MS method (625)[26]	-	-	-	-	-
112. Bis(2-chloroisopropyl) ether	GC method (611)[39]	-	-	-	-	-
micrograms per liter	GC/MS method (625)[26]	-	-	-	-	-
113. Bis(2-ethylhexyl)phthalate,	GC method (606)[34]	-	-	-	-	-
micrograms per liter	GC/MS method (625)[26]	-	-	-	-	-
114. Bromodichloromethane,	GC method (601)[29]	-	-	-	-	-
micrograms per liter	GC/MS method (624)[26]	-	-	-	-	-
115. Bromoform,	GC method (601)[29]	-	-	-	-	-
micrograms per liter	GC/MS method (624)[26]	-	-	-	-	-
116. Bromomethane,	GC method (601)[29]	-	-	-	-	-
micrograms per liter	GC/MS method (624)[26]	-	-	-	-	-
117. 4-Bromophenylphenyl ether,	GC method (611)[39]	-	-	-	-	-
micrograms per liter	GC/MS method (625)[26]	-	-	-	-	-
118. Butylbenzyl phthalate,	GC method (606)[34]	-	-	-	-	-
micrograms per liter	GC/MS method (625)[26]	-	-	-	-	-
119. Carbon tetrachloride,	GC method (601)[29]	-	-	-	-	-
micrograms per liter	GC/MS method (624)[26]	-	-	-	-	-
120. Chlordane,	GC method (608)[36]	-	-	-	-	-
micrograms per liter	GC/MS method (625)[26]	-	-	-	-	-

TABLE I. LIST OF APPROVED TEST PROCEDURES (Cont.)

Parameter and units	Method	Reference (Page Nos.) 1974 EPA Methods	14th Ed. Standard Methods	Part II 1975 ASTM	USGS Methods[1]	Other Approved Methods
121. 4-Chloro-3-methylphenol	GC method (604)[32]	-	-	-	-	-
micrograms per liter	GC/MS method (625)[26]	-	-	-	-	-
122. Chlorobenzene,	GC methods (601)[29] (602)[30]	-	-	-	-	-
micrograms per liter	GC/MS, method (624)[26]	-	-	-	-	-
123. Chloroethane,	GC method (601)[29]	-	-	-	-	-
micrograms per liter	GC/MS, method (624)[26]	-	-	-	-	-
124. 2-Chloroethylvinyl ether	GC method (601)[29]	-	-	-	-	-
micrograms per liter	GC/MS, method (624)[26]	-	-	-	-	-
125. Chloroform,	GC method (601)[29]	-	-	-	-	-
micrograms per liter	GC/MS, method (624)[26]	-	-	-	-	-
126. Chloromethane,	GC method (601)[29]	-	-	-	-	-
micrograms per liter	GC/MS method (624)[26]	-	-	-	-	-
127. 2-Chloronaphthalene,	GC method (612)[40]	-	-	-	-	-
micrograms per liter	GC/MS method (625)[26]	-	-	-	-	-
128. 2-Chlorophenol,	GC method (604)[32]	-	-	-	-	-
micrograms per liter	GC/MS, method (625)[26]	-	-	-	-	-
129. 4-Chlorophenylphenyl ether,	GC method (611)[39]	-	-	-	-	-
micrograms per liter	GC/MS, method (625)[26]	-	-	-	-	-
130. Chrysene,	GC or HPLC method (610)[38]	-	-	-	-	-
micrograms per liter	GC/MS method (625)[26]	-	-	-	-	-
131. 4,4'-DDD	GC method (608)[36]	-	-	-	-	-
micrograms per liter	GC/MS method (625)[26]	-	-	-	-	-
132. 4,4'-DDE	GC method (608)[36]	-	-	-	-	-
micrograms per liter	GC/MS method (625)[26]	-	-	-	-	-
133. 4,4'-DDT	GC method (608)[36]	-	-	-	-	-
micrograms per liter	GC/MS method (625)[26]	-	-	-	-	-
134. Dibenzo(a,h)anthracene,	GC or HPLC method (610)[38]	-	-	-	-	-
micrograms per liter	GC/MS method (625)[26]	-	-	-	-	-
135. Dibromochloromethane,	GC method (601)[29]	-	-	-	-	-
micrograms per liter	GC/MS method (624)[26]	-	-	-	-	-
136. 1,2-Dichlorobenzene,	GC methods (601)[29] (602)[30] (612)[40]	-	-	-	-	-
micrograms per liter	GC/MS method (625)[26]	-	-	-	-	-

TABLE 1. LIST OF APPROVED TEST PROCEDURES (Cont.)

Parameter and units	Method	Reference (Page Nos.) 1974 EPA Methods	14th Ed. Standard Methods	Part 31 1975 ASTM	USGS Methods[1]	Other Approved Methods
137. 1,3-Dichlorobenzene micrograms per liter	GC methods (601)[29] (602)[30] (612)[40]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
138. 1,4-Dichlorobenzene, micrograms per liter	GC methods (601)[29] (602)[30] (612)[40]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
139. 3,3'-Dichlorobenzidine, micrograms per liter	HPLC method (605)[33]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
140. Dichlorodifluoromethane micrograms per liter	GC method (601)[29]	-	-	-	-	-
141. 1,1-Dichloroethane micrograms per liter	GC method (601)[29]	-	-	-	-	-
	GC/MS method (624)[26]	-	-	-	-	-
142. 1,2-Dichloroethane, micrograms per liter	GC method (601)[29]	-	-	-	-	-
	GC/MS method (624)[26]	-	-	-	-	-
143. 1,1-Dichloroethane micrograms per liter	GC method (601)[29]	-	-	-	-	-
	GC/MS method (624)[26]	-	-	-	-	-
144. trans-1,2-Dichloroethane, micrograms per liter	GC method (601)[29]	-	-	-	-	-
	GC/MS method (624)[26]	-	-	-	-	-
145. 2,4-Dichlorophenol, 2,4-D micrograms per liter	GC method (604)[32]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
146. 1,2-Dichloropropene, micrograms per liter	GC method (601)[29]	-	-	-	-	-
	GC/MS method (624)[26]	-	-	-	-	-
147. cis-1,3-Dichloropropene micrograms per liter	GC method (601)[29]	-	-	-	-	-
	GC/MS method (624)[26]	-	-	-	-	-
148. trans-1,3-Dichloropropene micrograms per liter	GC method (601)[29]	-	-	-	-	-
	GC/MS method (624)[26]	-	-	-	-	-
149. Dieldrin, micrograms per liter	GC method (608)[36]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
150. Diethyl phthalate, micrograms per liter	GC method (606)[34]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
151. 2,4-Dimethylphenol, micrograms per liter	GC method (604)[32]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
152. Dimethyl phthalate, micrograms per liter	GC method (606)[34]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-

TABLE 1. LIST OF APPROVED TEST PROCEDURES (Cont.)

Parameter and units	Method	Reference (Page Nos.) 1974 EPA Methods	14th Ed. Standard Methods	Part 31 1975 ASTM	USGS Methods[1]	Other Approved Methods
153. Di-n-butyl phthalate, micrograms per liter	GC method (606)[34]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
154. Di-n-octyl phthalate, micrograms per liter	GC method (606)[34]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
155. 4,6-Dinitro-2-methylphenol, micrograms per liter	GC method (604)[32]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
156. 2,4-Dinitrophenol, micrograms per liter	GC method (604)[32]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
157. 2,4-Dinitrotoluene, micrograms per liter	GC method (609)[37]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
158. 2,6-Dinitrotoluene, micrograms per liter	GC method (609)[37]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
159. 1,2-Diphenylhydrazine, micrograms per liter	GC/MS method (625)[26]	-	-	-	-	-
160. Endosulfan I, micrograms per liter	GC method (608)[36]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
161. Endosulfan II, micrograms per liter	GC method (608)[36]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
162. Endosulfan sulfate, micrograms per liter	GC method (608)[36]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
163. Endrin, micrograms per liter	GC method (608)[36]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
164. Endrin aldehyde, micrograms per liter	GC method (608)[36]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
165. Ethylbenzene, micrograms per liter	GC method (602)[30]	-	-	-	-	-
	GC/MS method (624)[26]	-	-	-	-	-
166. Fluoranthene, micrograms per liter	GC or HPLC method (610)[38]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
167. Fluorene, micrograms per liter	GC or HPLC method (610)[38]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
168. Heptachlor, micrograms per liter	GC method (608)[36]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-

TABLE I. LIST OF APPROVED TEST PROCEDURES (Cont.)

Parameter and units	Method	1974 EPA Methods	14th Ed. Standard Methods	Reference (Page Nos.) Part 31 1975 ASTM	USGS Methods[1]	Other Approved Methods
169. Heptachlor epoxide, micrograms per liter	GC method (608)[36]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
170. Hexachlorobenzene, micrograms per liter	GC method (612)[40]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
171. Hexachlorobutadiene, micrograms per liter	GC method (612)[40]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
172. Hexachlorocyclopentadiene, micrograms per liter	GC method (612)[40]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
173. Hexachloroethane, micrograms per liter	GC method (612)[40]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
174. Indeno(1,3,3-cd)pyrene, micrograms per liter	GC or HPLC method (610)[38]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
175. Isophorone, micrograms per liter	GC method (609)[37]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
176. Methylene chloride, micrograms per liter	GC method (601)[29]	-	-	-	-	-
	GC/MS method (624)[26]	-	-	-	-	-
177. Naphthalene, micrograms per liter	GC or HPLC method (610)[38]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
178. Nitrobenzene, micrograms per liter	GC method (609)[37]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
179. 2-Nitrophenol, micrograms per liter	GC method (604)[32]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
180. 4-Nitrophenol, micrograms per liter	GC method (604)[32]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
181. N-Nitrosodimethylamine, micrograms per liter	GC method (607)[35]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
182. N-Nitrosodipropylamine, micrograms per liter	GC method (607)[35]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
183. N-Nitrosodiphenylamine, micrograms per liter	GC method (607)[35]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
184. PCB-1016, micrograms per liter	GC method (608)[36]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-

TABLE I. LIST OF APPROVED TEST PROCEDURES (Cont.)

Parameter and units	Method	Reference (Page Nos.) 1974 EPA Methods	14th Ed. Standard Methods	Part II 1975 ASTM	USGS Methods[1]	Other Approved Methods
185. PCB-1221, micrograms per liter	GC method (608)[36]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
186. PCB-1232, micrograms per liter	GC method (608)[36]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
187. PCB-1242, micrograms per liter	GC method (608)[36]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
188. PCB-1248, micrograms per liter	GC method (608)[36]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
189. PCB-1254, micrograms per liter	GC method (608)[36]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
190. PCB-1260, micrograms per liter	GC method (608)[36]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
191. Pentachlorophenol, micrograms per liter	GC method (608)[36]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
192. Phenanthrene, micrograms per liter	GC or HPLC method (610)[38]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
193. Phenol, micrograms per liter	GC method (604)[32]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
194. Pyrene, micrograms per liter	GC or HPLC method (610)[38]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
195. 2,3,7,8-Tetrachlorodibenzo-p-dioxin micrograms per liter	GC/MS methods (613)[41] (625)[26]	-	-	-	-	-
196. 1,1,2,2-Tetrachloroethane, micrograms per liter	GC method (601)[29]	-	-	-	-	-
	GC/MS method (624)[26]	-	-	-	-	-
197. Tetrachloroethene, micrograms per liter	GC method (601)[29]	-	-	-	-	-
	GC/MS method (624)[26]	-	-	-	-	-
198. Toluene, micrograms per liter	GC method (602)[30]	-	-	-	-	-
	GC/MS method (624)[26]	-	-	-	-	-
199. Toxaphene, micrograms per liter	GC method (608)[36]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-

TABLE I. LIST OF APPROVED TEST PROCEDURES (Cont.)

Parameter and units	Method	Reference (Page Nos.) 1974 EPA Methods	14th Ed. Standard Methods	Part 31 1975 ASTM	USGS Methods[1]	Other Approved Methods
200. 1,2,4-Trichlorobenzene, micrograms per liter	GC method (612)[40]	-	-	-	-	-
	GC/MS method(625)[26]	-	-	-	-	-
201. 1,1,1-Trichloroethane, micrograms per liter	GC method (601)[29]	-	-	-	-	-
	GC/MS method(624)[26]	-	-	-	-	-
202. 1,1,2-Trichloroethane, micrograms per liter	GC method (601)[29]	-	-	-	-	-
	GC/MS method(624)[26]	-	-	-	-	-
203. Trichloroethene, micrograms per liter	GC method (601)[29]	-	-	-	-	-
	GC/MS method(624)[26]	-	-	-	-	-
204. Trichlorofluoromethane, micrograms per liter	GC method (601)[29]	-	-	-	-	-
	GC/MS method(624)[26]	-	-	-	-	-
205. 2,4,6-Trichlorophenol, micrograms per liter	GC method (604)[32]	-	-	-	-	-
	GC/MS method (625)[26]	-	-	-	-	-
206. Vinyl Chloride, micrograms per liter	GC method (601)[29]	-	-	-	-	-
	GC/MS method (624)[26]	-	-	-	-	-
207. Orthophosphate (as P), milligrams per liter	Manual or automated ascorbic acid reduction	249 256	481 624	384 -	131 -	(621)[2] -
208. Pesticides, milligrams per liter	Gas chromatography[10]	-	555	529	(24)[11]	-
209. Phenols, milligram per liter	Colorimetric, (4AAP)	241	582	545	-	-
210. Phosphorus (elemental), milligrams per liter	Gas chromatography[22]	-	-	-	-	-
211. Phosphorus, total (as P), milligrams per	Persulfate digestion followed by manual or automated ascorbic acid reduction	249 256	476,481 624	- 384	133 -	(621)[2] -

TABLE I. LIST OF APPROVED TEST PROCEDURES (Cont.)

Parameter and units	Method	Reference (Page Nos.) 1974 EPA Methods	14th Ed. Standard Methods	Part 31 1975 ASTM	USGS Methods[1]	Other Approved Methods
Radiological						
212. Alpha—total, pCi per liter	Proportional or scintillation	-	648	591	(75)[10] (78)[24]	-
213. Alpha—counting error, pCi per liter	Proportional or scintillation counter	-	648	594	(79)[10]	-
214. Beta—total, pCi per liter	Proportional counter	-	648	601	(75)[10] (78)[24]	-
215. Beta—counting error, pCi per liter	Proportional counter	-	648	606	(79)[10]	-
216. a) Radium—total, pCi per liter	Proportional counter	-	661	661	-	-
b) ^{226}Ra, pCi per liter	Scintillation counter	-	667	-	(81)[10]	-
Residue						
217. Total, milligrams per liter	Gravimetric, 103 to 105°C	270	91	-	-	-
218. Total dissolved (filterable), milligrams per liter	Glass fiber filtration, 180°C	266	92	-	-	-
219. Total suspended (non-filterable), milligrams per liter	Glass fiber filtration, 103 to 105°C	268	94	-	-	(537)[26]
220. Settleable, milliliters per liter or milligrams per liter	Volumetric or gravimetric	-	95	-	-	-
221. Total volatile, milligrams per liter	Gravimetric, 550°C	272	95	-	-	-

TABLE I. LIST OF APPROVED TEST PROCEDURES (Cont.)

Parameter and units	Method	Reference (Page Nos.) 1974 EPA Methods	14th Ed. Standard Methods	Part 31 1975 ASTM	USGS Methods[1]	Other Approved Methods
202. Specific conductance, micromhos per centimeter at 25°C	Wheatstone bridge conductimetry	275	71	120	148	(606)[2]
203. Sulfate (as SO_4) milligrams per liter	Gravimetric;	-	493	424	-	(626)[2]
	turbidimetric; or	277	496	425	-	(623)[2]
	automated colorimetric (barium chloranilate)	279	-	-	-	-
224. Sulfide (as S), milligrams per liter	Titrimetric—iodine for levels greater than 1 mg per liter;	284	505	-	154	-
	Methylene blue photometric	-	503	-	-	-
225. Sulfite (as SO_3), milligrams per liter	Titrimetric, iodine-iodate	285	508	435	-	-
226. Surfactants, milligrams per liter	Colorimetric (Methylene blue)	157	600	494	(11)[22]	-
227. Temperature, degrees C	Calibrated glass or electrometric thermometer	286	125	-	(31)[25]	-
228. Turbidity, NTU	Nephelometric	295	132	223	156	-

Footnotes:

1. All page references for USGS methods unless otherwise noted are to Brown, E., Skougstad, N.W., and Fishman, M.J., "Methods for Collection and Analysis of Water Samples for Dissolved Minerals and Gases, "U.S. Geological Survey Techniques of Water-Resources Inv., book 5 ch. A1, (1970)."

2. EPA comparable method may be found on indicated page of "Official Methods of Analysis of the Association of Official Analytical Chemists" methods manual, 12th ed. (1975).

3. Manual distillation is not required if comparability data on representative effluent samples are on company file to show that this preliminary distillation step is not necessary; however, manual distillation will be required to resolve any controversies.

4. The method used must be specified.

5. The 5 tube MPN is used.

6. Slack, K.V. and others, "Methods for Collection and Analysis of Aquatic Biological and Microbiological Samples "U.S. Geological Survey Techniques of Water-Resource Inv., book 5, ch A4 (1973)."

7. Since the membrane filter technique usually yields low and variable recovery from chlorinated wastewaters, the MPN method will be required to resolve any controversies.

8. The chloramine-T oxidation-colormetric procedure for benzidine is available from the Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268

9. American National Standard on Photographic Processing Effluents, Apr. 2, 1975. Available from ANSI, 1430 Broadway, New York, N.Y. 10018.

10. Fishman, M.J. and Brown, Eugene, "Selected Methods of the U.S. Geological Survey for Analysis of Wastewaters," (1976) open-file report 76-177.

11. Procedures for pentachlorophenol, chlorinated organic compounds, and pesticides can be obtained from the Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268.

12. Color method (ADMI procedure) available from Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268.

13. For samples suspected of having thiocyanate interference, magnesium chloride is used as the digestion catalyst. In the approved test procedure for cyanides, the recommended catalysts are replaced with 20 ml of a solution of 510 g/l magnesium chloride ($MgCl_2 \cdot 6H_2O$). This substitution will eliminate thiocyanate interference for both total cyanide and cyanide amenable to chlorination measurements.

14. For the determination of total metals the sample is not filtered before processing. Because vigorous digestion procedures may result in a loss of certain metals through precipation, a less vigorous treatment is recommended as given on p. 83 (4.1.4) of "Methods for Chemical Analysis of Water and Wastes" (1974). In those instances where a more vigorous digestion is desired the procedure on p. 82 (4.1.3) should be followed. For the measurement of the noble metal series (gold, iridium, osmium, palladium, platinum, rhodium and ruthenium), an aqua regia digestion is to be substituted as follows: Transfer a representative aliquot of the well-mixed sample to a Griffin beaker and add 3 ml of concentrated redistilled HNO_3. Place the beaker on a steam bath and evaporate to dryness. Cool the beaker and cautiously add a 5 ml portion of aqua regia. (Aqua regia is prepared immediately before use by carefully adding 3 volumes of concentrated HCl to one volume of concentrated HNO_3.) Cover the beaker with a watch glass and return to the steam bath. Continue heating the covered beaker for 50 min. Remove cover and evaporate to dryness. Cool and take up the residue in a small quantity of 1:1 HCl. Wash down the beaker walls and watch glass with distilled water and filter the sample to remove silicates and other insoluble material that could clog the atomizer. Adjust the volume to some predetermined value based on the expected metal concentration. The sample is now ready for analysis.

15. As the various furnace devices (flameless AA) are essentially atomic absorption techniques, they are considered to be approved test methods. Methods of standard addition are to be followed as noted in p. 78 of "Methods for Chemical Analysis of Water and Wastes." 1974

16. Dissolved metals are defined as those constitutuents which will pass through a 0.45 μm membrane filter. A prefiltration is permissible to free the sample from larger suspended solids. Filter the sample as soon as practical after collection using the first 50 to 100 ml to rinse the filter flask. (Glass or plastic filtering apparatus are recommended to avoid possible contamination.) Discard the portion used to rinse the flask and collect the required volume of filtrate. Acidify the filtrate with 1:1 redistilled HNO_3 to a pH or 2. Normally, 3 ml of (1:1) acid per liter should be sufficient to preserve the samples.

17. See "Atomic Absorption Newsletter," vol. 13, 75 (1974). Available from Perkin-Elmer Corp., Main Ave., Norwalk, Conn. 06852

18. Method available from Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268

19. Recommended methods for the analysis of silver in industrial wastewaters at concentrations of 1 mg/l and above are inadequate where silver exists as an inorganic halide. Silver halides such as the bromide and chloride are relatively insoluble in reagents such as nitric acid but are readily soluble in an aqueous buffer of sodium thiosulfate and sodium hydroxide to a pH of 12. Therefore, for levels of silver above 1 mg/l 20 ml of sample should be diluted to 100 ml by adding 40 ml each of 2M $Na_2S_2O_3$ and 2M NaOH. Standards should be prepared in the same manner. For levels of silver below 1 mg/l the recommended method is satisfactory.

20. An automated hydrazine reduction method is available from the Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268.

21. A number of such systems manufactured by various companies are considered to be comparable in their performance. In addition, another technique, based on combustion-methane detection is also acceptable.

22. Goerlitz, D., Brown, E., "Methods for Analysis of Organic Substances in Water": U.S. Geological Survey Techniques of Water-Resources Inb., book 5, ch. A3 (1972)

23. R.F. Addison and R.G. Ackman, "Direct Determination of Elemental Phosphorus by Gas-Liquid Chromatography," "Journal of Chromatography," vol. 47, No. 3, pp. 421-426, 1970.

24. The method found on p. 75 measures only the dissolved portion while the method on p. 78 measures only suspended. Therefore, the 2 results must be added together to obtain "total".

25. Stevens, H.H., Fick, J.F., and Smoot, G.F., "Water Temperature - Influential Factors, Field Measurement and Data Presentation; U.S. Geological Survey Techniques of Water Resources Inv., book 1 (1975)."

26. EPA interim methods for analysis of organics in municipal and industrial wastewater by GC/MS purge and trap (Method 624 and methylene chloride extraction (Method 625) procedures are available from the Environmental Monitoring and Support Laboratory, U.S.E.P.A., Cincinnati, Ohio, 45268. Direct Aqueous injection is to be used in these GC/MS procedures for all compounds that exceed 1000 micrograms per liter. Dichlorodifluoromethane should be analyzed by the interim gas chromatographic method 601. For differentiation between isomeric pairs anthracene and phenanthrene, chrysene and benzo(a)anthracene, and benzo (b) fluoranthene and benzo (k) fluoranthene use method 610 of polynuclear aromatic hydrocarbons. "Interim Method for Benzidine and its Salts in Wastewater" is available from the Environmental Monitoring and Support Laboratory, U.S.E.P.A., Cincinnati, Ohio, 45268 (EMSL-CI).

27. The Inductively Coupled Plasma Optical Emission Spectrometric Method (ICP) is available from the Environmental Monitoring and Support Laboratory, U.S.E.P.A. Cincinnati, Ohio 45268 (EMSL-CI).

28. Method 507 for Carbonaceous Biochemical Oxygen Demand (BOD carbonaceous) is available from the Environmental Monitoring and Support Laboratory, U.S.E.P.A. Cincinnati, Ohio 45268 (EMSL-CI).

29. Inert gas purge, followed by gas chromatography with halide specific detection (interim method 601), available from EMSL-CI.

30. Inert gas purge followed by gas chromatography and photoionization detection (interim method 602), available from EMSL-CI.

31. Inert gas purge followed by gas chromatographic separation and detection with flame ionization detector (interim method 603), available from EMSL-CI.

32. Methylene chloride extraction, followed by gas chromatography with flame ionization or electron capture detection (interim method 604), available from EMSL-CI.

33. Chloroform extraction followed by concentration and high performance liquid chromatography (HPLC) with electrochemical detection (interim method 605), available from EMSL-CI.

34. Methylene chloride extraction followed by gas chromatography with flame ionization or electron capture detection (interim method 606), available from EMSL-CI.

35. Methylene chloride extraction followed by gas chromatography with nitrogen-phosphorous or reductive Hall detectors (interim method 607), available from EMSL-CI.

36. Methylene chloride extraction followed by gas chromatography with electron capture or halogen specific detection (interim method 608), available from EMSL-CI.

37. Methylene chloride extraction followed by exchange to toluene, gas chromatography with flame ionization detection (interim method 609), available from EMSL-CI.

38. Methylene chloride extraction followed by HPLC with fluoresence or UV detection; or gas chromatography (interim method 610), available from EMSL-CI.

39. Methylene chloride extraction followed by gas chromatography with halogen-specific detector (interim method 611), available from EMSL-CI.

40. Methylene chloride extraction followed by concentration, gas chromatography with electron capture detection (interim method 612), available from EMSL-CI.

41. Methylene chloride extraction followed by transfer to hexane and capillary column gas chromatography/mass spectometry with electron impact ionization (interim method 613), available from EMSL-CI.

42. Microbiological Methods for Monitoring the Environment (December 1978) available for the Environmental Monitoring and Support Laboratory U.S. E.P.A. Cincinnati, Ohio 45268.

APPENDIX III:

t-TEST LEVELS OF SIGNIFICANCE

Appendix III: t-Test Levels of Significance

Values of t for Given Probability Levels

Degrees of Freedom	Probability of a Larger Value				
	.1	.05	.025	.01	.005
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
40	1.303	1.684	2.021	2.423	2.704
60	1.296	1.671	2.000	2.390	2.660
120	1.290	1.661	1.984	2.358	2.626
∞	1.282	1.645	1.960	2.326	2.576

degrees of freedom = n-1

use for one-tailed t-test

(TOC, TOX, specific conductance)

use for two-tailed t-test (pH)

APPENDIX IV:

EPA'S RCRA REGULATIONS

Subpart F—Ground-Water Monitoring

§ 265.90 Applicability.

(a) Within one year after the effective date of these regulations, the owner or operator of a surface impoundment, landfill, or land treatment facility which is used to manage hazardous waste must implement a ground-water monitoring program capable of determining the facility's impact on the quality of ground water in the uppermost aquifer underlying the facility, except as § 265.1 and paragraph (c) of this Section provide otherwise.

(b) Except as paragraphs (c) and (d) of this Section provide otherwise, the owner or operator must install, operate, and maintain a ground-water monitoring system which meets the requirements of § 265.91, and must comply with §§ 265.92–265.94. This ground-water monitoring program must be carried out during the active life of the facility, and for disposal facilities, during the post-closure care period as well.

(c) All or part of the ground-water monitoring requirements of this Subpart may be waived if the owner or operator can demonstrate that there is a low potential for migration of hazardous waste or hazardous waste constituents from the facility via the uppermost aquifer to water supply wells (domestic, industrial, or agricultural) or to surface water. This demonstration must be in writing, and must be kept at the facility. This demonstration must be certified by a qualified geologist or geotechnical engineer and must establish the following:

(1) The potential for migration of hazardous waste or hazardous waste constituents from the facility to the uppermost aquifer, by an evaluation of:

(i) A water balance of precipitation, evapotranspiration, runoff, and infiltration; and

(ii) Unsaturated zone characteristics (i.e., geologic materials, physical properties, and depth to ground water); and

(2) The potential for hazardous waste or hazardous waste constituents which enter the uppermost aquifer to migrate to a water supply well or surface water, by an evaluation of:

(i) Saturated zone characteristics (i.e., geologic materials, physical properties, and rate of ground-water flow); and

(ii) The proximity of the facility to water supply wells or surface water.

(d) If an owner or operator assumes (or knows) that ground-water monitoring of indicator parameters in accordance with §§265.91 and 265.92 would show statistically significant increases (or decreases in the case of pH) when evaluated under § 265.93(b), he may, install, operate, and maintain an alternate ground-water monitoring system (other than the one described in §§ 265.91 and 265.92). If the owner or operator decides to use an alternate ground-water monitoring system he must:

(1) Within one year after the effective date of these regulations, submit to the Regional Administrator a specific plan, certified by a qualified geologist or geotechnical engineer, which satisfies the requirements of § 265.93(d)(3), for an alternate ground-water monitoring system;

(2) Not later than one year after the effective date of these regulations, initiate the determinations specified in § 265.93(d)(4);

(3) Prepare and submit a written report in accordance with § 265.93(d)(5);

(4) Continue to make the determinations specified in § 265.93(d)(4) on a quarterly basis until final closure of the facility; and

(5) Comply with the recordkeeping and reporting requirements in § 265.94(b).

§ 265.91 Ground-water monitoring system.

(a) A ground-water monitoring system must be capable of yielding ground-water samples for analysis and must consist of:

(1) Monitoring wells (at least one) installed hydraulically upgradient (i.e., in the direction of increasing static head) from the limit of the waste management area. Their number, locations, and depths must be sufficient to yield ground-water samples that are:

(i) Representative of background ground-water quality in the uppermost aquifer near the facility; and

(ii) Not affected by the facility; and

(2) Monitoring wells (at least three) installed hydraulically downgradient (i.e., in the direction of decreasing static head) at the limit of the waste management area. Their number, locations, and depths must ensure that they immediately detect any statistically significant amounts of hazardous waste or hazardous waste constituents that migrate from the waste management area to the uppermost aquifer.

(b) Separate monitoring systems for each waste management component of a facility are not required provided that provisions for sampling upgradient and downgradient water quality will detect any discharge from the waste management area.

(1) In the case of a facility consisting of only one surface impoundment, landfill, or land treatment area, the waste management area is described by the waste boundary (perimeter).

(2) In the case of a facility consisting of more than one surface impoundment, landfill, or land treatment area, the waste management area is described by an imaginary boundary line which circumscribes the several waste management components.

(c) All monitoring wells must be cased in a manner that maintains the integrity of the monitoring well bore hole. This casing must be screened or perforated, and packed with gravel or sand where necessary, to enable sample collection at depths where appropriate aquifer flow zones exist. The annular space (i.e., the space between the bore hole and well casing) above the sampling depth must be sealed with a suitable material (e.g., cement grout or bentonite slurry) to prevent contamination of samples and the ground water.

§ 265.92 Sampling and analysis.

(a) The owner or operator must obtain and analyze samples from the installed ground-water monitoring system. The owner or operator must develop and follow a ground-water sampling and analysis plan. He must keep this plan at the facility. The plan must include procedures and techniques for:

(1) Sample collection;

(2) Sample preservation and shipment;

(3) Analytical procedures; and

(4) Chain of custody control.

[*Comment:* See "Procedures Manual For Ground-water Monitoring At Solid Waste Disposal Facilities," EPA-530/SW-611, August 1977 and "Methods for Chemical Analysis of Water and Wastes," EPA-600/4-79-020, March 1979 for discussions of sampling and analysis procedures.]

(b) The owner or operator must determine the concentration or value of the following parameters in ground-water samples in accordance with paragraphs (c) and (d) of this section:

(1) Parameters characterizing the suitability of the ground water as a drinking water supply, as specified in Appendix III.

(2) Parameters establishing ground-water quality:

(i) Chloride

(ii) Iron

(iii) Manganese

(iv) Phenols

(v) Sodium

(vi) Sulfate

[*Comment:* These parameters are to be used as a basis for comparison in the event a ground-water quality assessment is required under § 265.93(d).]

(3) Parameters used as indicators of ground-water contamination:

(i) pH

(ii) Specific Conductance

(iii) Total Organic Carbon

(iv) Total Organic Halogen

(c)(1) For all monitoring wells, the owner or operator must establish initial

background concentrations or values of all parameters specified in paragraph (b) of this Section. He must do this quarterly for one year.

(2) For each of the indicator parameters specified in paragraph (b)(3) of this Section, at least four replicate measurements must be obtained for each sample and the initial background arithmetic mean and variance must be determined by pooling the replicate measurements for the respective parameter concentrations or values in samples obtained from upgradient wells during the first year.

(d) After the first year, all monitoring wells must be sampled and the samples analyzed with the following frequencies:

(1) Samples collected to establish ground-water quality must be obtained and analyzed for the parameters specified in paragraph (b)(2) of this Section at least annually.

(2) Samples collected to indicate ground-water contamination must be obtained and analyzed for the parameters specified in paragraph (b)(3) of this Section at least semi-annually.

(e) Elevation of the ground-water surface at each monitoring well must be determined each time a sample is obtained.

§ 265.93 Preparation, evaluation, and response.

(a) Within one year after the effective date of these regulations, the owner or operator must prepare an *outline* of a ground-water quality assessment program. The outline must describe a more comprehensive ground-water monitoring program (than that described in §§ 265.91 and 265.92) capable of determining:

(1) Whether hazardous waste or hazardous waste constituents have entered the ground water;

(2) The rate and extent of migration of hazardous waste or hazardous waste constituents in the ground water; and

(3) The concentrations of hazardous waste or hazardous waste constituents in the ground water.

(b) For each indicator parameter specified in § 265.92(b)(3), the owner or operator must calculate the arithmetic mean and variance, based on at least four replicate measurements on each sample, for each well monitored in accordance with § 265.92(d)(2), and compare these results with its initial background arithmetic mean. The comparison must consider individually each of the wells in the monitoring system, and must use the Student's t-test at the 0.01 level of significance (see Appendix IV) to determine statistically significant increases (and decreases, in the case of pH) over initial background.

(c)(1) If the comparisons for the *upgradient* wells made under paragraph (b) of this Section show a significant increase (or pH decrease), the owner or operator must submit this information in accordance with § 265.94(a)(2)(ii).

(2) If the comparisons for *downgradient* wells made under paragraph (b) of this Section show a significant increase (or pH decrease), the owner or operator must then immediately obtain additional ground-water samples from those downgradient wells where a significant difference was detected, split the samples in two, and obtain analyses of all additional samples to determine whether the significant difference was a result of laboratory error.

(d)(1) If the analyses performed under paragraph (c)(2) of this Section confirm the significant increase (or pH decrease), the owner or operator must provide written notice to the Regional Administrator—within seven days of the date of such confirmation—that the facility may be affecting ground-water quality.

(2) Within 15 days after the notification under paragraph (d)(1) of this Section, the owner or operator must develop and submit to the Regional Administrator a specific plan, based on the outline required under paragraph (a) of this Section and certified by a qualified geologist or geotechnical engineer, for a ground-water quality assessment program at the facility.

(3) The plan to be submitted under § 265.90(d)(1) or paragraph (d)(2) of this Section must specify:

(i) The number, location, and depth of wells;

(ii) Sampling and analytical methods for those hazardous wastes or hazardous waste constituents in the facility;

(iii) Evaluation procedures, including any use of previously-gathered ground-water quality information; and

(iv) A schedule of implementation.

(4) The owner or operator must implement the ground-water quality assessment plan which satisfies the requirements of paragraph (d)(3) of this Section, and, at a minimum, determine:

(i) The rate and extent of migration of the hazardous waste or hazardous waste constituents in the ground water; and

(ii) The concentrations of the hazardous waste or hazardous waste constituents in the ground water.

(5) The owner or operator must make his first determination under paragraph (d)(4) of this Section as soon as technically feasible, and, within 15 days after that determination, submit to the Regional Administrator a written report containing an assessment of the ground-water quality.

(6) If the owners or operator determines, based on the results of the first determination under paragraph (d)(4) of this Section, that no hazardous waste or hazardous waste constituents from the facility have entered the ground water, then he may reinstate the indicator evaluation program described in § 265.92 and paragraph (b) of this Section. If the owner or operator reinstates the indicator evaluation program, he must so notify the Regional Administrator in the report submitted under paragraph (d)(5) of this Section.

(7) If the owner or operator determines, based on the first determination under paragraph (d)(4) of this Section, that hazardous waste or hazardous waste constituents from the facility have entered the ground water, then he:

(i) Must continue to make the determinations required under paragraph (d)(4) of this Section on a quarterly basis until final closure of the facility, if the ground-water quality assessment plan was implemented prior to final closure of the facility; or

(ii) May cease to make the determinations required under paragraph (d)(4) of this Section, if the ground-water quality assessment plan was implemented during the post-closure care period.

(e) Notwithstanding any other provision of this Subpart, any ground-water quality assessment to satisfy the requirements of § 265.93(d)(4) which is initiated prior to final closure of the facility must be completed and reported in accordance with § 265.93(d)(5).

(f) Unless the ground water is monitored to satisfy the requirements of § 265.93(d)(4), at least annually the owner or operator must evaluate the data on ground-water surface elevations obtained under § 265.92(e) to determine whether the requirements under § 265.91(a) for locating the monitoring wells continues to be satisfied. If the evaluation shows that § 265.91(a) is no longer satisfied, the owner or operator must immediately modify the number, location, or depth of the monitoring wells to bring the ground-water monitoring system into compliance with this requirement.

§ 265.94 Recordkeeping and reporting.

(a) Unless the ground water is monitored to satisfy the requirements of § 265.93(d)(4), the owner or operator must:

(1) Keep records of the analyses required in § 265.92(c) and (d), the associated ground-water surface elevations required in § 265.92(e), and

the evaluations required in § 265.93(b) throughout the active life of the facility, and, for disposal facilities, throughout the post-closure care period as well; and

(2) Report the following ground-water monitoring information to the Regional Administrator:

(i) During the first year when initial background concentrations are being established for the facility: concentrations or values of the parameters listed in § 265.92(b)(1) for each ground-water monitoring well within 15 days after completing each quarterly analysis. The owner or operator must separately identify for each monitoring well any parameters whose concentration or value has been found to exceed the maximum contaminant levels listed in Appendix III.

(ii) Annually: concentrations or values of the parameters listed in § 265.92(b)(3) for each ground-water monitoring well, along with the required evaluations for these parameters under § 265.93(b). The owner or operator must separately identify any significant differences from initial background found in the upgradient wells, in accordance with § 265.93(c)(1). During the active life of the facility, this information must be submitted as part of the annual report required under § 265.75.

(iii) As a part of the annual report required under § 265.75: results of the evaluation of ground-water surface elevations under § 265.93(f), and a description of the response to that evaluation, where applicable.

(b) If the ground water is monitored to satisfy the requirements of § 265.93(d)(4), the owner or operator must:

(1) Keep records of the analyses and evaluations specified in the plan, which satisfies the requirements of § 265.93(d)(3), throughout the active life of the facility, and, for disposal facilities, throughout the post-closure care period as well; and

(2) Annually, until final closure of the facility, submit to the Regional Administrator a report containing the results of his ground-water quality assessment program which includes, but is not limited to, the calculated (or measured) rate of migration of hazardous waste or hazardous waste constituents in the ground water during the reporting period. This report must be submitted as part of the annual report required under § 265.75.

Appendix IV—Tests for Significance

As required in § 265.93(b) the owner or operator must use the Student's t-test to determine statistically significant changes in the concentration or value of an indicator parameter in periodic ground-water samples when compared to the initial background concentration or value of that indicator parameter. The comparison must consider individually each of the wells in the monitoring system. For three of the indicator parameters (specific conductance, total organic carbon, and total organic halogen) a single-tailed Student's t-test must be used to test at the 0.01 level of significance for significant increases over background. The difference test for pH must be a two-tailed Student's t-test at the overall 0.01 level of significance.

The student's t-test involves calculation of the value of a t-statistic for each comparison of the mean (average) concentration or value (based on a minimum of four replicate measurements) of an indicator parameter with its initial background concentration or value. The calculated value of the t-statistic must then be compared to the value of the t-statistic found in a table for t-test of significance at the specified level of significance. A calculated value of t which exceeds the value of t found in the table indicates a statistically significant change in the concentration or value of the indicator parameter.

Formulae for calculation of the t-statistic and tables for t-test of significance can be found in most introductory statistics texts.

RESULTS OF GROUNDWATER INVESTIGATION
FISHER BODY PLANT
ELYRIA, OHIO

Prepared for

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February 1985

G/WT File 84524

1.0 INTRODUCTION

Ground/Water Technology, Inc., (G/WT) has undertaken a groundwater investigation at the Fisher Body Division facility in Elyria, Ohio. The investigation is comprised of a program of permeability testing and groundwater sampling of existing monitoring wells leading to a hydrogeologic evaluation of the sludge basins on site and an assessment of potential subsurface contamination.

In compliance with Ohio EPA Hazardous Waste Rule 3745-65-93, G/WT acting as authorized representatives for General Motors Corporation, Fisher Body Division, HWFAB Permit #02-47-0192 has undertaken a groundwater quality assessment. The plan was prepared and approved in conformance with the requirements for preparation, evaluation and response under the hazardous waste rule cited above.

The purpose of the groundwater assessment program was to determine as specified under Rule 3745-65-93 (A):

1.) Whether hazardous waste or hazardous waste constituents have entered the groundwater;

2.) The rate and extent of migration of hazardous waste or

hazardous waste constituents in the groundwater; and

3.) The concentration of hazardous waste or hazardous waste constituents in the groundwater.

The G/WT investigation and report is based upon our proposal to GMC Fisher Body Division and our submittal to the Ohio EPA on their behalf dated August 1984. The scope of the work was refined and revised based upon the comments of the Ohio EPA, specifically, the addition of analyses for volatile organic contaminants and analyses of samples of the lagoon underdrain water. Field work was initiated October 17, 1984.

This report presents the results of G/WT's investigations. It describes the hydrogeologic regime in the area of the sludge basins and the extent of subsurface contamination as determined by the pre-existing monitoring wells.

1.1 PROBLEM DEFINITION

The GMC Fisher Body plant is located in Elyria, Ohio, in an area of large industrial production plants. The plant produces finished parts for automobiles; including painting, metalworking and chrome-plating operations. Production wastes are pumped as a sludge to three settling basins on the southeastern part of the property. Chemical analysis of the sludge shows it to be non-

ignitable, non-corrosive and non-reactive. The sludge generally contains high levels of chromium, copper, iron, nickel and zinc. The sludge is generally 10% to 30% solids by weight. High levels of organic carbon and oil and grease may also be encountered.

The three lagoons are constructed side by side. Each lagoon is 200 feet wide by 500 feet long. Solid material settles out of the sludge mixture and the lagoons are periodically cleaned out. Six monitoring wells were placed around the lagoons in 1981 in compliance with RCRA regulations.

The location of the sludge lagoons on the property are shown on Figure 1.1. Locations of existing monitoring wells are also shown on this figure. Each lagoon is approximately 6 feet deep and has a graded sand and gravel filter at the base of it leading to a drainage field. The drainage field consists of a 6-inch diameter tile laid in a trench beneath the bottom of the basin. Lagoon #1, the northern lagoon, was placed in operation in 1971. Lagoon #2 was placed in operation in 1972. Lagoon #3, the southern lagoon, was placed in operation in 1974. All lagoons are believed to be functioning properly at this time. Each lagoon has been cleaned out at least twice over the life of the lagoon. Figure 1.2 shows the construction details of the sludge lagoons.

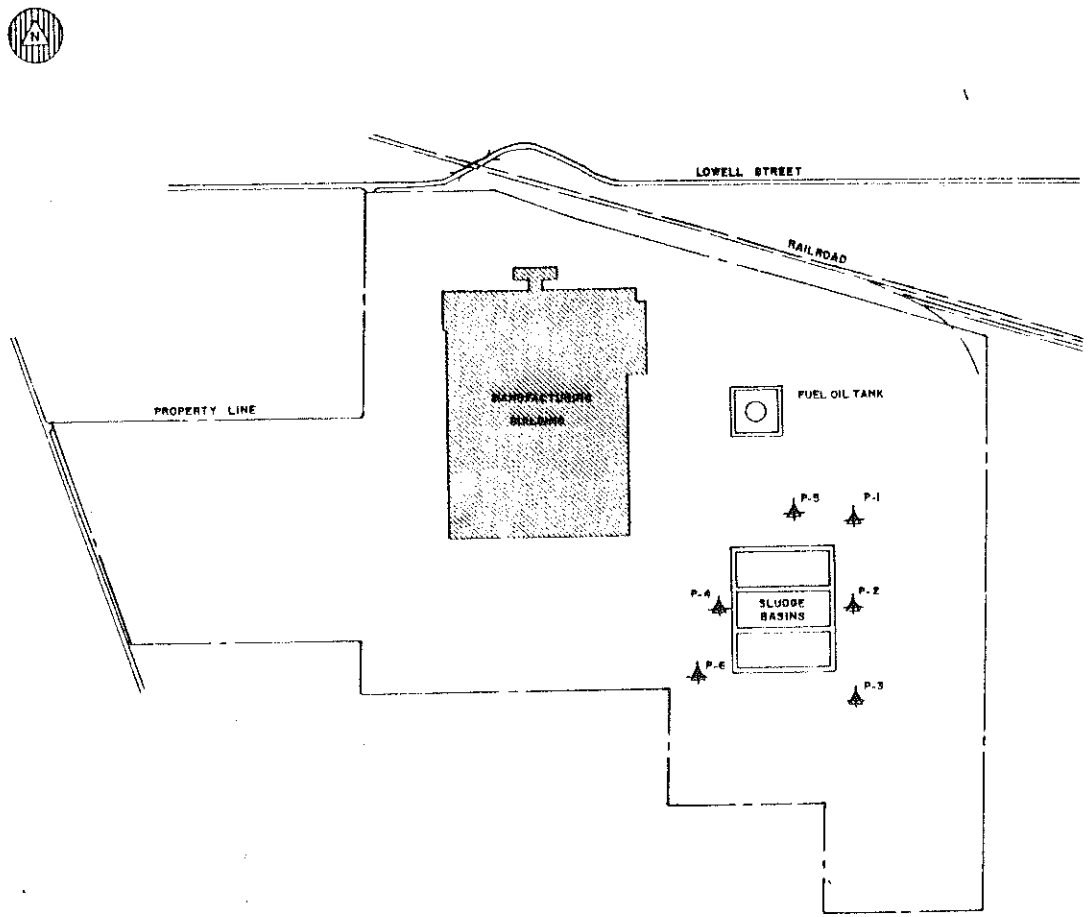
The GMC Fisher Body Division currently has a groundwater monitoring program in existence in accordance with Ohio EPA

Hazardous Waste Rule 3745-65-92. The program consists of six monitoring wells around the sludge lagoons. The locations of the wells are shown in Figure 1.1. The wells vary in depth from 15 to 29 feet. Well P-4 has been broken and is inoperative.

Four of these monitoring wells, P-1, P-2, P-5 and P-6 satisfy EPA requirements of one upgradient and three downgradient wells. Consequently, only these four wells have been sampled historically to satisfy Rule 3745-65-92 requirements. Significant variations in the indicator parameters (pH, specific conductance) as determined by the Student t Test have initiated the need for this additional groundwater quality assessment program.

2.0 FIELD PROGRAM

The field program of the groundwater quality assessment investigation at the Elyria, Ohio, facility was outlined in our proposal to GMC Fisher Body Division. The program consisted of collecting groundwater samples from all existing monitoring wells and the lagoon underdrain system. The samples were analyzed for background data and for hazardous waste constituents used in the facility. Additionally, all existing monitoring wells had constant head and/or falling head permeability tests conducted on them. The static groundwater levels were recorded for all monitoring wells as part of the data gathering process. The



GMC-FISHER BODY DIVISION

ELYRIA OHIO

MONITORING WELL LOCATIONS

SCALE NOT TO SCALE | G/WT FILE NO. 84524

GROUNDWATER TECHNOLOGY INC.

FIGURE NO 1.1

DRAWN BY S.SPADY DATE 6/28/84 CHECKED BY _____ DATE _____

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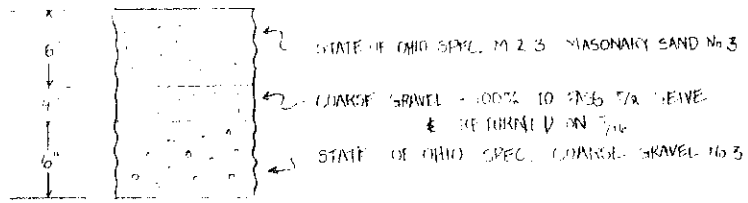
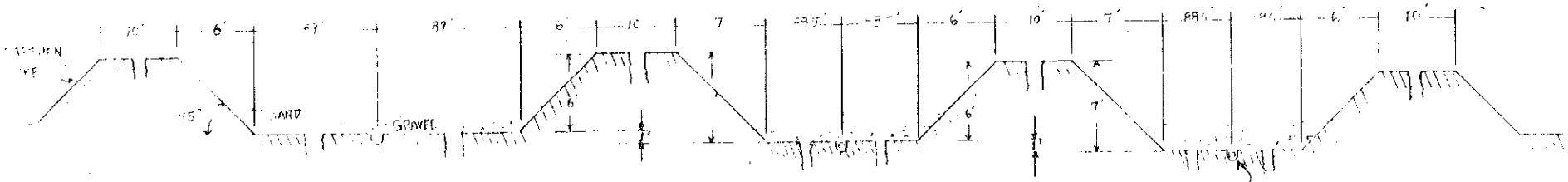


CROSS SECTION THROUGH
SAND & GRAVEL



SIDES & LINES ALL AT 45° ANGLE.
BASIN LEVELS ARE STEPPED DOWN
FROM SOUTH TO NORTH IN ORDER
TO CONFORM TO LAND CONTOUR
AS IS NECESSARY.

SECTION B B

*NOTE - DRAWING WAS TAKEN FROM A G.M.C.
PLANT ENG DEPT ORIGINAL ENTITLED - SECTIONAL
VIEW OF FLYER BASINS & OUTLET PIPING.
DWG. NO. TPNT-119

SECTIONAL VIEW OF SLUDGE BASINS

SCALE: 1" = 8'	G/WT FILE NO. 81524
GROUNDWATER TECHNOLOGY INC.	FIGURE NO 1.2

specific methodology applied in this program is detailed below.

2.1 GROUNDWATER SAMPLING

Groundwater samples were collected from the on-site wells on October 17 and 18, 1984. The samples were to be analyzed for purgeable organic compounds, trace metals and various indicators of groundwater quality.

As part of the sampling process, it was discovered that Well P-4 was broken below grade and that collection of samples from this well was impossible. Samples were collected from the five remaining monitoring wells and the lagoon underdrain system.

Purging of the monitoring wells and collection of the samples was accomplished using bailers made of either teflon or stainless steel. Each monitoring well had a bailer dedicated to it for the whole sampling process. All bailers were cleaned in the laboratory prior to the field program. The bailers were thoroughly cleaned using the following procedure:

- wash sampler with laboratory grade soap and water
- rinse three times with clean water
- rinse at least one time with distilled water
- rinse with reagent grade methanol

Each bailer was allowed to dry until all methanol had evaporated. The bailers were then carefully individually wrapped in aluminum foil for transportation to the site. New lines were used to lower each bailer into the monitoring well and were disposed of in an appropriate manner at the completion of the program. C/WT field personnel collecting groundwater samples wore chemically-inert protective gloves to prevent skin contact with sampling devices and lines.

Monitoring wells were purged to remove a minimum of 3 to 5 well volumes prior to obtaining groundwater samples for analysis and to insure that all stagnant water had been removed from the well bore and surrounding sandpack. Monitoring well P-6 recovered extremely slowly. Consequently, the bailing and purging process was conducted over a two-day period.

Groundwater samples were obtained immediately after completion of the purging operation in each well. Samples were collected from a depth of approximately three feet below the groundwater surface in each well. Specific conductivity and pH were measured in the field at the time of sampling.

Groundwater samples collected for metals analysis were filtered in the field through a 0.45 micron filter. All samples were collected directly from the bailer.

Preservatives were added to individual sampling bottles by the

analytical laboratory prior to shipment. The samples were collected and preserved in the following manner:

- Metals, TOC: A 200 ml sample was collected and filtered on site through a 0.45 micron filter paper. The sample was stored in a glass container containing HNO_3 to reduce the pH to 2.

- TOH, chlorides, sulphates: A 500 ml sample was collected in a glass container and stored on ice.

- Phenols: A 500 ml sample was collected in a glass container containing the preservative H_3NO_4. The container was stored on ice.

- Volatile organics: Two 40 ml samples were collected in widemouth glass vials. The containers were stored on ice.

Chain-of-custody procedures were used throughout the sampling process and during transportation to the laboratory. The information recorded for each sample included:

- Laboratory name
- Sampler's identity
- Sample location
- Sample source

- Sample laboratory number
- Time and date of sampling
- Weather conditions

Chain-of-custody procedures that were utilized included:

- Listing all samples on chain-of-custody manifests
- Samples bottles were transported in one container with manifest attached
- All personnel responsible for sampling transport and receiving samples sign manifest
- Analyst identity and laboratory were recorded on manifest
- Samples were kept within locked vehicle, or within sight of custodian until received by laboratory custodian

2.2 CHEMICAL ANALYSES

It was determined that groundwater samples would be analyzed for background data as described under Ohio Hazardous Waste Rule #3745-65-92 (B)(3) and for such hazardous waste constituents used in the facility as specified under Hazardous Waste Rule#3745-65-93 (D)(3)(b). These constituents were:

Hexavalent Chromium	Zinc
Trivalent Chromium	Chloride
Copper	Sulphate
Iron	Phenols
Nickel	pH
Manganese	Specific Conductance
Sodium	TOC
Purgeable Halocarbons	

Groundwater samples were analyzed by EA Engineering, Science and Technology, Inc., of Sparks, Maryland. EA is a U.S. EPA certified drinking water standards laboratory. The methods of analysis are shown on Table 2.1.

Groundwater samples were received at the EA facility on October 19, 1984. Samples were checked against the chain-of-custody form and logged into the laboratory system prior to analysis. All analyses were performed under strict quality control as specified

TABLE 2.1

ANALYTICAL PROCEDURES

General Motors Corporation
Fisher Body Division

PARAMETER	METHOD	DESCRIPTION
Zinc	289.1	AA
Nickel	249.1	AA
Copper	220.1	AA
Chloride	325.3	Titrimetric - Mercury Nitrate
Iron	236.1	AA
Manganese	243.1	AA
Phenols	420	Spectrophotometric, 4-AAP, Distillation
Sodium	273.1	AA
Sulfate	375.3	Gravimetric
pH	150.1	Measured in Field
Spec. Cond.	120.1	Measured in Field
T.O.C.	415.1	Byron 401
T.O.H. (Halogen)	0.1	Manufactures Methods Dohrman
Hexavalent Chromium	218.4	AA Chelation - Extraction
Trivalent Chromium	218.3	AA Total Chromium Minus Hex Chromium
Volatile Organics (Purgeable Halocarbons)	624.0	GC/MS

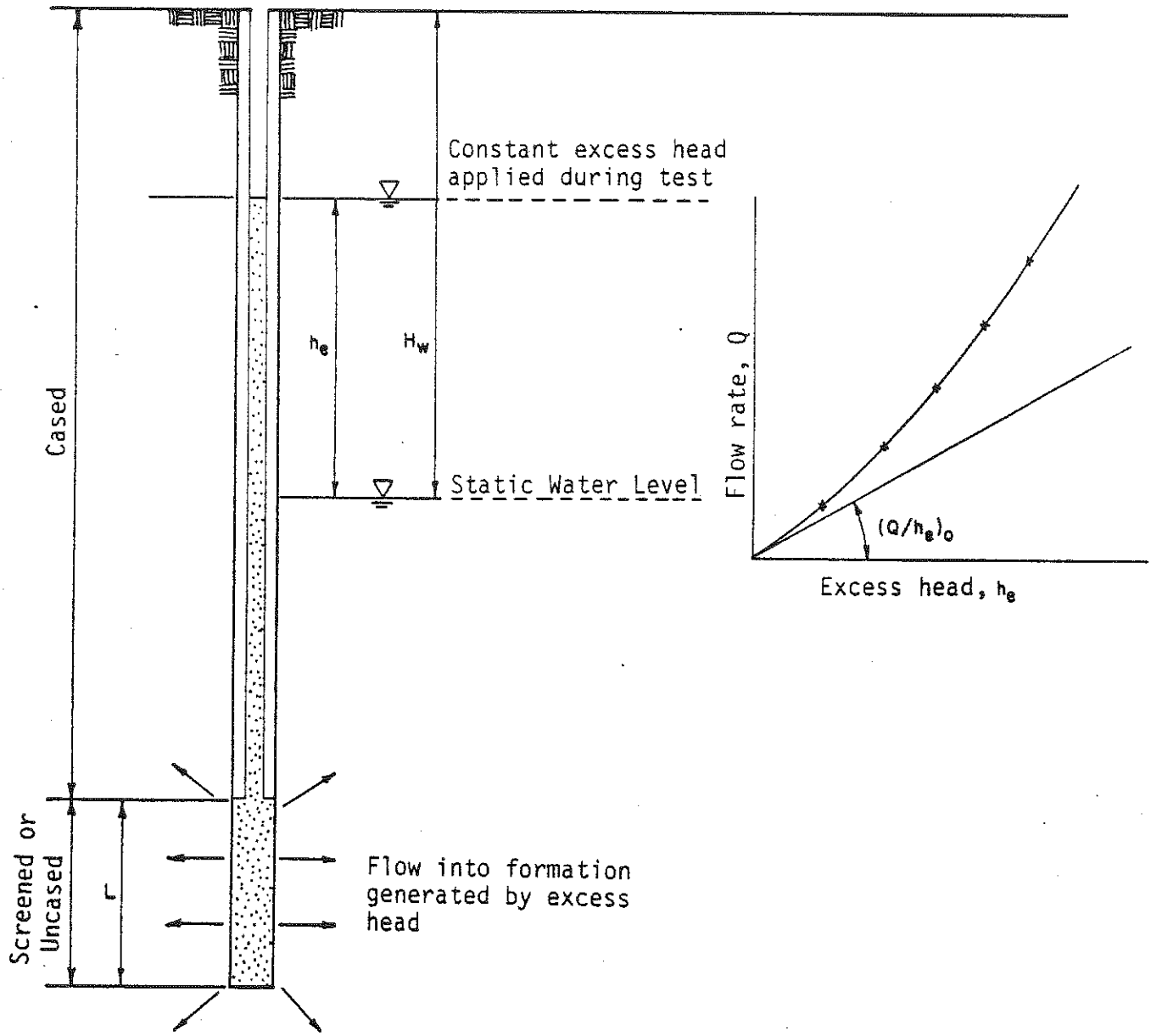
in EA's quality control program. All parametric holding times were met in the analytical effort. Results of the analyses are presented in Section 3. EA's quality assurance/quality control program is presented as Appendix A.

2.3 PERMEABILITY TESTS

It was originally proposed that constant head permeability tests be conducted on all six existing monitoring wells. These tests were attempted on monitoring wells P-2, P-3, P-5 and P-6. However, only successful results were achieved on well P-2. The generally low hydraulic conductivity of the strata tested by the permeability test resulted in steady-state flow rates which were too small to be accurately measured. Consequently, falling head permeability tests were substituted in monitoring wells P-3, P-5 and P-6.

Monitoring well P-1 was not tested by either method as this well was not accessible to a water supply or testing equipment. Monitoring well P-4 was not tested as it had been destroyed.

The constant head permeability test comprises of measuring water levels in the monitoring well as potable water is pumped into the well at a steady-state flow rate. Figure 2.1 illustrates the principle of this test. Water is allowed to flow into the monitoring well at a constant rate measured with a flowmeter.



Permeability, $k = \frac{1}{2\pi L} \cdot \left(\frac{Q}{h_e}\right)_o \cdot \ln (R/r)$

$\ln (R/r)$ may be taken as 7.

If Q is litres/min. and dimensions are in metres,

$$k = \frac{5.833}{\pi L} \cdot \left(\frac{Q}{h_e}\right)_o \cdot 10^{-5} \text{ m/sec}$$

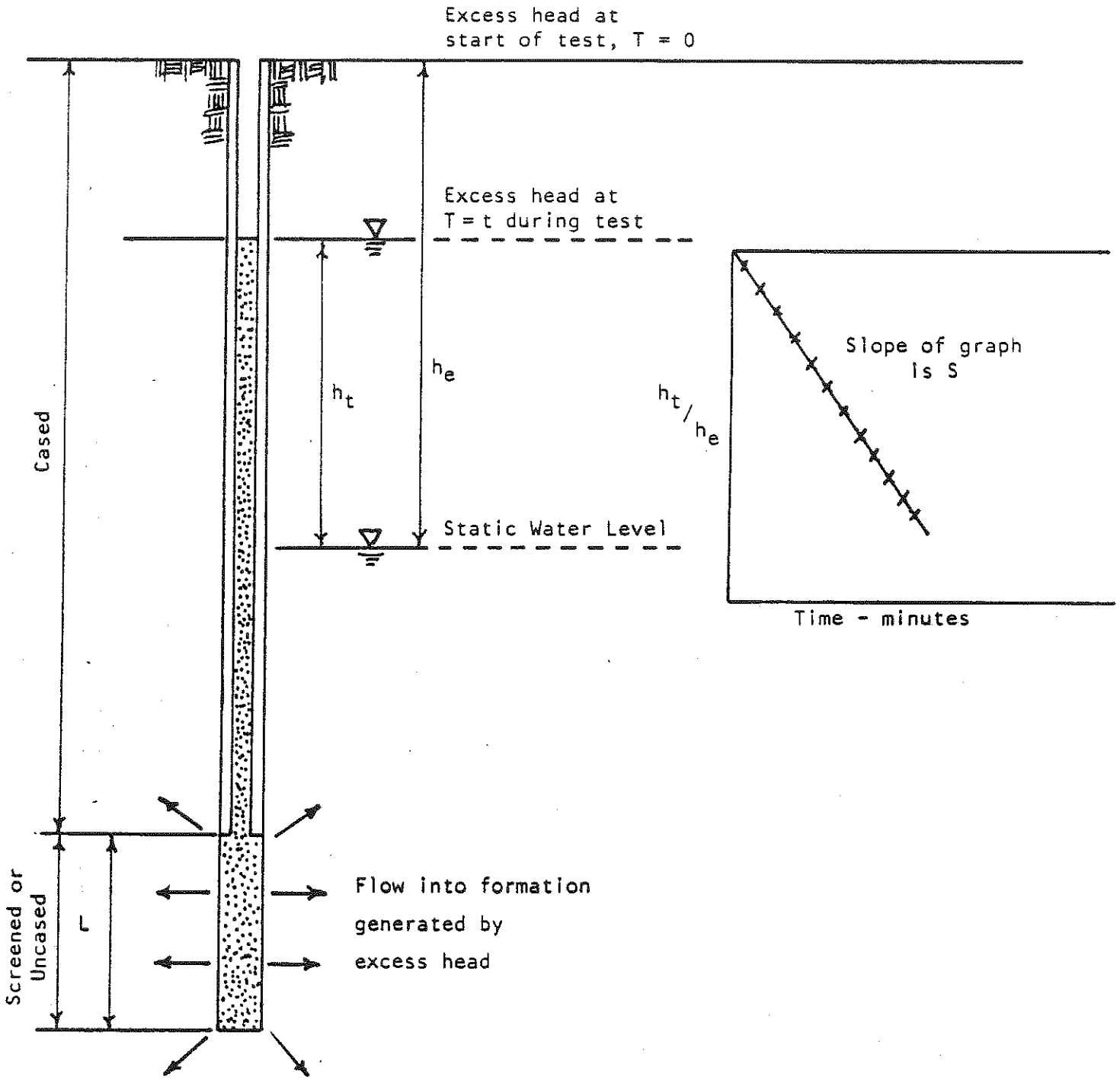
Principle of constant head test

Figure 2.1

The excess head produced by the inflow is measured and the flow rate recorded. If feasible, a number of different flow rates are used and the corresponding excess head measured to verify the results. The test is run for several minutes at each flow rate until a steady-state equilibrium level is achieved. If multiple reading are taken, the flow rate versus excess head is plotted, and the slope is used to calculate the hydraulic conductivity.

Falling head permeability tests are generally judged not to be as accurate as constant head permeability tests. However, at the lower permeabilities encountered at this site, the test can be used with a high degree of confidence. Figure 2.2 illustrates the principle of the falling head test. The static water level in the monitoring well is measured and the water is added, raising the water level. At the start of the test the drop in the water level is recorded against time until the water reaches, or nearly reaches, the original static water level. Readings are generally taken as quickly as possible initially and then every minute until the test is completed. The duration of a test is frequently 15 minutes, and it is rare that readings beyond 30 minutes are necessary. The resulting excess head versus time is plotted on semi-log paper to determine the slope needed to calculate the hydraulic conductivity. Results of the permeability tests are discussed in Section 3.

3.0 HYDROGEOLOGY



Permeability, $K = 0.133\ S \left(\frac{r_c^2}{L}\right)$

r, L in meters

Time in minutes

K in m/sec

PRINCIPLE OF FALLING HEAD TEST

FIGURE 2.2

GROUNDWATER TECHNOLOGY, INC

3.1 GEOLOGY

The GMC Fisher Body facility in Elyria is located on a flatlying plains region near the waters of Lake Erie. It is situated within the Interior Lowlands Physiographic Province, an area of relatively flatlying sedimentary rock from Pennsylvanian to Cambrian in age. The thick deposits of relatively soft sedimentary rock lie directly on the Precambrian basement rock. In the area of the facility, a thin veneer of soft till, deposited during the Wisconsin glacial event, overlies the site to thicknesses of 12 feet. Bedrock underlies this till deposit at relatively shallow depths.

The stratigraphy in the region of the sludge lagoons was determined by Camp Dresser McKee (CDM) as part of their 1981 investigation. As no further geologic work was undertaken as part of our investigation, the CDM description of the stragriphy is included:

> Soft light brown to greenish gray clay till deposited by the Wisconsin glacial advance comprises the first 9 to 12 feet of the surficial materials. In the vicinity of boring P-3 and to a lesser degree in boring P-2 a soft light greenish gray shale underlies the glacial deposits. This shale is approximately 5 feet thick in the vicinity of P-3 and approximately 2.5 feet thick near boring P-2. This shale may be an isolated deposit or may possibly correlate with the Orangeville shale, Mississippian in age. A very hard light greenish gray fine grained sandstone with very thin shale interbeds underlies the shale east and southeast of the disposal ponds and underlies the glacial material west and northeast of the ponds. This sandstone probably correlates with the Berea sandstone, Lower

TABLE 3.1

GROUNDWATER ELEVATIONS (MSL)

Well#	EL Well Top	5-81	7-81	1-26-82	5-5-82	8-24-82	11-16-82	5-13-83	11-23-83	4-18-84	5-8-84	5-30-84	10-17-84
P-1	749.8	739.3		738.8	741.3	743.0	736.2	737.5	738.6	740.5	738.1	740.6	737.3
P-2	748.9	744.9		730.9	731.3	733.5	744.3	745.4	745.0	745.6	745.8	745.6	741.2
P-3	749.3	744.3											738.0
P-4	754.2	747.2											
P-5	752.2		743.0	730.8	732.3	733.7	741.5	743.9	743.9	743.7	740.9	744.0	741.2
P-6	753.8		744.8	743.4	743.6	748.0	745.9	749.2	748.6	749.4	749.8	749.6	742.0

General Motors Corp.

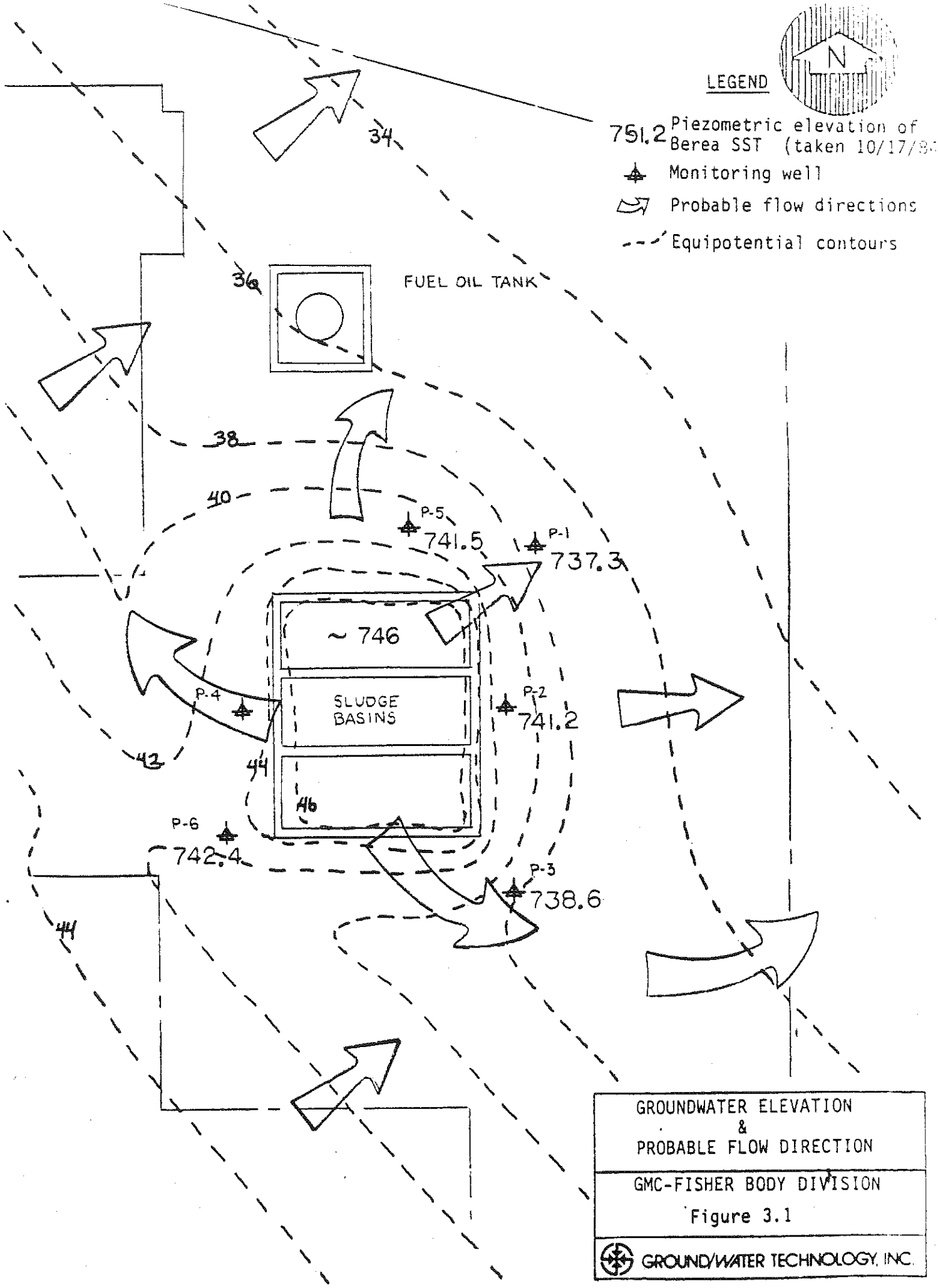
Fisher Body Division
Elyria, Ohio

Mississippian in age. Based on the six widely spaced borings, the sandstone appears to thin to the east and south ranging in thickness from 14 feet west of the ponds and five feet southeast and southwest of the ponds. The sandstone encountered in boring P-5 and P-6 was found to be highly weathered which is in great contrast to the extreme hardness of the sandstone encountered in the other borings. How the sandstone behaves beyond the borings could not be determined from this investigation; however, regional data obtained in a literature review indicates that the Berea sandstone is discontinuous owing its discontinuity to preglacial erosion and in some cases non-deposition. A unit that probably correlates with the Bedford shale, lower Mississippian in age, underlies the sandstone. East of the ponds, this shale is bluish gray. West of the ponds, the shale was found to be red. The depth to the shale was found to be approximately 15 to 22 feet.

The base of the three sludge basins are at an approximate elevation of 740.5 feet. This would place the bottom of the basin within the Berea sandstone on the western portion of the sludge lagoon. On the eastern portion of the lagoon the base is within the unconsolidated clay till and the weathered shale. These low permeability materials on the eastern side, would tend to act as a confining layer to the sludge within the lagoons.

3.2 GROUNDWATER

Groundwater elevations within the Berea sandstone were measured as part of the field investigation. These elevations are shown on Table 3.1. This table is a compilation of groundwater elevations collected by others over a three-year period. Groundwater elevations within the sandstone as measured as part of this investigation are shown on Figure 3.1.



GROUNDWATER ELEVATION
&
PROBABLE FLOW DIRECTION

GMC-FISHER BODY DIVISION

Figure 3.1

GROUND/WATER TECHNOLOGY, INC.

Groundwater flow directions within the sandstone are shown on Figure 3.1. A distinct mounding has occurred due to the presence of sludge and water within the basin. The resulting mounding has caused steepening of gradients and local reversals of flow directions. The overall trend of flow within the sandstone is towards the northeast. Outside of the immediate vicinity of the sludge basin, this flow direction reasserts itself. It should be noted that all of the monitoring wells lie within the area affected by the groundwater mounding of the sludge basin. As a consequence, some variations in the actual regional flow direction and gradients may be anticipated. However, the overall flow paths would remain similar to those shown in Figure 3.1.

Further evidence of groundwater mounding in the immediate vicinity of the sludge basin is found in Table 3.1. Monitoring well P-6, the well located farthest upgradient, shows seasonal fluctuations on the order of 6 feet. Additionally, monitoring well P-1, the well farthest downgradient, shows seasonal fluctuations on the order of 5 feet. However, monitoring wells P-2 and P-5 show groundwater elevation fluctuations of 15 feet and 13 feet, respectively, over the life of the wells. As these wells are much closer to the sludge basins, the wells are impacted upon to a greater degree by activities within those basins. It is therefore anticipated that seasonal fluctuations in the groundwater elevation of the Berea sandstone are on the order of 5 feet. Greater variations within the monitoring wells

are reflection of changes in the rate of artificial recharge to this sandstone aquifer.

Groundwater flow occurs under a hydraulic gradient that is related to the change in potential energy between two points. The potential at any point within the sandstone aquifer is related to the elevation of the groundwater within a monitoring well at that point. Consequently, the groundwater flow is in the direction of the lower groundwater elevations. At the Elyria facility, the general groundwater flow direction is towards the northeast under a hydraulic gradient on the order of 0.003 feet per feet.

The rate of groundwater flow is dependent upon the hydraulic gradient accross the site and the hydraulic conductivity of the Berea sandstone. The hydraulic conductivity of the sandstone is a reflection of the ability of the media to transmit water through it under a constant hydraulic gradient of one foot per foot. Hydraulic conductivities for the sandstone have been calculated on the basis of the constant head and falling head permeability tests conducted as part of this investigation. A summary of these test results is shown on Table 3.2. The calculated horizontal hydraulic conductivity of the sandstone is 7×10^{-4} centimeters per second (14 gallons per day per square foot). This hydraulic conductivity is relatively high for a sandstone aquifer.

TABLE 3.2

PERMEABILITY TEST RESULTS

P-2	K= 2.65 x 10^{-4} cm/sec.
P-3	K= 6.25 x 10^{-4} cm/sec.
P-5	K= 12.5 x 10^{-4} cm/sec.
P-6	K= 3.1 x 10^{-4} cm/sec.
P-2C	K= 8.9 x 10^{-4} cm/sec.

NOTE: P-2C Constant head test result.

General Motors Corp.

Fisher Body Division
Elyria, Ohio

Under the conditions of the relatively low hydraulic gradient anticipated at this site, the linear velocity of groundwater within the sandstone would be on the order of 5 to 15 feet per year to the northeast.

3.3 GROUNDWATER QUALITY

Results of chemical analyses are presented as Appendix C attached. These results are summarized in Tables 3.3 and 3.4.

Concentrations of groundwater indicators shown in Table 3.4 have demonstrated a significant increase in comparison to historic sampling events. Specifically, concentration increases in chlorides, copper, iron, nickel, sodium and zinc. Consequently, it appears that concentrations of metals within the groundwater near the sludge lagoons is increasing.

Concentrations of indicators in the groundwater at the site generally approach or slightly exceed drinking water standards. These include chloride, sulfate, chromium, manganese and phenols. However, it should be noted that all of these constituents remain well below the RCRA guidelines for groundwater contamination. The one exception to this rule is iron. Iron concentrations in groundwater from wells P-2 and P-6 exceed these RCRA guidelines. Moreover, levels of iron in the remaining monitoring wells are also high.

TABLE 3.3

ANALYTICAL SUMMARY
Fisher Body Plant, Elyria, Ohio

Well #	pH	Specific Conductance (µS)	Total Volatiles (PPB)
P-1	6.9	1625	ND
P-2	7.3	1100	ND
P-3	7.2	1500	ND
P-5	7.0	1525	646
P-6	7.1	1050	ND
underdrain	7.1	1850	ND

NOTES:
The water samples were collected on Oct. 18,1984.
ND= none detected

TABLE 3.4

RESULTS OF DETERMINATION OF CONCENTRATION OF INDICATORS OF GROUND-WATER QUALITY IN AQUEOUS SAMPLES RECEIVED FROM GROUND/WATER TECHNOLOGY 19 OCTOBER 1984

Parameter	Unit	P1	P2	P3	P5	P6	Under-Drain	Field Blank
Chloride	mg/l	80.9	44.8	52.8	137	7.1	259	<0.1
Sulfate	mg/l	91	195	408	248	97	456	<2
Hexavalent Chromium	mg/l	0.012	0.009	<0.002	0.004	0.008	0.010	<0.002
Trivalent Chromium	mg/l	0.020	0.058	0.026	0.052	0.052	0.370	--
Copper	mg/l	0.062	0.044	0.017	0.542	0.072	0.309	<0.001
Iron	mg/l	28	56	12	14	42	25	<0.05
Manganese	mg/l	0.448	1.00	0.025	0.018	1.70	0.043	0.004
Nickel	mg/l	0.027	0.078	0.392	0.078	0.121	1.41	<0.001
Sodium	mg/l	51.2	80.7	53.8	61.1	8.78	171	0.1
Zinc	mg/l	0.185	0.219	0.128	1.32	0.538	0.262	<0.005
Total Organic Carbon	mg/l	11.6	7.0	6.6	7.3	11.5	44.9	<0.3
Phenols	mg/l	<0.01	0.02	0.03	0.02	0.03	0.54	0.01
Total Organic Halogen	mg/l	0.10	0.06	0.11	2.98	0.07	0.21	<0.03
EA Number		7635	7636	7637	7638	7639	7640	7641

Table 3.5 is a summary of constituent concentrations within the sludge of the settling basins. As can be seen in this table, extremely high levels of chromium, copper, iron, nickel and zinc, as well as total organic carbon, found in the sludge are not reflected in the groundwater of the wells surrounding the basin.

Chemical analysis for volatile organic compounds shown in Table 3.3 were performed on all samples. Concentrations of volatile compounds were below detection limits in all samples with the exception of groundwater from well P-5. A total of 650 ppb volatile compounds were identified in the sample. These compounds were primarily trans-1,2-dichloroethene and trichloroethene. The presence of volatile compounds in this sample exclusively and the location of well P-5 near railway tracks and in an area of past disposal, suggests that the volatile compounds may have a source other than the sludge lagoons.

To reach the Berea sandstone the sludge leachate must migrate downward through either overlying shale or a clay-rich till deposit over much of the area of the lagoons. The high clay content of these deposits will result in the absorption of metal compounds. Chloride, sulfate and sodium compounds are not easily absorbed onto clay particles. Consequently, these constituents tend to be much more conservative in nature and are commonly used as tracers or indicators of groundwater contamination.

TABLE 3.5

LAGOON SLUDGE ANALYSIS
Fisher Body Plant

ELEMENT	AVERAGE CONCENTRATION (PPM)	RANGE (PPM)
Al	3500	*
As	1.6	0.8-2.2
Ba	200	52-300
Cd	2.0	0.5-2.5
Cr	12000	8500-62000
Cr^{+6}	2.0	0.8-12
CN (total)	2.5	1.0-12.0
Fe	2200	1000-4400
Pb	90	27-270
Mg	3200	*
Mn	42	*
Hg	0.1	<0.1-0.5
Ni	4500	2500-8000
PCB	<1.0	<1.0
Phenol	<10.0	<10-10
Se	0.8	0.25-1.3
Ag	2.0	0.9-3.4
Zn	1500	1200-1800
TOC	13000	9000-18000
Oil and Grease	9000	6000-10000
% Solids		10%-30%
pH	10	8-11

Not ignitable
Non-corrosive
Not reactive

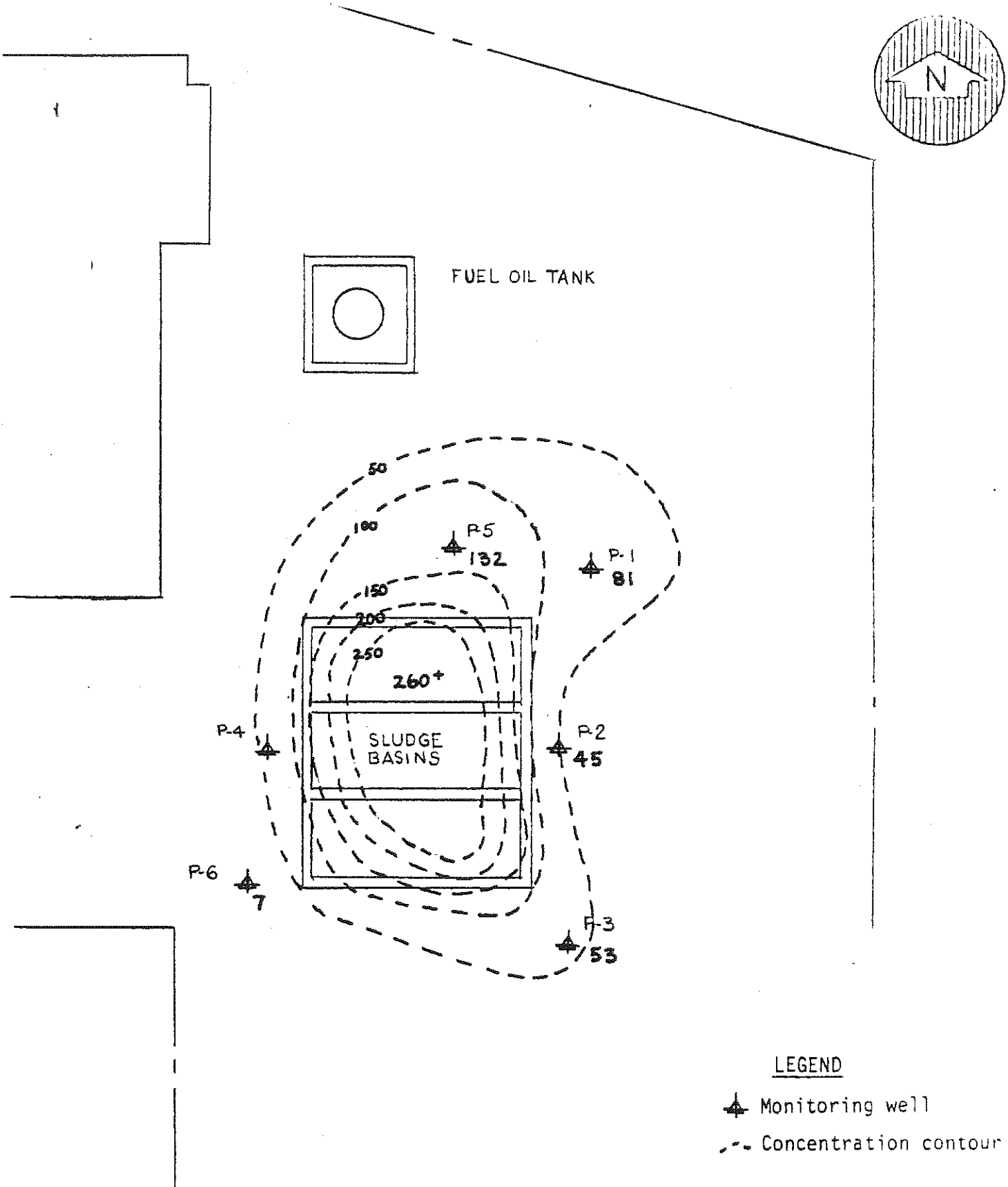
* only one test performed, no range

Figure 3.2 is a plot of chloride concentrations taken from the latest sampling results. While these concentrations are very low, generally well within drinking water standards, they do indicate the general directions of groundwater movement. As may be seen in this figure, there is a general trend to the north and east away from the sludge lagoons. Lowest concentrations are found in the upgradient well P-6.

As calculated in the previous section, the linear groundwater velocity through the Berea sandstone in this region is on the order of 5 to 15 feet per year to the northeast. This figure would represent the rate migration of a non-reactive, conservative chemical constituent. Such an estimate would be extremely conservative in that it would discount the effects of advection, dispersion and absorption upon the rate of migration. The mounding effect caused by the sludge lagoons likely results in some dispersion of chemical constituents over a wider front. However, it is likely that the regional groundwater flow will quickly reassert itself and result in any movement of chemical constituents within the groundwater in a northeasterly direction.

4.0 SUMMARY AND CONCLUSIONS

Ground/Water Technology has undertaken a permeability testing and groundwater sampling program of existing monitoring wells at the



CHLORIDE CONCENTRATIONS IN PPM (as of 10/17/84)

GMC-FISHER BODY DIVISION

Figure 3.2

GROUND/WATER TECHNOLOGY, INC.

Elyria facility of GMC Fisher Body Division. A total of six water samples were collected for analyses and permeability tests conducted on four wells.

The sludge lagoons at the Elyria facility are situated upon unconsolidated deposits of soft till to the maximum depth of 12 feet. This material overlies weathered bedrock which becomes more competent with depth. Bedrock consists of sandstone and interbedded shale deposits.

Groundwater within the monitoring wells occurs at a depth of approximately 8 to 11 feet below ground surface. The general groundwater flow direction within the Berea sandstone is to the northeast. However, the presence of the sludge settling lagoons has resulted in groundwater mounding beneath them. Based upon the information available, it appears that groundwater from beneath the ponds flows radially in all directions before the regional flow direction quickly reasserts itself.

Hydraulic conductivities within the sandstone have been calculated to be on the order of 7×10^{-4} centimeters per second (14 gallons per day per square foot). This results in a linear flow velocity in the groundwater of 5 to 15 feet per year. Consequently, the resident time of groundwater beneath the ponds is relatively long.

Analytical results of the October 1984 round of sampling

indicates that concentrations of relevant metals in the groundwater have increased signicantly in comparison to historical sampling results. However, in absolute terms these concentrations remain relatively low. For the most part, on the order of the current drinking water standards, the most notable exception to date is iron. Concentrations of iron within the samples were from 12 to 56 ppm, thereby exceeding RCRA guidelines for groundwater contamination.

Analysis of spacial distribution of chloride concentrations indicate that there is a trend towards increasing concentrations to the north and east of the lagoons. This result is consistent with the anticipated regional groundwater flow direction. However, it should be noted that the absolute concentrations remain very low. While these trends are also evident with sulfate and sodium constituents, no pattern emerges for the spacial distribution of metal concentrations. This is likely due to the effects of sorption by clay particles in the subsurface, variable flow directions due to mounding and variations within the lagoons themselves.

The specific purpose of the groundwater assessment program was to determine, under Rule 3745-65-93 (A):

1. Whether hazardous waste or hazardous waste constituents have entered the groundwater.

Results of this investigation indicate that increased concentrations of priority pollutant metals have occurred due to the presence of the sludge lagoons. Additionally, 650 ppb of total volatile organic compounds were reported in the sample of monitoring well P-5. It is, however, not known if these volatile organics have a source in the sludge lagoon or are a result of other past disposal practices.

Relative concentrations of hazardous waste constituents within the groundwater in the immediate vicinity of the sludge lagoons remain low. One exception to this rule being the concentrations of iron within the groundwater of the Berea sandstone.

2. The rate and extent of migration of hazardous waste or hazardous waste constituents in the groundwater.

An assessment of the local hydrogeology indicates that the groundwater in the area has a linear velocity on the order of 5 to 15 feet per year to the northeast. This figure would represent the most conservative estimate of the rate of migration of hazardous waste or hazardous waste constituents in the groundwater. At this rate of migration, such hazardous waste constituents would remain within 300 feet of the sludge lagoons.

3. The concentration of hazardous waste or hazardous waste constituents in the groundwater.

The concentration of hazardous waste constituents are shown in the analytical report found in Appendix C. The most significant concentrations are at the levels of iron within the groundwater of the monitoring wells.

APPENDIX A

E C R A

Sampling and Sample Handling

QUALITY ASSURANCE

It will be the responsibility of the project director to (a) coordinate his sampling, preservation, and shipment with the laboratory, (b) obtain clean sample containers from the laboratory, (c) provide adequate sample identification and compositing instructions, and (d) provide duplicates and blanks as required by the laboratory. Additional prearrangements will be made with the laboratory if sample splitting is desired, to create separate supernatant and settleable matter samples, or if calculations on a wet-weight basis in addition to the standard dry-weight calculations are desired.

Bottles and caps will be supplied by the laboratory. New and recycled bottles will be washed as described in Glassware Cleaning Requirements.

Sampling for purgeable organics requires special consideration and equipment. The sample container should consist of a 45-ml, screw-cap vial fitted with a Teflon faced, silicone septum. The vials, septa, and caps should be washed in hot detergent water and thoroughly rinsed with tapwater and organic-free water, then dried at 105° C for one hour. The vials should then be cooled to room temperature in a contaminant-free area. When cool, the vials should be sealed with the septa, Teflon (du Pont) side down, and screw cap and maintained in this sealed condition until filled with sample.

The bottles used for collecting water samples for solvent extraction should not be overfilled or prerinsed with sample before filling because oil and other material that can cause erroneously high results may remain in the sample bottle after rinsing. Bottles should be filled with sample to about 90 percent of capacity, and the level should be marked to determine if leakage occurs. Because full sample bottles are difficult to pour from during extractions, complete filling should be avoided. In the collection of sediment samples, non representative debris, such as large stones or wood should be discarded.

Multiple samples are required for purgeable organics analysis because of leakage and because the measurement process is destructive to the sample. All vials should be identified with waterproof labels. The water sample vials are filled to overflowing from a bubble-free source so that a convex meniscus is formed at the top. They are sealed by carefully placing the

septum, Teflon side down, on the opening of the vial and screwing the cap firmly in place.

Shipment and receipt of samples must be coordinated with the laboratory to minimize time in transit because it is the prerogative of the laboratory to reject samples where delays in shipment have caused them to age beyond acceptable holding times. All samples for organic analysis should arrive at the laboratory on the same day collected, or should be shipped and maintained at less than 4° C for arrival by the next day. The samples are shipped in insulated ice chests.

Upon receipt, the samples should be checked for adequate identification, sample temperature or presence of ice in the chest, and leakage. Samples for volatile organics should be checked for air bubbles. The samples are logged in with the receipt time noted. Unless the condition of the samples fails to meet the criteria for acceptance by the laboratory, required preservatives are added immediately and the samples are all refrigerated.

A master flowsheet should be prepared for each sample, listing parameters to be determined and pretreatment operations to be performed. The master flowsheet is kept at a fixed location and is designed to handle dated entries indicating when operations are completed. Methods requiring extraction permit double entry on the master flowsheet so laboratory throughput times can be calculated in terms of receipt-to-extraction and receipt-to-completion times. A separate set of forms follows the sample through the laboratory. Each sample form records information for a class of parameters and details cleanup operations and other method options. Calculations and cross references to chromotograph files are entered on the sample form also.

The chain-of-custody program begins when the laboratory dispatches the sample collectors. Each time a sample is collected, a form is initiated stating where and when the sample was collected, with cross reference to a number on the sample container. The sample collectors return to the laboratory with the samples in their guarded possession and deliver them personally to the responsible person in the laboratory. The person (custodian) receiving the samples in turn signs each ledger to acknowledge receipt and locks the sample in a refrigerator. The analyst then comes to the custodian and signs for the sample that he is taking for analysis. In this way, full documentation of the sample handling is maintained from sample collection throuh completion of the analysis.

SOIL SAMPLES

Soil samples which require compositing will be treated as follows:

Each discrete sample will be logged in with an individual laboratory number and chain-of-custody form, which will accompany the sample.

Soil samples will be thoroughly mixed an any extraneous matter such as twigs, pebbles, and other unrepresentative material, will be removed from the sample.

The composite will be formed by weighing equal amounts of each discrete sample, combining them, and then thoroughly mixing. The individual samples will be weighed out "non desiccated", (with the moisture content in the sample being the same as it was when received).

The composite of the soil sample will then be dried overnight with magnesum sulfate. After drying they will be extracted, with a soxhlet extraction procedure, for both acid fraction and base neutral determination by GC, GC/MS.

Soil samples, which require volatile organic determination, will be combined in the described manner but will not be desiccated. After the discrete samples have been combined, a volatile organic headspace analysis for priority pollutants will be performed by GC, GC/MS.

Duplicate analyses will be performed on 10% of the samples. Spiked sample analyses will be performed on 10% of the samples for all analytical procedures with the exception of volatile organic headspace analysis on soil. There is no practical means to perform a spike analysis on soil samples, which are processed for volatile organic headspace analysis.

All spike and duplicate analytical data must fall within the control limits of the laboratories "SHEWHART", quality assurance data charts.

All results for soil samples will be reported on a dry weight basis.

GLASSWARE AND CLEANING REQUIREMENTS

Glassware to be used in the determination of trace organic constituents in water, such as chlorinated pesticides, should be as free as possible of organic contaminants. A chromic acid wash of at least 15 minutes is necessary to destroy these organic residues. Rinse thoroughly with tap water and, finally, with distilled water. Glassware may be dried for immediate use by rinsing with redistilled acetone. Othrerwise glassware may be oven dried or drip dried. Glassware should be stored immediately after drying to prevent any accumulation of dust.

Bottles to be used for the collection of samples for organic analyses will be rinsed successively with chromic acid cleaning solution, tap water, distilled water, and, finally, several times with a redistilled solvent such as acetone, hexane, petroleum ether, or chloroform. Caps are washed with detergent, rinsed with tap water, and solvent. Liners are treated in the same way as the bottles and are stored in a sealed container.

PETROLEUM HYDROCARBON ANALYSIS

To achieve the levels of detection required by the NJDEP, EA Engineering has utilized specialized analytical technqiues. A detection limit of one part per million cannot efficiently be achieved using the standard infrared techniques for petroleum hydrocarbons. Instead, a method employing the use of the mass spectograph has been developed.

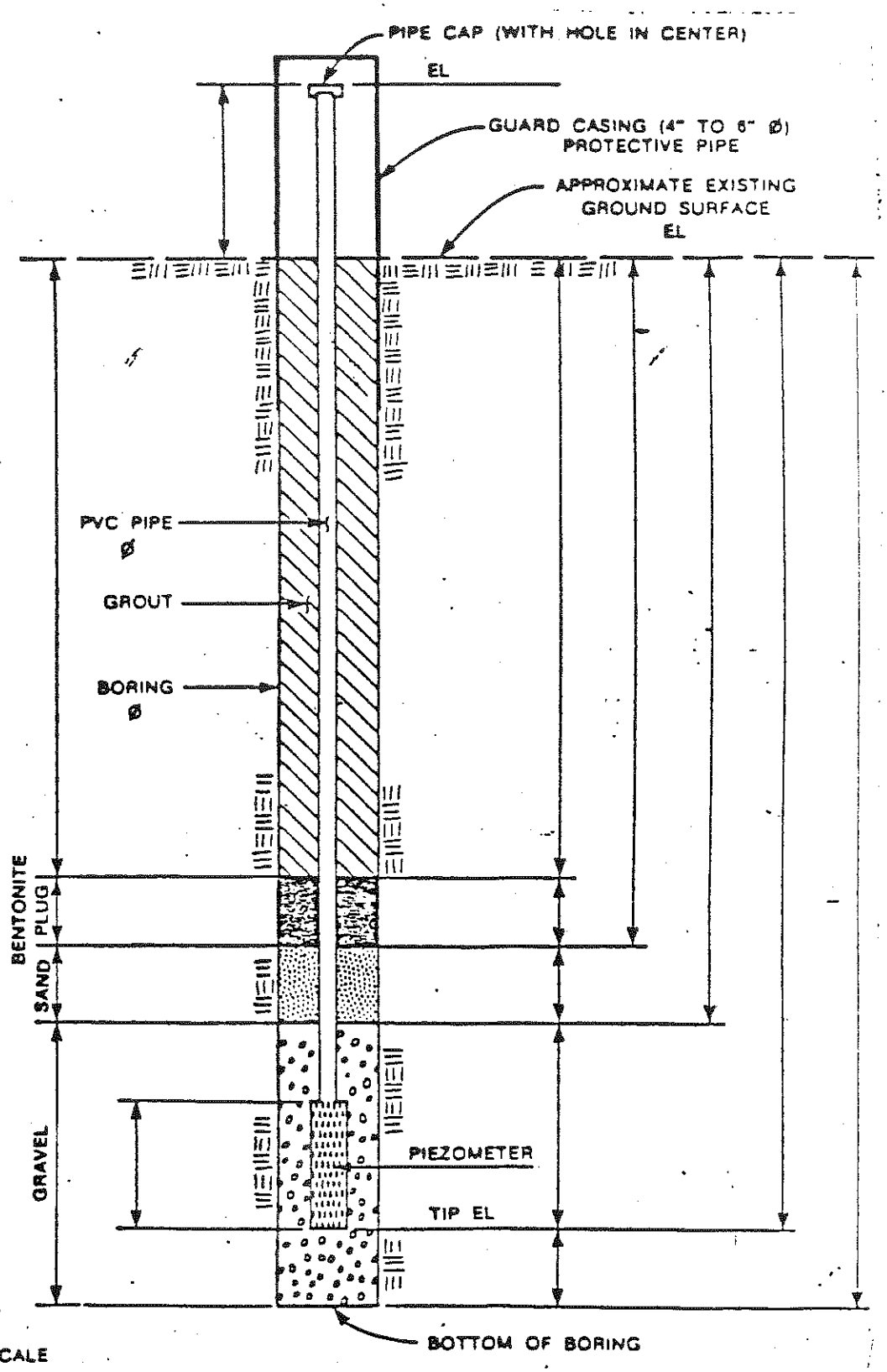
Specifically, all samples are spiked with 2-fluorobiphenol prior to extraction to ensure accurate results. A twenty gram sample of the soil is then taken and mixed with an equal amount of anhydrous sodium sulphate. This mixture is extracted with three portions of methylene chloride. The resulting mixture is then extracted by a filter column of sodium sulphate and evaporated to 2.0 milliliters using a K.D. set up.

The sample material is injected onto the mass spectograph. The Carbon-10 to Carbon-12 strings are analyzed and compared to a standard derived from No. 2 fuel oil. This process evaluates presence and quantities of aliphantic hydrocarbons.

APPENDX B

SOIL BORING LOGS

Boring Number	Interval (ft)	Description
P-1	0-3	Gray brown silty clay
	3-10	Light brown silty sand and gravel
	10-12	Weathered redish brown sandstone
	12-19	Very hard find grained greenish gray sandstone, very thin shale interbeds
	19-29	Gray shale
P-2	0-8	Brown silty clay trace sand
	8-11	Gray silty clay trace sand
	11-13.5	Gray shale sandy interbeds
	13.5-22	Sandstone, medium fine gravel, thin shale interbeds
	22-23	Gray shale, some silt
P-5	0-3	Brown silty clay, trace sand
	8-23	Weathered light gray sandstone
	23-29	Light gray sandstone, medium fine grain
P-6	0-10	Brown silty clay, trace sand
UP GRAD.	10-15	Weathered light gray sandstone
WELL	15-18.5	Weathered red shale



NOTE: FIGURE NOT TO SCALE

FIGURE 2c

IDEALIZED PIEZOMETER PROFILE

FILE NO. _____
PAGE 1 OF 2

CDM

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fisher Body (GM)
PROJECT NO. 1211
BORING NO. P-1
PIEZOMETER NO. P-1

FIELD ENG/GEO Ross Overby DATE 5/14/81
CHECKED BY Ross Overby DATE 5/14/81
COORDINATES _____
DATE OF INSTALLATION 5/14/81

BOREHOLE DRILLING

DRILLING METHOD Auger/Rotary
DRILLING FLUID(S) USED.
FLUID Water FROM _____ TO _____
FLUID _____ FROM _____ TO _____

TYPE OF BIT Roller/ Tricone
CASING SIZE(S) USED: None
SIZE _____ FROM _____ TO _____
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE PVC
DIAMETER OF PERFORATED SECTION 2" ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS _____
TOTAL PERFORATED AREA _____

RISER PIPE MATERIAL PVC
RISER PIPE DIAMETERS 2" ID
O.D. _____ I.D. _____
LENGTH OF PIPE SECTIONS _____
JOINING METHOD GLUE ASTM 2564

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 3'
PROTECTIVE PIPE O.D _____

OTHER PROTECTION _____

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (ft)	
TOP OF RISER PIPE	1.1		105.9	
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE				
BOREHOLE FILL MATERIALS	TOP 0	BOTTOM 13	TOP 104.8	BOTTOM 91.8
GROUT/SLURRY	TOP 0	BOTTOM 13	TOP 104.8	BOTTOM 91.8
BENTONITE	TOP 13	BOTTOM 14	TOP 91.8	BOTTOM 90.8
SAND	TOP 14	BOTTOM 20	TOP 90.8	BOTTOM 84.8
GRAVEL	TOP 15	BOTTOM 20	TOP 89.8	BOTTOM 84.8
PERFORATED SECTION	20		84.8	
PIEZOMETER TIP				
BOTTOM OF BOREHOLE	10.5		95.4	
GWL AFTER INSTALLATION				

WAS THE HOLE FLUSHED BEFORE INSTALLATION? YES ☒ NO ☐
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☒ NO ☐
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS _____

FILE NO. _____
PAGE 1 OF 2

CDM.

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fisher Body (GM) FIELD ENG/GEO Ross Overby DATE 5/15/81
PROJECT NO. 1211 CHECKED BY Ross Overby DATE 5/15/81
BORING NO. P-2 COORDINATES _____
PIEZOMETER NO. P-2 DATE OF INSTALLATION 5/15/81

BOREHOLE DRILLING

DRILLING METHOD Rotary/Auger
DRILLING FLUID(S) USED. Water
FLUID _____ FROM _____ TO _____
FLUID _____ FROM _____ TO _____

TYPE OF BIT Roller/Tricone
CASING SIZE(S) USED.
SIZE _____ FROM _____ TO _____
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE PVC
DIAMETER OF PERFORATED SECTION 2" ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS _____
TOTAL PERFORATED AREA _____

RISER PIPE MATERIAL PVC
RISER PIPE DIAMETERS 2" ID
O.D. _____ I.D. _____
LENGTH OF PIPE SECTIONS _____
JOINING METHOD Glue ASTM 2564

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 3'
PROTECTIVE PIPE O.D. _____

OTHER PROTECTION _____

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (ft)	
TOP OF RISER PIPE	1.8		105.0	
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE				
BOREHOLE FILL MATERIALS				
GROUT/SLURRY	TOP 0	BOTTOM 14	TOP 103.2	BOTTOM 89.2
BENTONITE	TOP 0	BOTTOM 14	TOP 103.2	BOTTOM 89.2
SAND	TOP 14	BOTTOM 15	TOP 89.2	BOTTOM 88.2
GRAVEL	TOP 15	BOTTOM 22	TOP 88.2	BOTTOM 81.2
PERFORATED SECTION	TOP 17	BOTTOM 22	TOP 86.2	BOTTOM 81.2
PIEZOMETER TIP	22		81.2	
BOTTOM OF BOREHOLE				
GWL AFTER INSTALLATION	4.0		101.0	

WAS THE HOLE FLUSHED BEFORE INSTALLATION? YES ☒ NO ☐
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☒ NO ☐
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS _____

FILE NO. _____
PAGE 1 OF 2

CDM

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fisher Body (GM) FIELD ENG/GEO Ross Overby DATE 7-28-81
PROJECT NO. 1211 CHECKED BY Ross Overby DATE 7-28-81
BORING NO. P-5 COORDINATES _____
PIEZOMETER NO. P-5 DATE OF INSTALLATION 7-28-81

BOREHOLE DRILLING

DRILLING METHOD Auger/Rotary
DRILLING FLUID(S) USED.
FLUID Water FROM _____ TO _____
FLUID _____ FROM _____ TO _____

TYPE OF BIT Roller/Tricone
CASING SIZE(S) USED:
SIZE _____ FROM _____ TO _____
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE PVC
DIAMETER OF PERFORATED SECTION 4" OD
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS _____
TOTAL PERFORATED AREA _____

RISER PIPE MATERIAL PVC
RISER PIPE DIAMETERS 4" OD
O.D. _____ I.D. _____
LENGTH OF PIPE SECTIONS _____
JOINING METHOD GLUE ASTM 2564

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 3'
PROTECTIVE PIPE O.D _____

OTHER PROTECTION _____

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	1.4		108.3	
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE				
BOREHOLE FILL MATERIALS				
GROUT/SLURRY	TOP 0	BOTTOM 18	TOP 106.9	BOTTOM 90.3
BENTONITE	TOP 18	BOTTOM 21	TOP 90.3	BOTTOM 87.3
SAND	TOP 21	BOTTOM 23	TOP 87.3	BOTTOM 85.3
GRAVEL	TOP 23	BOTTOM 29	TOP 85.3	BOTTOM 79.3
PERFORATED SECTION	TOP 24	BOTTOM 29	TOP 84.3	BOTTOM 79.3
PIEZOMETER TIP	29'		79.3	
BOTTOM OF BOREHOLE				
GWL AFTER INSTALLATION	9.2'		99.1	

WAS THE HOLE FLUSHED BEFORE INSTALLATION? YES ☒ NO ☐
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☒ NO ☐
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS _____

FILE NO _____
PAGE 1 OF 2

CDM

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fisher Body (GM) FIELD ENG/GEO Ross Overby DATE 7-29-81
PROJECT NO. 1211 CHECKED BY Ross Overby DATE 7-29-81
BORING NO. P-6 COORDINATES _____
PIEZOMETER NO. P-6 DATE OF INSTALLATION 7-29-81

BOREHOLE DRILLING

DRILLING METHOD Auger
DRILLING FLUID(S) USED.
FLUID _____ FROM _____ TO _____
FLUID _____ FROM _____ TO _____

TYPE OF BIT Auger
CASING SIZE(S) USED:
SIZE _____ FROM _____ TO _____
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE PVC
DIAMETER OF PERFORATED SECTION 4" OD
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS _____
TOTAL PERFORATED AREA _____

RISER PIPE MATERIAL PVC
RISER PIPE DIAMETERS. 4" OD
O.D. _____ I.D. _____
LENGTH OF PIPE SECTIONS _____
JOINING METHOD GLUE ASTM 2564

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 3'
PROTECTIVE PIPE O.D. _____

OTHER PROTECTION _____

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (ft)	
TOP OF RISER PIPE	1.5		109.9	
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE				
BOREHOLE FILL MATERIALS				
GROUT/SLURRY	TOP 0	BOTTOM 7	TOP 109.9	BOTTOM 102.9
BENTONITE	TOP 7	BOTTOM 8	TOP 102.9	BOTTOM 101.9
SAND	TOP 8	BOTTOM 10	TOP 101.9	BOTTOM 99.9
GRAVEL	TOP 10	BOTTOM 15	TOP 99.9	BOTTOM 94.9
PERFORATED SECTION	TOP 10	BOTTOM 15	TOP 99.9	BOTTOM 94.9
PIEZOMETER TIP	15		94.9	
BOTTOM OF BOREHOLE				
GWL AFTER INSTALLATION	9.0		100.9	

WAS THE HOLE FLUSHED BEFORE INSTALLATION? YES [ ] NO [X]
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]

REMARKS _____

APPENDIX C

RESULTS OF ANALYSIS OF AQUEOUS SAMPLES
FROM ELYRIA, OHIO PROJECT
COLLECTED 17 & 18 OCTOBER 1984
RECEIVED 19 OCTOBER 1984

Prepared for

Ground/Water Technology, Inc.
100 Ford Road
Denville, New Jersey 07834

Prepared by

EA Engineering, Science, and Technology, Inc.
Hunt Valley/Loveton Center
15 Loveton Circle
Sparks, Maryland 21152

NOVEMBER 1984

ANALYTICAL SUMMARY

Six aqueous samples were collected by Ground/Water Technology, Inc. personnel 17 and 18 October 1984 from a location in Elyria, Ohio. These samples were received at EA's Sparks, Maryland facility on 19 October 1984. After visual examination of the containers, the samples were checked against the Chain of Custody, logged into the laboratory system and given individual EA laboratory accession numbers. These samples were to be analyzed for purgeable organic compounds, trace metals, and various indicators of ground-water quality.

The metals analyses were performed by atomic absorption spectrophotometry (AAS). Both Perkin-Elmer 5000 and 503 AA spectrophotometers equipped with autosamplers and graphite furnaces were utilized. The results of these determinations are presented in Table 1.

The concentrations of purgeable organics in the samples were determined utilizing an automated Tekmar LSC-2 purge and trap concentrator interfaced to a Hewlett-Packard 5985B gas chromatograph/mass spectrometer (GC/MS) according to U.S. EPA Method 624. The operating and purge parameters are listed in Table 2.

All analyses were performed under strict quality control as specified in EA's analytical quality control program. All parametric holding times were met in this analytical effort.

Included in this report are the reconstructed ion chromatograms (RIC) of the samples, blanks and standards, tuning spectra, Chain of Custody Record and the Report/Analysis Review form.

TABLE 2. HEWLETT-PACKARD MODEL 5985B GAS CHROMATOGRAPH/MASS SPECTROMETER OPERATING CONDITIONS - VOLATILES

COLUMN	6′ X 2 mm I.D. 1% SP-1000 ON 60/80 MESH CARBOPACK B
CARRIER GAS FLOW	HELIUM-22 ml/min
INJECTION PORT TEMPERATURE	180 C
SOURCE TEMPERATURE	200 C
INITIAL OVEN TEMPERATURE	45 C (2 min)
TEMPERATURE RATE	8 C/min
FINAL OVEN TEMPERATURE	220 C
TYPE OF IONIZATION	ELECTRON IMPACT
ELECTRON ENERGY	70 volts
SCAN TIME	2 seconds
EM VOLTAGE	1800 volts
PURGE TIME	11 min
DESORPTION TIME	5 min
DESORPTION TEMPERATURE	180 C
TRAP SORBENT	TENAX, SILICA GEL, CHARCOAL

EA ENGINEERING, SCIENCE AND TECHNOLOGY, INC.
LABORATORY RESULTS
PURGEABLE HALOCARBONS**EPA METHOD 624

Sample Identification: Ground/Water Tech. - P-1
Laboratory Number: 7635
Date Collected: 17 October 1984
Date Analyzed: 23 October 1984

Volatile Compounds		ppb (ug/l)
Carbon tetrachloride	Less than	2
Chlorobenzene	Less than	2
1,2-Dichloroethane	Less than	2
1,1,1-Trichloroethane	Less than	2
1,1-Dichloroethane	Less than	2
1,1,2-Trichloroethane	Less than	2
1,1,2,2-Tetrachloroethane ..	Less than	2
Chloroethane	Less than	2
2-Chloroethylvinyl ether ...	Less than	10
Chloroform	Less than	2
1,1-Dichloroethene	Less than	2
trans-1,2-Dichloroethene ...	Less than	2
1,2-Dichloropropane	Less than	2
1,3-Dichloropropene	Less than	2
Methylene chloride	Less than	10
Chloromethane	Less than	2
Bromomethane	Less than	2
Bromoform	Less than	2
Bromodichloromethane	Less than	2
Fluorotrichloromethane	Less than	2
Dichlorodifluoromethane	Less than	2
Chlorodibromomethane	Less than	2
Tetrachloroethene	Less than	2
Trichloroethene.....	Less than	2
Vinyl chloride.....	Less than	2

SPIKE RECOVERY DATA
(40 ppb added to each sample prior to analysis)

D6-benzene	37.8 ppb	94.5 % recovery
Fluorobenzene	38.7 ppb	96.8 % recovery
Pentafluorobenzene	38.9 ppb	97.3 % recovery

EA ENGINEERING, SCIENCE AND TECHNOLOGY, INC.
LABORATORY RESULTS
PURGEABLE HALOCARBONS**EPA METHOD 624

Sample Identification: Ground/Water Tech. - P-2
Laboratory Number: 7636
Date Collected: 17 October 1984
Date Analyzed: 23 October 1984

Volatile Compounds		ppb (ug/l)
Carbon tetrachloride	Less than	2
Chlorobenzene	Less than	2
1,2-Dichloroethane	Less than	2
1,1,1-Trichloroethane	Less than	2
1,1-Dichloroethane	Less than	2
1,1,2-Trichloroethane	Less than	2
1,1,2,2-Tetrachloroethane ..	Less than	2
Chloroethane	Less than	2
2-Chloroethylvinyl ether ...	Less than	10
Chloroform	Less than	2
1,1-Dichloroethene	Less than	2
trans-1,2-Dichloroethene ...	Less than	2
1,2-Dichloropropane	Less than	2
1,3-Dichloropropene	Less than	2
Methylene chloride	Less than	10
Chloromethane	Less than	2
Bromomethane	Less than	2
Bromoform	Less than	2
Bromodichloromethane	Less than	2
Fluorotrichloromethane	Less than	2
Dichlorodifluoromethane	Less than	2
Chlorodibromomethane	Less than	2
Tetrachloroethene	Less than	2
Trichloroethene.....	Less than	2
Vinyl chloride.....	Less than	2

SPIKE RECOVERY DATA
(40 ppb added to each sample prior to analysis)

D6-benzene	37.3 ppb	93.3 % recovery
Fluorobenzene	38.6 ppb	96.5 % recovery
Pentafluorobenzene	38.3 ppb	95.8 % recovery

EA ENGINEERING, SCIENCE AND TECHNOLOGY, INC.
LABORATORY RESULTS
PURGEABLE HALOCARBONS**EPA METHOD 624

Sample Identification: Ground/Water Tech. - P-3
Laboratory Number: 7637
Date Collected: 17 October 1984
Date Analyzed: 23 October 1984

Volatile Compounds		ppb (ug/l)
Carbon tetrachloride	Less than	2
Chlorobenzene	Less than	2
1,2-Dichloroethane	Less than	2
1,1,1-Trichloroethane	Less than	2
1,1-Dichloroethane	Less than	2
1,1,2-Trichloroethane	Less than	2
1,1,2,2-Tetrachloroethane ..	Less than	2
Chloroethane	Less than	2
2-Chloroethylvinyl ether ...	Less than	10
Chloroform	Less than	2
1,1-Dichloroethene	Less than	2
trans-1,2-Dichloroethene ...	Less than	2
1,2-Dichloropropane	Less than	2
1,3-Dichloropropene	Less than	2
Methylene chloride	Less than	10
Chloromethane	Less than	2
Bromomethane	Less than	2
Bromoform	Less than	2
Bromodichloromethane	Less than	2
Fluorotrichloromethane	Less than	2
Dichlorodifluoromethane	Less than	2
Chlorodibromomethane	Less than	2
Tetrachloroethene	Less than	2
Trichloroethene.....	Less than	2
Vinyl chloride.....	Less than	2

SPIKE RECOVERY DATA
(40 ppb added to each sample prior to analysis)

D6-benzene	37.1 ppb	92.8 % recovery
Fluorobenzene	37.0 ppb	92.5 % recovery
Pentafluorobenzene	38.3 ppb	95.8 % recovery

EA ENGINEERING, SCIENCE AND TECHNOLOGY, INC.
LABORATORY RESULTS
PURGEABLE HALOCARBONS**EPA METHOD 624

Sample Identification: Ground/Water Tech. - P-5
Laboratory Number: 7638
Date Collected: 17 October 1984
Date Analyzed: 23 October 1984

Volatile Compounds		ppb (ug/l)
Carbon tetrachloride	Less than	2
Chlorobenzene	Less than	2
1,2-Dichloroethane	Less than	2
1,1,1-Trichloroethane	Less than	2
1,1-Dichloroethane	Less than	2
1,1,2-Trichloroethane	Less than	2
1,1,2,2-Tetrachloroethane ..	Less than	2
Chloroethane	Less than	2
2-Chloroethylvinyl ether ...	Less than	10
Chloroform	Less than	2
1,1-Dichloroethene		2
trans-1,2-Dichloroethene ...		220
1,2-Dichloropropane	Less than	2
1,3-Dichloropropene	Less than	2
Methylene chloride	Less than	10
Chloromethane	Less than	2
Bromomethane	Less than	2
Bromoform	Less than	2
Bromodichloromethane	Less than	2
Fluorotrichloromethane	Less than	2
Dichlorodifluoromethane	Less than	2
Chlorodibromomethane	Less than	2
Tetrachloroethene	Less than	2
Trichloroethene.....		370
Vinyl chloride.....		52

SPIKE RECOVERY DATA
(40 ppb added to each sample prior to analysis)

D6-benzene	39.4 ppb	98.5 % recovery
Fluorobenzene	37.4 ppb	93.5 % recovery
Pentafluorobenzene	38.6 ppb	96.5 % recovery

EA ENGINEERING, SCIENCE AND TECHNOLOGY, INC.
LABORATORY RESULTS
PURGEABLE HALOCARBONS**EPA METHOD 624

Sample Identification: Ground/Water Tech. - P-6
Laboratory Number: 7639
Date Collected: 18 October 1984
Date Analyzed: 23 October 1984

Volatile Compounds		ppb (ug/l)
Carbon tetrachloride	Less than	2
Chlorobenzene	Less than	2
1,2-Dichloroethane	Less than	2
1,1,1-Trichloroethane	Less than	2
1,1-Dichloroethane	Less than	2
1,1,2-Trichloroethane	Less than	2
1,1,2,2-Tetrachloroethane ..	Less than	2
Chloroethane	Less than	2
2-Chloroethylvinyl ether ...	Less than	10
Chloroform	Less than	2
1,1-Dichloroethene	Less than	2
trans-1,2-Dichloroethene ...	Less than	2
1,2-Dichloropropane	Less than	2
1,3-Dichloropropene	Less than	2
Methylene chloride	Less than	10
Chloromethane	Less than	2
Bromomethane	Less than	2
Bromoform	Less than	2
Bromodichloromethane	Less than	2
Fluorotrichloromethane	Less than	2
Dichlorodifluoromethane	Less than	2
Chlorodibromomethane	Less than	2
Tetrachloroethene	Less than	2
Trichloroethene.....	Less than	2
Vinyl chloride.....	Less than	2

SPIKE RECOVERY DATA
(40 ppb added to each sample prior to analysis)

D6-benzene	38.8 ppb	97.0 % recovery
Fluorobenzene	38.6 ppb	96.5 % recovery
Pentafluorobenzene	40.2 ppb	100.5 % recovery

EA ENGINEERING, SCIENCE AND TECHNOLOGY, INC.
LABORATORY RESULTS
PURGEABLE HALOCARBONS**EPA METHOD 624

Sample Identification: Ground/Water Tech. - Underdrain
Laboratory Number: 7640
Date Collected: 18 October 1984
Date Analyzed: 23 October 1984

Volatile Compounds		ppb (ug/l)
Carbon tetrachloride	Less than	2
Chlorobenzene	Less than	2
1,2-Dichloroethane	Less than	2
1,1,1-Trichloroethane	Less than	2
1,1-Dichloroethane	Less than	2
1,1,2-Trichloroethane	Less than	2
1,1,2,2-Tetrachloroethane ..	Less than	2
Chloroethane	Less than	2
2-Chloroethylvinyl ether ...	Less than	10
Chloroform	Less than	2
1,1-Dichloroethene	Less than	2
trans-1,2-Dichloroethene ...	Less than	2
1,2-Dichloropropane	Less than	2
1,3-Dichloropropene	Less than	2
Methylene chloride	Less than	10
Chloromethane	Less than	2
Bromomethane	Less than	2
Bromoform	Less than	2
Bromodichloromethane	Less than	2
Fluorotrichloromethane	Less than	2
Dichlorodifluoromethane	Less than	2
Chlorodibromomethane	Less than	2
Tetrachloroethene	Less than	2
Trichloroethene.....	Less than	2
Vinyl chloride.....	Less than	2

SPIKE RECOVERY DATA
(40 ppb added to each sample prior to analysis)

D6-benzene	37.7 ppb	94.3 % recovery
Fluorobenzene	37.7 ppb	94.3 % recovery
Pentafluorobenzene	39.7 ppb	99.3 % recovery

EA ENGINEERING, SCIENCE AND TECHNOLOGY, INC.
LABORATORY RESULTS
PURGEABLE HALOCARBONS**EPA METHOD 624

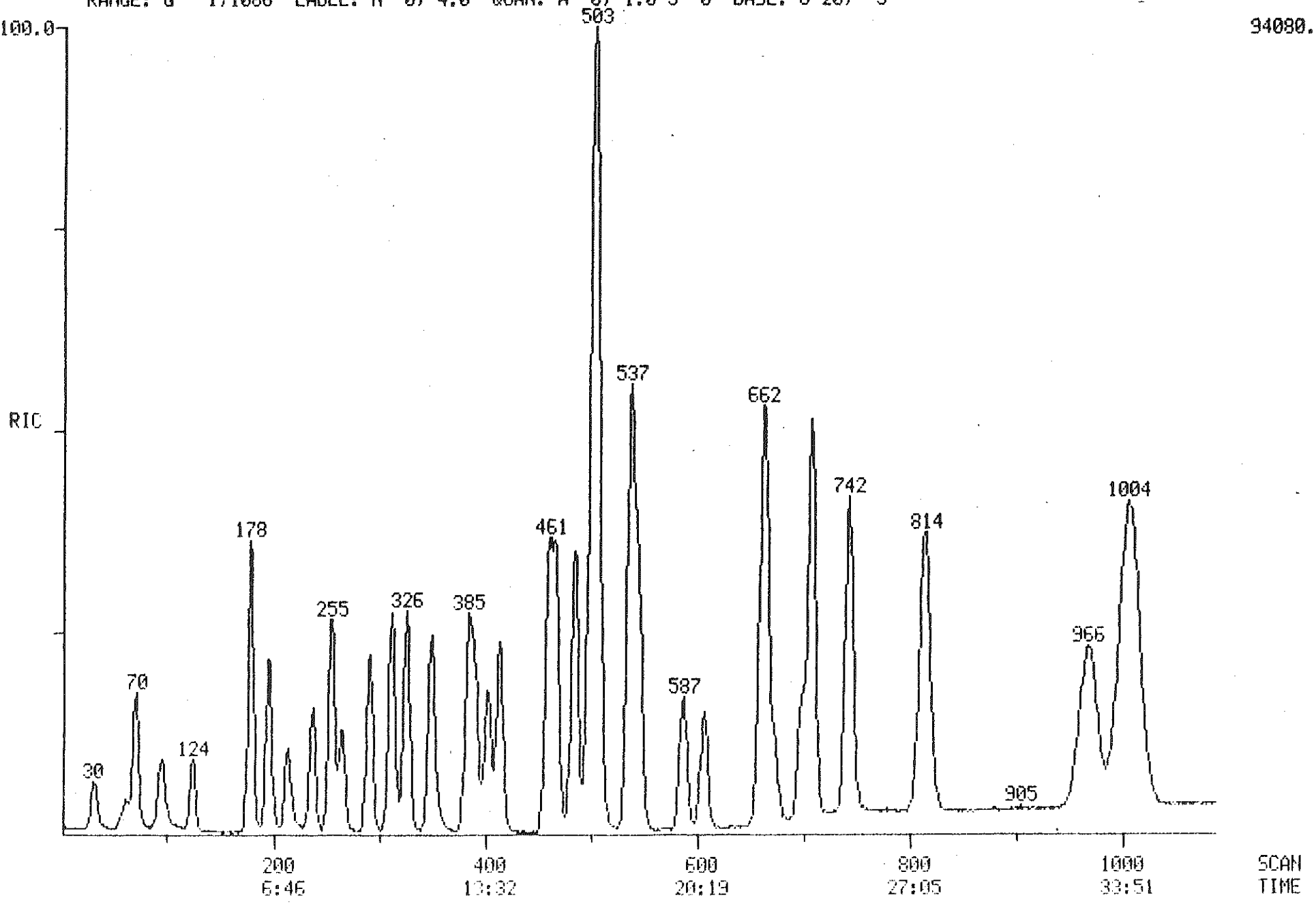
Sample Identification: Ground/Water Tech. - Field Blank
Laboratory Number: 7641
Date Collected:
Date Analyzed: 23 October 1984

Volatile Compounds		ppb (ug/l)
Carbon tetrachloride	Less than	2
Chlorobenzene	Less than	2
1,2-Dichloroethane	Less than	2
1,1,1-Trichloroethane	Less than	2
1,1-Dichloroethane	Less than	2
1,1,2-Trichloroethane	Less than	2
1,1,2,2-Tetrachloroethane ..	Less than	2
Chloroethane	Less than	2
2-Chloroethylvinyl ether ...	Less than	10
Chloroform	Less than	2
1,1-Dichloroethene	Less than	2
trans-1,2-Dichloroethene ...	Less than	2
1,2-Dichloropropane	Less than	2
1,3-Dichloropropene	Less than	2
Methylene chloride	Less than	10
Chloromethane	Less than	2
Bromomethane	Less than	2
Bromoform	Less than	2
Bromodichloromethane	Less than	2
Fluorotrichloromethane	Less than	2
Dichlorodifluoromethane	Less than	2
Chlorodibromomethane	Less than	2
Tetrachloroethene	Less than	2
Trichloroethene.....	Less than	2
Vinyl chloride.....	Less than	2

SPIKE RECOVERY DATA
(40 ppb added to each sample prior to analysis)

D6-benzene	38.0 ppb	95.0 % recovery
Fluorobenzene	37.5 ppb	93.8 % recovery
Pentafluorobenzene	39.1 ppb	97.8 % recovery

RIC DATA: CF21 #1 SCANS 1 TO 1086
10/23/84 0:00:00
SAMPLE: VOLATILES STD. 10-23-84 WEM
CONDS.:
RANGE: G 1,1086 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3



Quantitation Report File: CF21

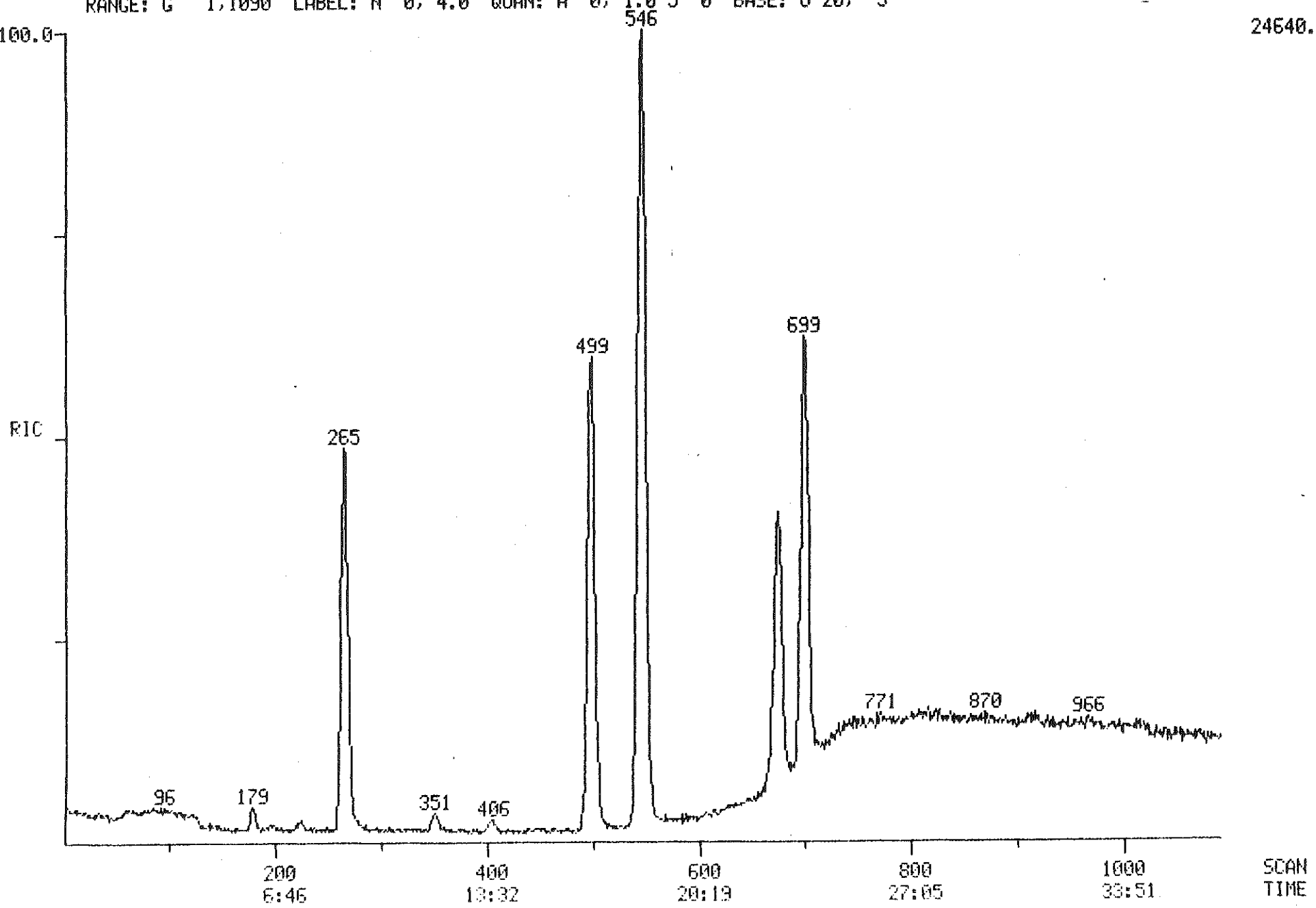
Data: CF21.MI
10/23/84 0:00:00
Sample: VOLATILES STD. 10-23-84 WEM
Submitted by: Analyst:

AMOUNT=AREA * REF.AMNT/(REF.AREA)* RESP.FACT)
Resp. fac. from Library Entry

NO	NAME
1	BROMOCHLOROMETHANE (RETENTION TIME STANDARD)
2	2-BROMO-1-CHLOROPROPANE (INTERNAL STANDARD)
3	1,4-DICHLOROBUTANE (RETENTION TIME STANDARD)
4	D-6 BENZENE (SURROGATE)
5	FLUOROBENZENE (SURROGATE)
6	PENTAFLUOROBENZENE (SURROGATE)
7	CHLOROMETHANE
8	BROMOMETHANE
9	VINYL CHLORIDE
10	DICHLORODIFLUOROMETHANE
11	CHLOROETHANE
12	METHYLENE CHLORIDE
13	ACETONE
14	ACROLEIN
15	ACRYLONITRILE
16	TRICHLOROFLUOROMETHANE
17	1,1-DICHLOROETHENE
18	1,1-DICHLOROETHANE
19	TRANS-1,2-DICHLOROETHENE
20	CHLOROFORM
21	METHYL ETHYL KETONE
22	1,2-DICHLOROETHANE
23	1,1,1-TRICHLOROETHANE
24	CARBON TETRACHLORIDE
25	BROMODICHLOROMETHANE
26	1,2-DICHLOROPROPANE
27	TRANS-1,3-DICHLOROPROPENE
28	TRICHLOROETHENE
29	BENZENE
30	DIBROMOCHLOROMETHANE
31	1,1,2-TRICHLOROETHANE
32	CIS-1,3-DICHLOROPROPENE
33	2-CHLOROETHYLVINYL ETHER
34	BROMOFORM
35	METHYLISOBUTYL KETONE (MIBK)
36	TETRACHLOROETHENE
37	1,1,2,2-TETRACHLOROETHANE
38	TOLUENE
39	CHLOROBENZENE
40	ETHYLBENZENE
41	XYLENE ISOMER
42	XYLENE ISOMERS

No	m/z	Scan	Time	Ref	RRT	Meth	Area(Hght)	Amount	%Tot
1	128	265	8:58	2	0.486	A BB	12804.	40.000 PPB	0.72
2	77	545	18:27	2	1.000	A BB	33274.	40.000 PPB	0.72
3	55	673	22:47	2	1.235	A BB	28132.	40.000 PPB	0.72
4	84	498	16:51	2	0.914	A BV	57059.	40.000 PPB	0.72
5	96	544	18:25	2	0.998	A BB	61815.	40.000 PPB	0.72
6	168	698	23:38	2	1.281	A BB	40792.	40.000 PPB	0.72
7	50	30	1:01	2	0.055	A BB	25975.	100.000 PPB	1.81
8	94	70	2:22	2	0.128	A BB	36435.	100.000 PPB	1.81
9	62	95	3:13	2	0.174	A BV	31194.	100.000 PPB	1.81
10	85	92	3:07	2	0.169	A BV	12756.	100.000 PPB	1.81
11	64	124	4:12	2	0.228	A VB	24958.	100.000 PPB	1.81
12	84	178	6:02	2	0.327	A BB	49658.	100.000 PPB	1.81
13	43	195	6:36	2	0.358	A BB	70008.	1000.000 PPB	18.05
14	56	197	6:40	2	0.361	A BV	10621.	300.000 PPB	5.42
15	53	214	7:15	2	0.393	A BB	31669.	300.000 PPB	5.42
16	101	237	8:01	2	0.435	A BV	42829.	100.000 PPB	1.81
17	96	255	8:38	2	0.468	A BB	40900.	100.000 PPB	1.81
18	63	290	9:49	2	0.532	A BB	75880.	100.000 PPB	1.81
19	96	312	10:34	2	0.572	A BB	44397.	100.000 PPB	1.81
20	83	326	11:02	2	0.598	A BB	71193.	100.000 PPB	1.81
21	43	349	11:49	2	0.640	A BV	46128.	200.000 PPB	3.61
22	62	349	11:49	2	0.640	A BB	32220.	100.000 PPB	1.81
23	97	391	13:14	2	0.717	A BB	39638.	100.000 PPB	1.81
24	117	402	13:36	2	0.738	A VB	36997.	100.000 PPB	1.81
25	83	414	14:01	2	0.760	A BB	60392.	100.000 PPB	1.81
26	63	460	15:34	2	0.844	A BB	60607.	100.000 PPB	1.81
27	75	466	15:46	2	0.855	A BB	80330.	100.000 PPB	1.81
28	130	485	16:25	2	0.890	A BB	49974.	100.000 PPB	1.81
29	78	503	17:02	2	0.923	A BB	138000.	100.000 PPB	1.81
30	127	501	16:58	2	0.919	A BB	45272.	100.000 PPB	1.81
31	97	505	17:06	2	0.927	A BB	43951.	100.000 PPB	1.81
32	75	507	17:10	2	0.930	A BB	54510.	100.000 PPB	1.81
33	106	541	18:19	2	0.993	A BB	3309.	300.000 PPB	5.42
34	173	587	19:52	2	1.077	A BB	36875.	100.000 PPB	1.81
35	43	606	20:31	2	1.112	A BB	50202.	100.000 PPB	1.81
36	164	663	22:27	2	1.217	A BB	41896.	100.000 PPB	1.81
37	83	659	22:18	2	1.209	A BB	68279.	100.000 PPB	1.81
38	92	707	23:56	2	1.297	A BV	90249.	100.000 PPB	1.81
39	112	742	25:07	2	1.361	A BB	104332.	100.000 PPB	1.81
40	106	814	27:33	2	1.494	A BB	52119.	100.000 PPB	1.81
41	91	967	32:44	2	1.774	A BV	114086.	100.000 PPB	1.81
42	91	1004	33:59	2	1.842	A VB	266573.	200.000 PPB	3.61

RIC DATA: CF22 #1 SCANS 1 TO 1090
10/23/84 0:00:00
SAMPLE: VOLATILES BLANK 10-23-84 WEM
CONDS.:
RANGE: G 1,1090 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3



Quantitation Report File: CF22

Data: CF22.MI
10/23/84 0:00:00
Sample: VOLATILES BLANK 10-23-84 WEM
Submitted by: Analyst:

AMOUNT=AREA * REF.AMNT/(REF.AREA)* RESP.FACT)
Resp. fac. from Library Entry

NO	NAME
1	BROMOCHLOROMETHANE (RETENTION TIME STANDARD)
2	2-BROMO-1-CHLOROPROPANE (INTERNAL STANDARD)
3	1,4-DICHLOROBUTANE (RETENTION TIME STANDARD)
4	D-6 BENZENE (SURROGATE)
5	FLUOROBENZENE (SURROGATE)
6	PENTAFLUOROBENZENE (SURROGATE)
7	CHLOROMETHANE
8	BROMOMETHANE
9	VINYL CHLORIDE
10	DICHLORODIFLUOROMETHANE
11	CHLOROETHANE
12	METHYLENE CHLORIDE
13	ACETONE
14	ACROLEIN
15	ACRYLONITRILE
16	TRICHLOROFLUOROMETHANE
17	1,1-DICHLOROETHENE
18	1,1-DICHLOROETHANE
19	TRANS-1,2-DICHLOROETHENE
20	CHLOROFORM
21	METHYL ETHYL KETONE
22	1,2-DICHLOROETHANE
23	1,1,1-TRICHLOROETHANE
24	CARBON TETRACHLORIDE
25	BROMODICHLOROMETHANE
26	1,2-DICHLOROPROPANE
27	TRANS-1,3-DICHLOROPROPENE
28	TRICHLOROETHENE
29	BENZENE
30	DIBROMOCHLOROMETHANE
31	1,1,2-TRICHLOROETHANE
32	CIS-1,3-DICHLOROPROPENE
33	2-CHLOROETHYLVINYL ETHER
34	BROMOFORM
35	METHYLISOBUTYL KETONE (MIBK)
36	TETRACHLOROETHENE
37	1,1,2,2-TETRACHLOROETHANE
38	TOLUENE
39	CHLOROBENZENE
40	ETHYLBENZENE
41	XYLENE ISOMER
42	XYLENE ISOMERS

No	m/z	Scan	Time	Ref	RRT	Meth	Area(Hght)	Amount	%Tot
1	128	265	8:58	2	0.484	A BB	12917.	39.412 PPB	14.77
2	77	548	18:33	2	1.000	A BB	34068.	40.000 PPB	14.99
3	55	674	22:49	2	1.230	A BB	27286.	37.893 PPB	14.20
4	84	499	16:53	2	0.911	A BB	55351.	37.898 PPB	14.20
5	96	545	18:27	2	0.995	A BB	61169.	38.659 PPB	14.49
6	168	700	23:42	2	1.277	A BB	40818.	39.092 PPB	14.65
7	NOT	FOUND							
8	NOT	FOUND							
9	NOT	FOUND							
10	NOT	FOUND							
11	NOT	FOUND							
12	84	179	6:04	2	0.327	A BB	1019.	2.004 PPB	0.75
13	43	196	6:38	2	0.358	A BB	897.	12.514 PPB	4.69
14	NOT	FOUND							
15	NOT	FOUND							
16	NOT	FOUND							
17	NOT	FOUND							
18	NOT	FOUND							
19	NOT	FOUND							
20	NOT	FOUND							
21	43	349	11:49	2	0.637	A BB	3024.	12.806 PPB	4.80
22	NOT	FOUND							
23	NOT	FOUND							
24	NOT	FOUND							
25	NOT	FOUND							
26	NOT	FOUND							
27	NOT	FOUND							
28	NOT	FOUND							
29	78	502	17:00	2	0.916	A BB	706.	0.500 PPB	0.19
30	NOT	FOUND							
31	NOT	FOUND							
32	NOT	FOUND							
33	106	548	18:33	2	1.000	A BB	49.	4.339 PPB	1.63
34	NOT	FOUND							
35	NOT	FOUND							
36	164	667	22:35	2	1.217	A BB	293.	0.683 PPB	0.26
37	83	665	22:31	2	1.214	A*BB	370.	0.529 PPB	0.20
38	92	708	23:58	2	1.292	A BB	379.	0.410 PPB	0.15
39	NOT	FOUND							
40	NOT	FOUND							
41	91	960	32:30	2	1.752	A*VV	188.	0.161 PPB	0.06
42	NOT	FOUND							

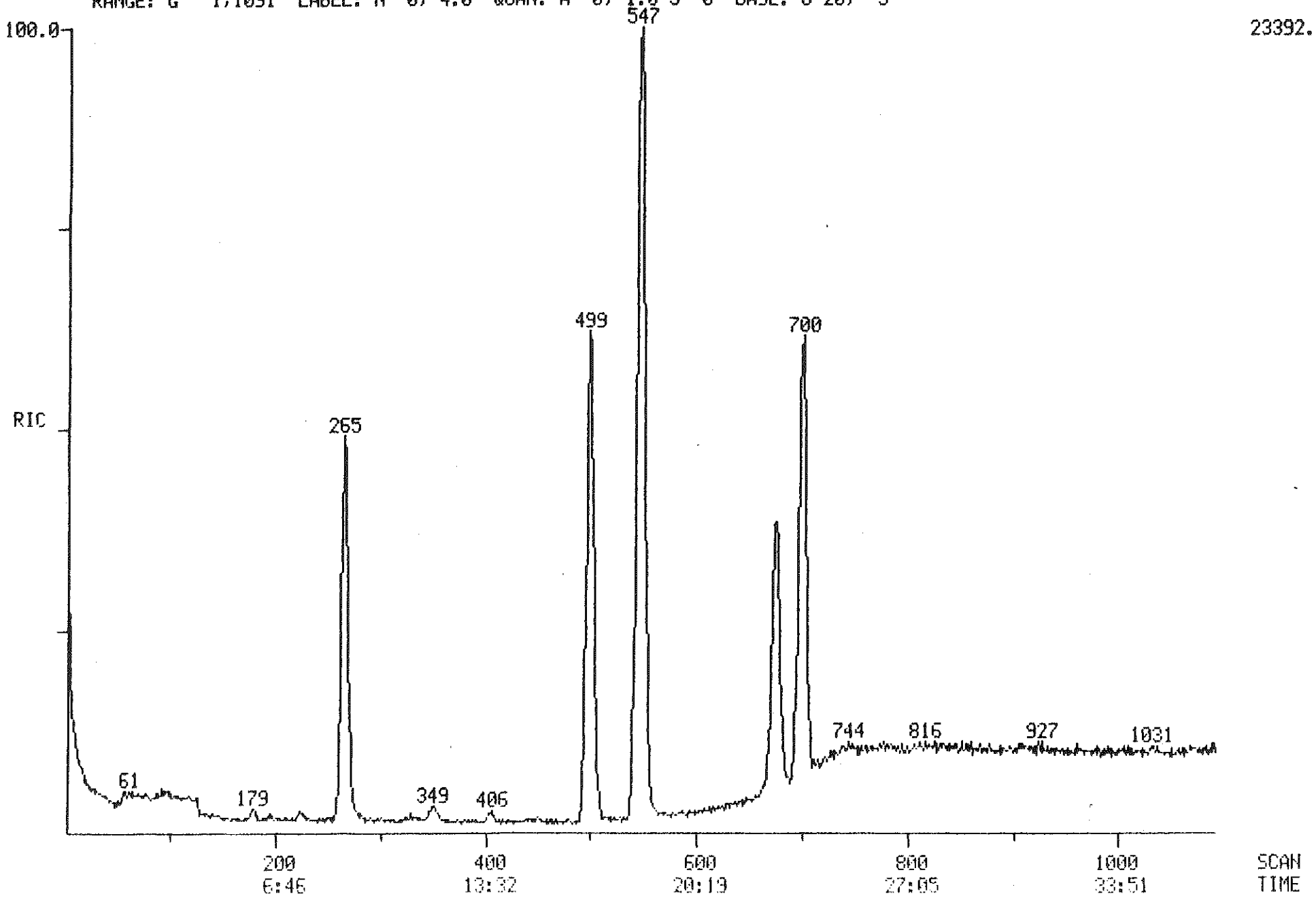
Quantitation Report File: CF23

Data: CF23.MI
10/23/84 0:00:00
Sample: GWT #7635 P-1 10-23-84 WEM
Submitted by: Analyst:

AMOUNT=AREA * REF.AMNT/(REF.AREA)* RESP.FACT)
Resp. fac. from Library Entry

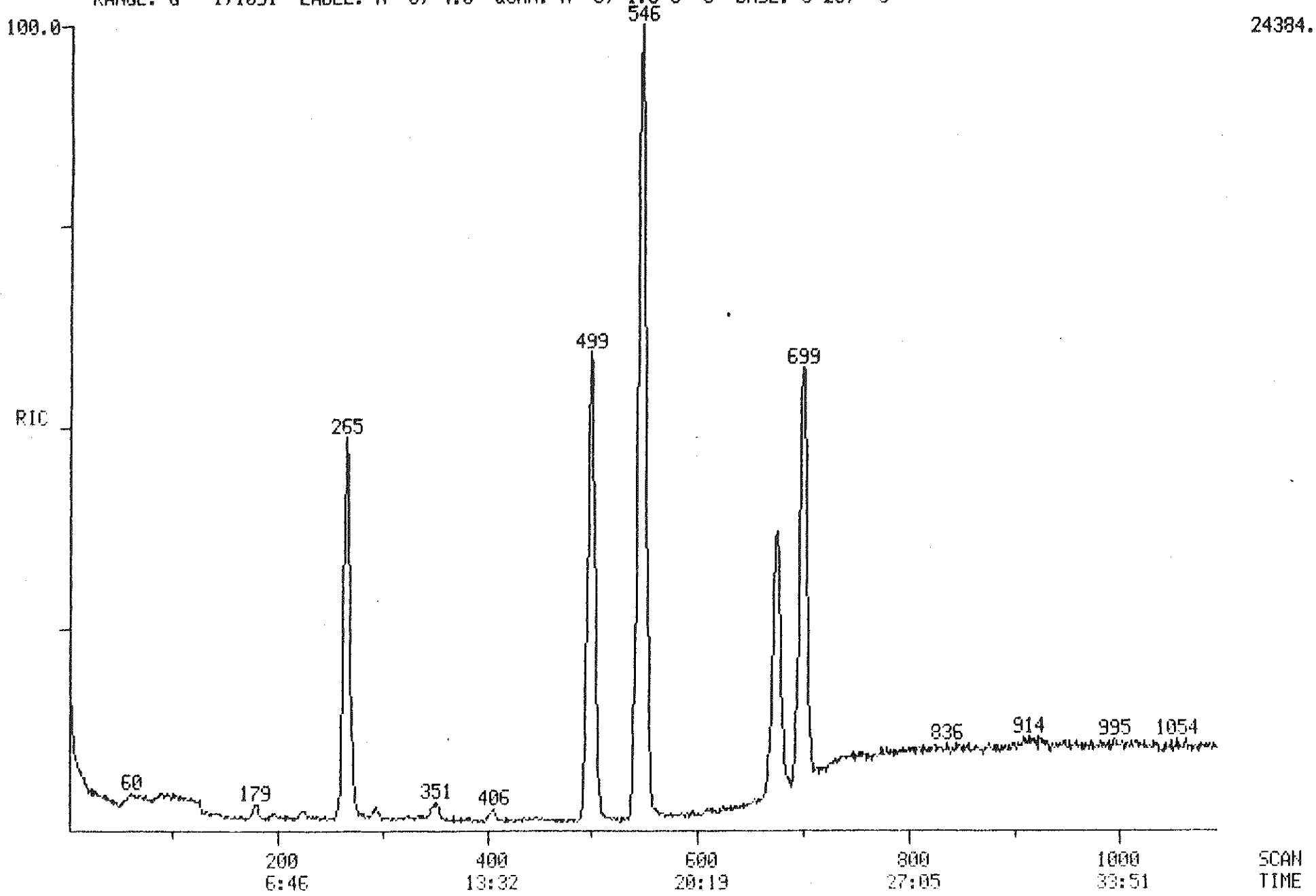
NO	NAME
1	BROMOCHLOROMETHANE (RETENTION TIME STANDARD)
2	2-BROMO-1-CHLOROPROPANE (INTERNAL STANDARD)
3	1,4-DICHLOROBUTANE (RETENTION TIME STANDARD)
4	D-6 BENZENE (SURROGATE)
5	FLUOROBENZENE (SURROGATE)
6	PENTAFLUOROBENZENE (SURROGATE)
7	CHLOROMETHANE
8	BROMOMETHANE
9	VINYL CHLORIDE
10	DICHLORODIFLUOROMETHANE
11	CHLOROETHANE
12	METHYLENE CHLORIDE
13	ACETONE
14	ACROLEIN
15	ACRYLONITRILE
16	TRICHLOROFLUOROMETHANE
17	1,1-DICHLOROETHENE
18	1,1-DICHLOROETHANE
19	TRANS-1,2-DICHLOROETHENE
20	CHLOROFORM
21	METHYL ETHYL KETONE
22	1,2-DICHLOROETHANE
23	1,1,1-TRICHLOROETHANE
24	CARBON TETRACHLORIDE
25	BROMODICHLOROMETHANE
26	1,2-DICHLOROPROPANE
27	TRANS-1,3-DICHLOROPROPENE
28	TRICHLOROETHENE
29	BENZENE
30	DIBROMOCHLOROMETHANE
31	1,1,2-TRICHLOROETHANE
32	CIS-1,3-DICHLOROPROPENE
33	2-CHLOROETHYLVINYL ETHER
34	BROMOFORM
35	METHYLISOBUTYL KETONE (MIBK)
36	TETRACHLOROETHENE
37	1,1,2,2-TETRACHLOROETHANE
38	TOLUENE
39	CHLOROBENZENE
40	ETHYLBENZENE
41	XYLENE ISOMER
42	XYLENE ISOMERS

RIC DATA: CF23 #1 SCANS 1 TO 1091
10/23/84 0:00:00
SAMPLE: GWT #7635 P-1 10-23-84 WEM
CONDS.:
RANGE: G 1,1091 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3



No	m/z	Scan	Time	Ref	RRT	Meth	Area(Hght)	Amount	%Tot
1	128	265	8:58	2	0.484	A BB	12326.	38.241 PPB	14.97
2	77	547	18:31	2	1.000	A BB	33505.	40.000 PPB	15.66
3	55	675	22:51	2	1.234	A BB	26303.	37.141 PPB	14.54
4	84	499	16:53	2	0.912	A BB	54253.	37.771 PPB	14.79
5	96	545	18:27	2	0.996	A BB	60263.	38.726 PPB	15.16
6	168	700	23:42	2	1.280	A BB	39948.	38.902 PPB	15.23
7	NOT	FOUND							
8	NOT	FOUND							
9	62	96	3:15	2	0.176	A BB	290.	0.923 PPB	0.36
10	NOT	FOUND							
11	NOT	FOUND							
12	84	181	6:08	2	0.331	A BB	479.	0.958 PPB	0.38
13	43	196	6:38	2	0.358	A BB	647.	9.178 PPB	3.59
14	NOT	FOUND							
15	NOT	FOUND							
16	NOT	FOUND							
17	NOT	FOUND							
18	NOT	FOUND							
19	NOT	FOUND							
20	NOT	FOUND							
21	43	351	11:53	2	0.642	A BB	2842.	12.237 PPB	4.79
22	NOT	FOUND							
23	NOT	FOUND							
24	NOT	FOUND							
25	NOT	FOUND							
26	NOT	FOUND							
27	NOT	FOUND							
28	NOT	FOUND							
29	78	502	17:00	2	0.918	A*BB	499.	0.359 PPB	0.14
30	NOT	FOUND							
31	NOT	FOUND							
32	NOT	FOUND							
33	NOT	FOUND							
34	NOT	FOUND							
35	NOT	FOUND							
36	164	668	22:37	2	1.221	A BB	189.	0.448 PPB	0.18
37	83	656	22:12	2	1.199	A*BB	265.	0.385 PPB	0.15
38	92	707	23:56	2	1.293	A*BB	87.	0.096 PPB	0.04
39	NOT	FOUND							
40	NOT	FOUND							
41	91	974	32:58	2	1.781	A*BB	204.	0.178 PPB	0.07
42	91	1008	34:07	2	1.843	A BB	106.	0.079 PPB	0.03

RIC DATA: CF24 #1 SCANS 1 TO 1091
10/23/84 0:00:00
SAMPLE: GWT #7636 P-2 10-23-84 WEM
CONDS.:
RANGE: G 1,1091 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3



Quantitation Report File: CF24

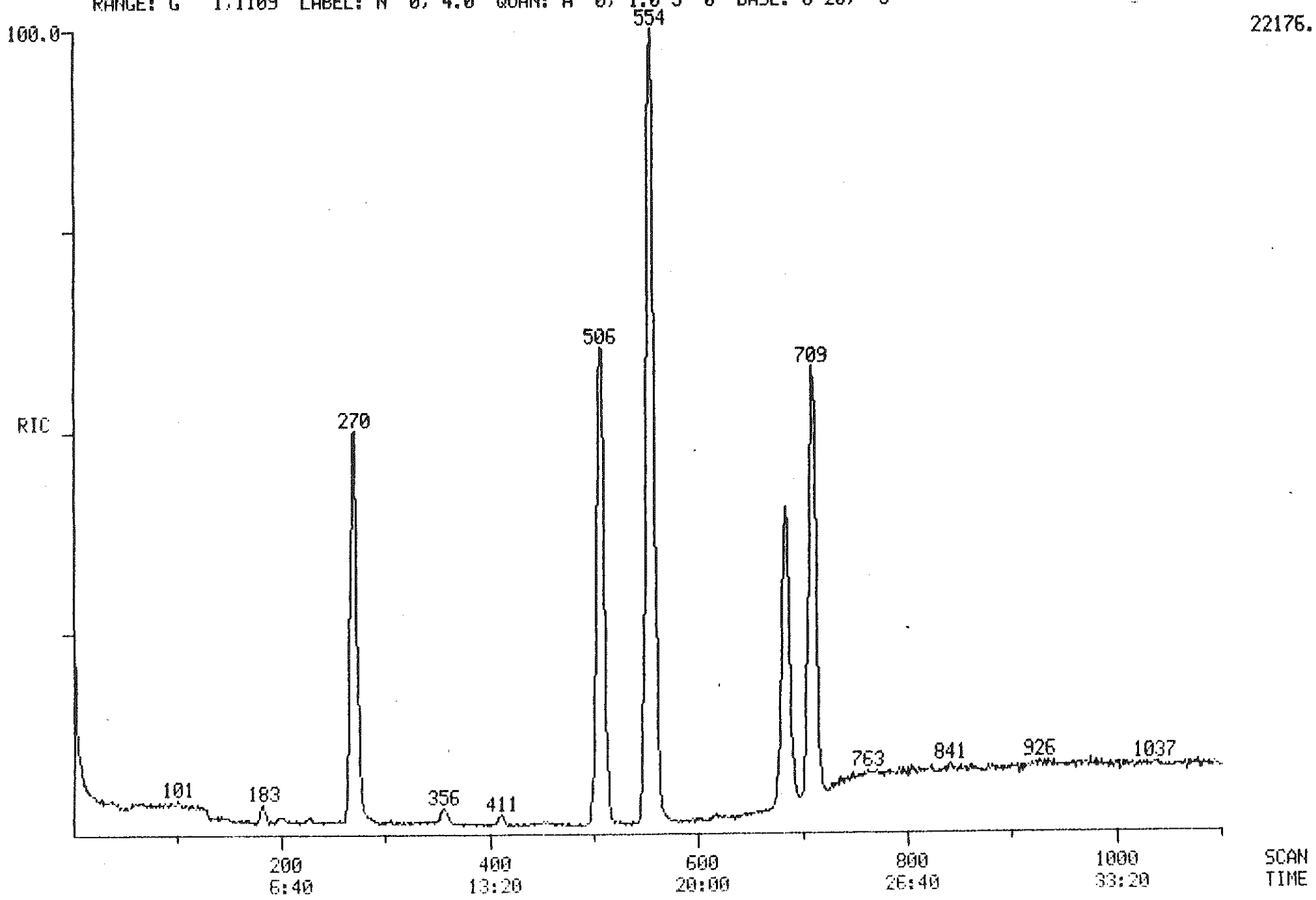
Data: CF24.MI
10/23/84 0:00:00
Sample: GWT #7636 P-2 10-23-84 WEM
Submitted by: Analyst:

AMOUNT=AREA * REF.AMNT/(REF.AREA)* RESP.FACT)
Resp. fac. from Library Entry

NO	NAME
1	BROMOCHLOROMETHANE (RETENTION TIME STANDARD)
2	2-BROMO-1-CHLOROPROPANE (INTERNAL STANDARD)
3	1,4-DICHLOROBUTANE (RETENTION TIME STANDARD)
4	D-6 BENZENE (SURROGATE)
5	FLUOROBENZENE (SURROGATE)
6	PENTAFLUOROBENZENE (SURROGATE)
7	CHLOROMETHANE
8	BROMOMETHANE
9	VINYL CHLORIDE
10	DICHLORODIFLUOROMETHANE
11	CHLOROETHANE
12	METHYLENE CHLORIDE
13	ACETONE
14	ACROLEIN
15	ACRYLONITRILE
16	TRICHLOROFLUOROMETHANE
17	1,1-DICHLOROETHENE
18	1,1-DICHLOROETHANE
19	TRANS-1,2-DICHLOROETHENE
20	CHLOROFORM
21	METHYL ETHYL KETONE
22	1,2-DICHLOROETHANE
23	1,1,1-TRICHLOROETHANE
24	CARBON TETRACHLORIDE
25	BROMODICHLOROMETHANE
26	1,2-DICHLOROPROPANE
27	TRANS-1,3-DICHLOROPROPENE
28	TRICHLOROETHENE
29	BENZENE
30	DIBROMOCHLOROMETHANE
31	1,1,2-TRICHLOROETHANE
32	CIS-1,3-DICHLOROPROPENE
33	2-CHLOROETHYLVINYL ETHER
34	BROMOFORM
35	METHYLISOBUTYL KETONE (MIBK)
36	TETRACHLOROETHENE
37	1,1,2,2-TETRACHLOROETHANE
38	TOLUENE
39	CHLOROBENZENE
40	ETHYLBENZENE
41	XYLENE ISOMER
42	XYLENE ISOMERS

No	m/z	Scan	Time	Ref	RRT	Meth	Area(Hght)	Amount	%Tot
1	128	265	8:58	2	0.484	A BB	12769.	39.362 PPB	15.32
2	77	548	18:33	2	1.000	A BV	33721.	40.000 PPB	15.56
3	55	675	22:51	2	1.232	A BV	27240.	38.218 PPB	14.87
4	84	499	16:53	2	0.911	A BB	53877.	37.269 PPB	14.50
5	96	546	18:29	2	0.996	A BB	60411.	38.573 PPB	15.01
6	168	699	23:40	2	1.276	A BB	39584.	38.301 PPB	14.90
7	NOT FOUND								
8	NOT FOUND								
9	NOT FOUND								
10	NOT FOUND								
11	NOT FOUND								
12	84	179	6:04	2	0.327	A BB	581.	1.154 PPB	0.45
13	43	196	6:38	2	0.358	A BB	698.	9.838 PPB	3.83
14	NOT FOUND								
15	NOT FOUND								
16	NOT FOUND								
17	NOT FOUND								
18	NOT FOUND								
19	NOT FOUND								
20	NOT FOUND								
21	43	351	11:53	2	0.641	A BB	2911.	12.454 PPB	4.85
22	NOT FOUND								
23	NOT FOUND								
24	NOT FOUND								
25	NOT FOUND								
26	NOT FOUND								
27	NOT FOUND								
28	NOT FOUND								
29	78	501	16:58	2	0.914	A BB	467.	0.334 PPB	0.13
30	NOT FOUND								
31	NOT FOUND								
32	NOT FOUND								
33	NOT FOUND								
34	NOT FOUND								
35	43	609	20:37	2	1.111	A BB	383.	0.754 PPB	0.29
36	164	665	22:31	2	1.214	A BB	187.	0.440 PPB	0.17
37	83	666	22:33	2	1.215	A*BB	105.	0.152 PPB	0.06
38	NOT FOUND								
39	NOT FOUND								
40	NOT FOUND								
41	91	971	32:52	2	1.772	A*BB	226.	0.195 PPB	0.08
42	91	1012	34:15	2	1.847	A*BB	209.	0.155 PPB	0.06

RIC DATA: CF35 #1 SCANS 1 TO 1100
10/24/84 0:00:00
SAMPLE: GWT #7637 P-3 10-23-84 WEM
CONDS.:
RANGE: G 1.1109 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3



Quantitation Report File: CF35

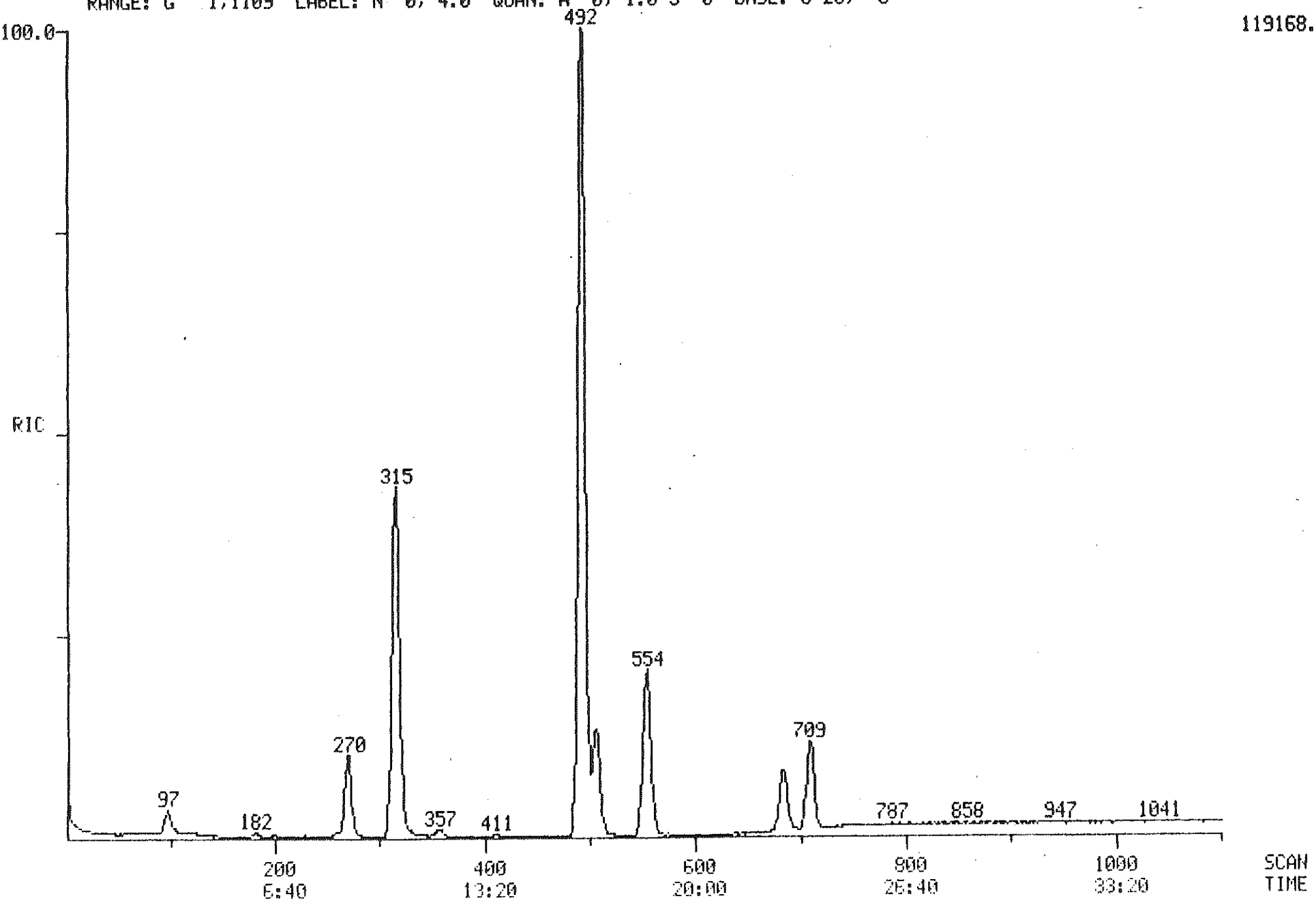
Data: CF35.MI
10/24/84 0:00:00
Sample: GWT #7637 P-3 10-23-84 WEM
Submitted by: Analyst:

AMOUNT=AREA * REF.AMNT/(REF.AREA)* RESP.FACT)
Resp. fac. from Library Entry

NO	NAME
1	BROMOCHLOROMETHANE (RETENTION TIME STANDARD)
2	2-BROMO-1-CHLOROPROPANE (INTERNAL STANDARD)
3	1,4-DICHLOROBUTANE (RETENTION TIME STANDARD)
4	D-6 BENZENE (SURROGATE)
5	FLUOROBENZENE (SURROGATE)
6	PENTAFLUOROBENZENE (SURROGATE)
7	CHLOROMETHANE
8	BROMOMETHANE
9	VINYL CHLORIDE
10	DICHLORODIFLUOROMETHANE
11	CHLOROETHANE
12	METHYLENE CHLORIDE
13	ACETONE
14	ACROLEIN
15	ACRYLONITRILE
16	TRICHLOROFLUOROMETHANE
17	1,1-DICHLOROETHENE
18	1,1-DICHLOROETHANE
19	TRANS-1,2-DICHLOROETHENE
20	CHLOROFORM
21	METHYL ETHYL KETONE
22	1,2-DICHLOROETHANE
23	1,1,1-TRICHLOROETHANE
24	CARBON TETRACHLORIDE
25	BROMODICHLOROMETHANE
26	1,2-DICHLOROPROPANE
27	TRANS-1,3-DICHLOROPROPENE
28	TRICHLOROETHENE
29	BENZENE
30	DIBROMOCHLOROMETHANE
31	1,1,2-TRICHLOROETHANE
32	CIS-1,3-DICHLOROPROPENE
33	2-CHLOROETHYLVINYL ETHER
34	BROMOFORM
35	METHYLISOBUTYL KETONE (MIBK)
36	TETRACHLOROETHENE
37	1,1,2,2-TETRACHLOROETHANE
38	TOLUENE
39	CHLOROBENZENE
40	ETHYLBENZENE
41	XYLENE ISOMER
42	XYLENE ISOMERS

No	m/z	Scan	Time	Ref	RRT	Meth	Area(Hght)	Amount	%Tot
1	128	271	9:02	2	0.488	A BB	12025.	38.656 PPB	14.83
2	77	555	18:30	2	1.000	A BB	32336.	40.000 PPB	15.35
3	55	684	22:48	2	1.232	A BV	28974.	42.392 PPB	16.27
4	84	507	16:54	2	0.914	A BB	51454.	37.117 PPB	14.24
5	96	553	18:26	2	0.996	A BB	55521.	36.969 PPB	14.19
6	168	709	23:38	2	1.277	A BB	37961.	38.304 PPB	14.70
7	NOT	FOUND							
8	NOT	FOUND							
9	NOT	FOUND							
10	NOT	FOUND							
11	NOT	FOUND							
12	84	183	6:06	2	0.330	A BB	727.	1.506 PPB	0.58
13	43	200	6:40	2	0.360	A BB	864.	12.699 PPB	4.87
14	NOT	FOUND							
15	NOT	FOUND							
16	NOT	FOUND							
17	NOT	FOUND							
18	NOT	FOUND							
19	NOT	FOUND							
20	NOT	FOUND							
21	43	356	11:52	2	0.641	A BB	2561.	11.426 PPB	4.38
22	NOT	FOUND							
23	NOT	FOUND							
24	NOT	FOUND							
25	NOT	FOUND							
26	NOT	FOUND							
27	NOT	FOUND							
28	NOT	FOUND							
29	78	507	16:54	2	0.914	A BB	388.	0.289 PPB	0.11
30	NOT	FOUND							
31	NOT	FOUND							
32	NOT	FOUND							
33	NOT	FOUND							
34	NOT	FOUND							
35	43	615	20:30	2	1.108	A BB	477.	0.978 PPB	0.38
36	164	674	22:28	2	1.214	A BB	187.	0.459 PPB	0.18
37	NOT	FOUND							
38	NOT	FOUND							
39	NOT	FOUND							
40	NOT	FOUND							
41	NOT	FOUND							
42	NOT	FOUND							

RIC DATA: CF34 #1 SCANS 1 TO 1100
10/24/84 0:00:00
SAMPLE: GWT #7638 P-5 10-23-84 WEM
CONDS.:
RANGE: G 1,1109 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3



Quantitation Report File: CF34

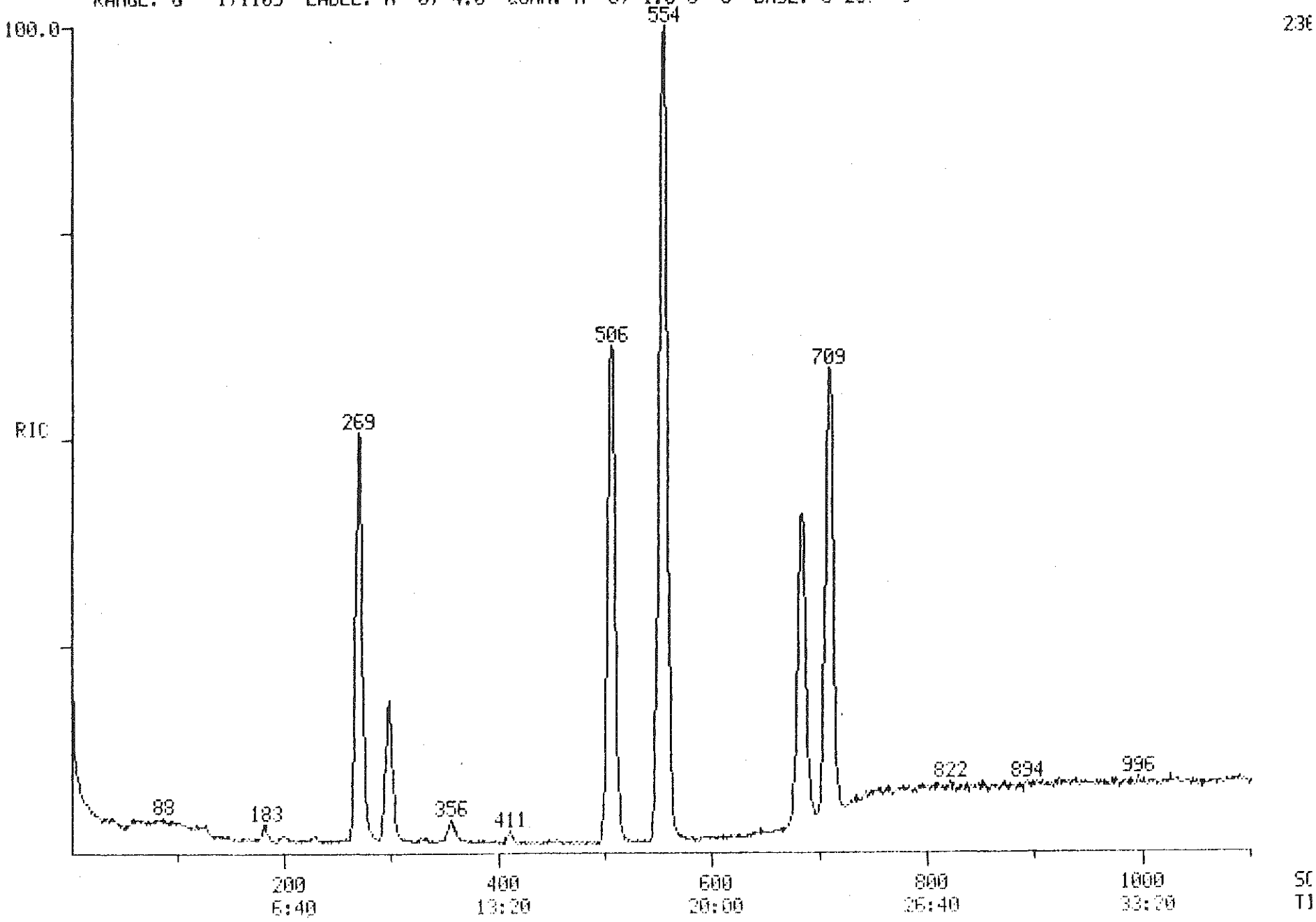
Data: CF34.MI
10/24/84 0:00:00
Sample: GWT #7638 P-5 10-23-84 WEM
Submitted by: Analyst:

AMOUNT=AREA * REF.AMNT/(REF.AREA)* RESP.FACT)
Resp. fac. from Library Entry

NO	NAME
1	BROMOCHLOROMETHANE (RETENTION TIME STANDARD)
2	2-BROMO-1-CHLOROPROPANE (INTERNAL STANDARD)
3	1,4-DICHLOROBUTANE (RETENTION TIME STANDARD)
4	D-6 BENZENE (SURROGATE)
5	FLUOROBENZENE (SURROGATE)
6	PENTAFLUOROBENZENE (SURROGATE)
7	CHLOROMETHANE
8	BROMOMETHANE
9	VINYL CHLORIDE
10	DICHLORODIFLUOROMETHANE
11	CHLOROETHANE
12	METHYLENE CHLORIDE
13	ACETONE
14	ACROLEIN
15	ACRYLONITRILE
16	TRICHLOROFLUOROMETHANE
17	1,1-DICHLOROETHENE
18	1,1-DICHLOROETHANE
19	TRANS-1,2-DICHLOROETHENE
20	CHLOROFORM
21	METHYL ETHYL KETONE
22	1,2-DICHLOROETHANE
23	1,1,1-TRICHLOROETHANE
24	CARBON TETRACHLORIDE
25	BROMODICHLOROMETHANE
26	1,2-DICHLOROPROPANE
27	TRANS-1,3-DICHLOROPROPENE
28	TRICHLOROETHENE
29	BENZENE
30	DIBROMOCHLOROMETHANE
31	1,1,2-TRICHLOROETHANE
32	CIS-1,3-DICHLOROPROPENE
33	2-CHLOROETHYLVINYL ETHER
34	BROMOFORM
35	METHYLISOBUTYL KETONE (MIBK)
36	TETRACHLOROETHENE
37	1,1,2,2-TETRACHLOROETHANE
38	TOLUENE
39	CHLOROBENZENE
40	ETHYLBENZENE
41	XYLENE ISOMER
42	XYLENE ISOMERS

No	m/z	Scan	Time	Ref	RRT	Meth	Area(Hght)	Amount	%Tot
1	128	270	9:00	2	0.486	A BB	12626.	38.574 PPB	4.27
2	77	556	18:32	2	1.000	A BB	34024.	40.000 PPB	4.43
3	55	684	22:48	2	1.230	A BB	30587.	42.532 PPB	4.71
4	84	506	16:52	2	0.910	A BB	57413.	39.361 PPB	4.36
5	96	553	18:26	2	0.995	A BB	59135.	37.422 PPB	4.14
6	168	710	23:40	2	1.277	A BB	40272.	38.620 PPB	4.27
7	NOT FOUND								
8	NOT FOUND								
9	62	97	3:14	2	0.174	A BV	16539.	51.851 PPB	5.74
10	NOT FOUND								
11	NOT FOUND								
12	84	182	6:04	2	0.327	A BB	849.	1.672 PPB	0.19
13	43	200	6:40	2	0.360	A BB	740.	10.337 PPB	1.14
14	NOT FOUND								
15	NOT FOUND								
16	NOT FOUND								
17	96	260	8:40	2	0.468	A BB	865.	2.068 PPB	0.23
18	NOT FOUND								
19	96	315	10:30	2	0.567	A BB	99997.	220.269 PPB	24.37
20	NOT FOUND								
21	43	356	11:52	2	0.640	A BB	2883.	12.224 PPB	1.35
22	NOT FOUND								
23	NOT FOUND								
24	NOT FOUND								
25	NOT FOUND								
26	NOT FOUND								
27	NOT FOUND								
28	130	493	16:26	2	0.887	A BB	187396.	366.721 PPB	40.58
29	78	506	16:52	2	0.910	A BB	596.	0.422 PPB	0.05
30	NOT FOUND								
31	NOT FOUND								
32	NOT FOUND								
33	NOT FOUND								
34	NOT FOUND								
35	43	620	20:40	2	1.115	A VB	713.	1.389 PPB	0.15
36	164	676	22:32	2	1.216	A BB	190.	0.444 PPB	0.05
37	NOT FOUND								
38	NOT FOUND								
39	NOT FOUND								
40	NOT FOUND								
41	NOT FOUND								
42	NOT FOUND								

RIC DATA: CF33 #1 SCANS 1 TO 1100
10/24/84 0:00:00
SAMPLE: GNT #7639 P-6 10-23-84 WEM
CONDS.:
RANGE: G 1,1109 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3



Quantitation Report File: CF33

Data: CF33.MI
10/24/84 0:00:00
Sample: GWT #7639 P-6 10-23-84 WEM
Submitted by: Analyst:

AMOUNT=AREA * REF.AMNT/(REF.AREA)* RESP.FACT)
Resp. fac. from Library Entry

NO	NAME
1	BROMOCHLOROMETHANE (RETENTION TIME STANDARD)
2	2-BROMO-1-CHLOROPROPANE (INTERNAL STANDARD)
3	1,4-DICHLOROBUTANE (RETENTION TIME STANDARD)
4	D-6 BENZENE (SURROGATE)
5	FLUOROBENZENE (SURROGATE)
6	PENTAFLUOROBENZENE (SURROGATE)
7	CHLOROMETHANE
8	BROMOMETHANE
9	VINYL CHLORIDE
10	DICHLORODIFLUOROMETHANE
11	CHLOROETHANE
12	METHYLENE CHLORIDE
13	ACETONE
14	ACROLEIN
15	ACRYLONITRILE
16	TRICHLOROFLUOROMETHANE
17	1,1-DICHLOROETHENE
18	1,1-DICHLOROETHANE
19	TRANS-1,2-DICHLOROETHENE
20	CHLOROFORM
21	METHYL ETHYL KETONE
22	1,2-DICHLOROETHANE
23	1,1,1-TRICHLOROETHANE
24	CARBON TETRACHLORIDE
25	BROMODICHLOROMETHANE
26	1,2-DICHLOROPROPANE
27	TRANS-1,3-DICHLOROPROPENE
28	TRICHLOROETHENE
29	BENZENE
30	DIBROMOCHLOROMETHANE
31	1,1,2-TRICHLOROETHANE
32	CIS-1,3-DICHLOROPROPENE
33	2-CHLOROETHYLVINYL ETHER
34	BROMOFORM
35	METHYLISOBUTYL KETONE (MIBK)
36	TETRACHLOROETHENE
37	1,1,2,2-TETRACHLOROETHANE
38	TOLUENE
39	CHLOROBENZENE
40	ETHYLBENZENE
41	XYLENE ISOMER
42	XYLENE ISOMERS

No	m/z	Scan	Time	Ref	RRT	Meth	Area(Hght)	Amount	%Tot
1	128	270	9:00	2	0.486	A BB	12892.	40.457 PPB	14.69
2	77	556	18:32	2	1.000	A BB	33124.	40.000 PPB	14.53
3	55	684	22:48	2	1.230	A BB	31066.	44.371 PPB	16.12
4	84	506	16:52	2	0.910	A BB	55139.	38.829 PPB	14.10
5	96	553	18:26	2	0.995	A BB	59401.	38.612 PPB	14.02
6	168	710	23:40	2	1.277	A BB	40827.	40.216 PPB	14.61
7	NOT	FOUND							
8	NOT	FOUND							
9	NOT	FOUND							
10	NOT	FOUND							
11	NOT	FOUND							
12	84	183	6:06	2	0.329	A BB	686.	1.388 PPB	0.50
13	43	200	6:40	2	0.360	A BB	823.	11.809 PPB	4.29
14	NOT	FOUND							
15	NOT	FOUND							
16	NOT	FOUND							
	NOT	FOUND							
		FOUND							
		ND							
		ND							
		56	11:52	2	0.640	A BB	3396.	14.791 PPB	5.37
		ND							
		ND							
		ND							
		ND							
		ID							
		ID							
		ID							
		6	16:52	2	0.910	A BB	459.	0.334 PPB	0.12
		D							
		D							
		D							
		5	18:30	2	0.998	A BB	44.	4.007 PPB	1.46
		ND							
	43	622	20:44	2	1.119	A BB	79.	0.159 PPB	0.06
36	164	676	22:32	2	1.216	A BB	187.	0.448 PPB	0.16
37	NOT	FOUND							
38	NOT	FOUND							
39	NOT	FOUND							
40	NOT	FOUND							
41	NOT	FOUND							
42	NOT	FOUND							

Quantitation Report File: CF32

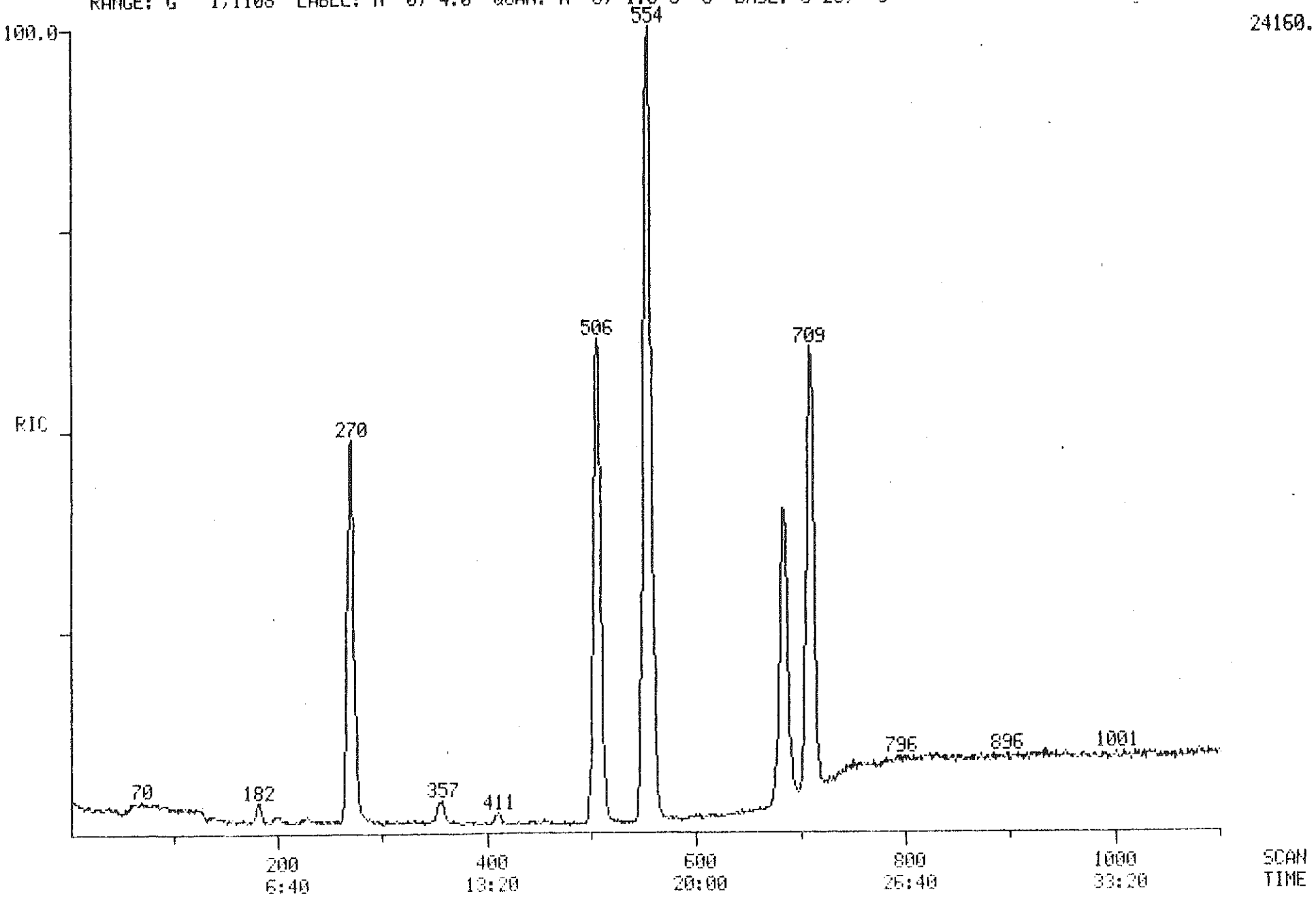
Data: CF32.MI
10/24/84 0:00:00
Sample: GWT #7640 UNDERDRAIN 10-23-84 WEM
Submitted by: Analyst:

AMOUNT=AREA * REF.AMNT/(REF.AREA)* RESP.FACT)
Resp. fac. from Library Entry

NO	NAME
1	BROMOCHLOROMETHANE (RETENTION TIME STANDARD)
2	2-BROMO-1-CHLOROPROPANE (INTERNAL STANDARD)
3	1,4-DICHLOROBUTANE (RETENTION TIME STANDARD)
4	D-6 BENZENE (SURROGATE)
5	FLUOROBENZENE (SURROGATE)
6	PENTAFLUOROBENZENE (SURROGATE)
7	CHLOROMETHANE
8	BROMOMETHANE
9	VINYL CHLORIDE
10	DICHLORODIFLUOROMETHANE
11	CHLOROETHANE
12	METHYLENE CHLORIDE
13	ACETONE
14	ACROLEIN
15	ACRYLONITRILE
16	TRICHLOROFLUOROMETHANE
17	1,1-DICHLOROETHENE
18	1,1-DICHLOROETHANE
19	TRANS-1,2-DICHLOROETHENE
20	CHLOROFORM
21	METHYL ETHYL KETONE
22	1,2-DICHLOROETHANE
23	1,1,1-TRICHLOROETHANE
24	CARBON TETRACHLORIDE
25	BROMODICHLOROMETHANE
26	1,2-DICHLOROPROPANE
27	TRANS-1,3-DICHLOROPROPENE
28	TRICHLOROETHENE
29	BENZENE
30	DIBROMOCHLOROMETHANE
31	1,1,2-TRICHLOROETHANE
32	CIS-1,3-DICHLOROPROPENE
33	2-CHLOROETHYLVINYL ETHER
34	BROMOFORM
35	METHYLISOBUTYL KETONE (MIBK)
36	TETRACHLOROETHENE
37	1,1,2,2-TETRACHLOROETHANE
38	TOLUENE
39	CHLOROBENZENE
40	ETHYLBENZENE
41	XYLENE ISOMER
42	XYLENE ISOMERS

No	m/z	Scan	Time	Ref	RRT	Meth	Area(Hght)	Amount	%Tot
1	128	270	9:00	2	0.486	A BB	12546.	39.198 PPB	11.80
2	77	556	18:32	2	1.000	A BB	33271.	40.000 PPB	12.04
3	55	684	22:48	2	1.230	A BV	29757.	42.314 PPB	12.73
4	84	506	16:52	2	0.910	A BB	53758.	37.689 PPB	11.34
5	96	553	18:26	2	0.995	A BB	58279.	37.715 PPB	11.35
6	168	709	23:38	2	1.275	A BB	40530.	39.747 PPB	11.96
7	NOT	FOUND							
8	NOT	FOUND							
9	NOT	FOUND							
10	NOT	FOUND							
11	NOT	FOUND							
12	84	182	6:04	2	0.327	A BB	691.	1.392 PPB	0.42
13	43	199	6:38	2	0.358	A BB	3218.	45.971 PPB	13.83
14	56	202	6:44	2	0.363	A BB	613.	17.316 PPB	5.21
15	NOT	FOUND							
16	NOT	FOUND							
17	NOT	FOUND							
18	63	296	9:52	2	0.532	A BB	594.	0.783 PPB	0.24
19	96	315	10:30	2	0.567	A BB	291.	0.656 PPB	0.20
20	NOT	FOUND							
21	43	356	11:52	2	0.640	A BB	3614.	15.671 PPB	4.72
22	NOT	FOUND							
23	NOT	FOUND							
24	NOT	FOUND							
25	NOT	FOUND							
26	NOT	FOUND							
27	NOT	FOUND							
28	130	493	16:26	2	0.887	A BB	357.	0.714 PPB	0.21
29	78	510	17:00	2	0.917	A BB	591.	0.428 PPB	0.13
30	NOT	FOUND							
31	NOT	FOUND							
32	NOT	FOUND							
33	NOT	FOUND							
34	NOT	FOUND							
35	43	617	20:34	2	1.110	A BB	5924.	11.802 PPB	3.55
36	164	674	22:28	2	1.212	A BB	215.	0.513 PPB	0.15
37	83	672	22:24	2	1.209	A BB	121.	0.177 PPB	0.05
38	92	718	23:56	2	1.291	A*BB	244.	0.270 PPB	0.08
39	NOT	FOUND							
40	NOT	FOUND							
41	91	988	32:56	2	1.777	A*BB	112.	0.098 PPB	0.03
42	NOT	FOUND							

RIC DATA: CF31 #1 SCANS 1 TO 1100
10/24/84 0:00:00
SAMPLE: GWT #7641 FIELD BLANK 10-23-84 WEM
CONDS.:
RANGE: G 1,1108 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3



Quantitation Report File: CF31

Data: CF31.MI
10/24/84 0:00:00
Sample: GWT #7641 FIELD BLANK 10-23-84 WEM
Submitted by: Analyst:

AMOUNT=AREA * REF.AMNT/(REF.AREA)* RESP.FACT)
Resp. fac. from Library Entry

NO	NAME
1	BROMOCHLOROMETHANE (RETENTION TIME STANDARD)
2	2-BROMO-1-CHLOROPROPANE (INTERNAL STANDARD)
3	1,4-DICHLOROBUTANE (RETENTION TIME STANDARD)
4	D-6 BENZENE (SURROGATE)
5	FLUOROBENZENE (SURROGATE)
6	PENTAFLUOROBENZENE (SURROGATE)
7	CHLOROMETHANE
8	BROMOMETHANE
9	VINYL CHLORIDE
10	DICHLORODIFLUOROMETHANE
11	CHLOROETHANE
12	METHYLENE CHLORIDE
13	ACETONE
14	ACROLEIN
15	ACRYLONITRILE
16	TRICHLOROFLUOROMETHANE
17	1,1-DICHLOROETHENE
18	1,1-DICHLOROETHANE
19	TRANS-1,2-DICHLOROETHENE
20	CHLOROFORM
21	METHYL ETHYL KETONE
22	1,2-DICHLOROETHANE
23	1,1,1-TRICHLOROETHANE
24	CARBON TETRACHLORIDE
25	BROMODICHLOROMETHANE
26	1,2-DICHLOROPROPANE
27	TRANS-1,3-DICHLOROPROPENE
28	TRICHLOROETHENE
29	BENZENE
30	DIBROMOCHLOROMETHANE
31	1,1,2-TRICHLOROETHANE
32	CIS-1,3-DICHLOROPROPENE
33	2-CHLOROETHYLVINYL ETHER
34	BROMOFORM
35	METHYLISOBUTYL KETONE (MIBK)
36	TETRACHLOROETHENE
37	1,1,2,2-TETRACHLOROETHANE
38	TOLUENE
39	CHLOROBENZENE
40	ETHYLBENZENE
41	XYLENE ISOMER
42	XYLENE ISOMERS

No	m/z	Scan	Time	Ref	RRT	Meth	Area(Hght)	Amount	%Tot
1	128	269	8:58	2	0.485	A BB	12730.	37.867 PPB	14.00
2	77	555	18:30	2	1.000	A BV	34945.	40.000 PPB	14.79
3	55	684	22:48	2	1.232	A BB	31063.	42.056 PPB	15.55
4	84	506	16:52	2	0.912	A BB	56985.	38.038 PPB	14.06
5	96	553	18:26	2	0.996	A BB	60904.	37.526 PPB	13.87
6	168	709	23:38	2	1.277	A BB	41919.	39.140 PPB	14.47
7	NOT	FOUND							
8	NOT	FOUND							
9	NOT	FOUND							
10	NOT	FOUND							
11	NOT	FOUND							
12	84	182	6:04	2	0.328	A BB	906.	1.737 PPB	0.64
13	43	201	6:42	2	0.362	A BB	1078.	14.662 PPB	5.42
14	NOT	FOUND							
15	NOT	FOUND							
16	NOT	FOUND							
17	NOT	FOUND							
18	NOT	FOUND							
19	NOT	FOUND							
20	NOT	FOUND							
21	43	355	11:50	2	0.640	A BV	4344.	17.934 PPB	6.63
22	NOT	FOUND							
23	NOT	FOUND							
24	NOT	FOUND							
25	NOT	FOUND							
26	NOT	FOUND							
27	NOT	FOUND							
28	NOT	FOUND							
29	78	507	16:54	2	0.914	A BB	630.	0.435 PPB	0.16
30	NOT	FOUND							
31	NOT	FOUND							
32	NOT	FOUND							
33	NOT	FOUND							
34	NOT	FOUND							
35	43	616	20:32	2	1.110	A BB	206.	0.391 PPB	0.14
36	164	675	22:30	2	1.216	A BB	233.	0.530 PPB	0.20
37	NOT	FOUND							
38	92	721	24:02	2	1.299	A*BB	85.	0.090 PPB	0.03
39	NOT	FOUND							
40	NOT	FOUND							
41	91	993	33:06	2	1.789	A BB	195.	0.163 PPB	0.06
42	91	1032	34:24	2	1.859	A*BB	198.	0.141 PPB	0.05

50 NG BFB 10-23-84 WEM

FRN 18759, FRN 83

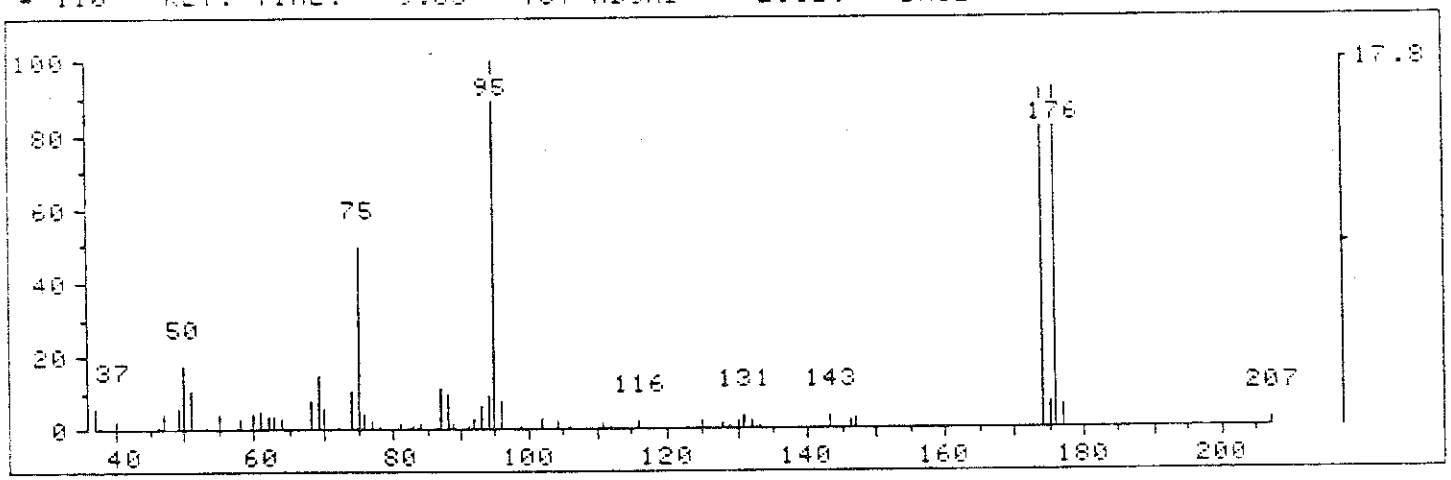
10.1800

179 SCANS (140 SCANS, 2.35 MINS)

1.0

MASS RANGE: 34.0, 254.5 TOTAL ABUND= 138403.

110 RET. TIME: 9.85 TOT ABUND= 2502. BASE PK/ABUND: 95.0/ 445.



FRN 18759, SPECTRUM # 110 RET.TIME: 9.85, 59 PEAKS

M/Z	REL ABUND	M/Z	REL ABUND	M/Z	REL ABUND	M/Z	REL ABUND
37	6.1	64	3.1	89	1.8	128	1.8
38	.4	68	7.9	91	.7	129	.2
40	2.5	69	14.6	92	3.4	130	2.5
46	.2	70	5.8	93	6.3	131	4.0
47	4.3	72	.7	94	9.4	132	2.7
49	6.1	74	10.6	95	100.0	133	.2
50	17.3	75	49.9	96	7.9	143	4.0
51	10.6	76	4.5	99	.7	146	2.5
53	.7	77	2.5	102	3.1	147	3.1
55	4.7	78	.7	104	2.2	174	92.1
58	3.4	81	1.8	106	1.3	175	7.0
60	4.5	83	.2	111	1.6	176	92.8
61	4.9	84	1.6	112	.2	177	6.3
62	3.8	87	11.5	116	2.5	207	2.2
63	4.0	88	9.9	125	2.2		

>PAUSE

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.

BFB EPA CRITERION VERIFIER 10-23-84

This program examines the relative abundances of a spectrum of BFB. It verifies that the relative abundances fall within the EPA guidelines. Any relative abundance outside of this criterion will be flagged with a '**'.

IS THE BFB SPECTRUM ON DISC (Y OR N)?Y

ENTER DISC FILE NUMBER?18759

ENTER SPECTRUM NUMBER OF BFB?110
BFB EPA CRITERION VERIFIER

DFN: 18759
SPECTRUM: 110

Mass	Rel. Abund.	Criterion
50	17.3034	15-40% MASS 95
75	49.8876	30-60% MASS 95
95	100	BASE PEAK
96	7.86517	5-9% MASS 95
173	0	< 2% MASS 174
174	92.1348	> 50% MASS 95
175	6.96629	5-9% MASS 174
176	92.809	> 95% BUT < 101% MASS 174
177	6.29214	5-9% MASS 176

NOTE: '**' indicates out of range!

CHAIN OF CUSTODY RECORD

SAMPLERS (Signature)

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE: WATER Diss.	WATER Diss.	AIR	SEDIMENT	PLANT TISSUE	ANIMAL TISSUE	NO. OF CONTAINERS
					✓					
					✓					
					✓		Teflon [illegible] in TOX - VOA			
					✓					
					✓					
							TOX			
							VOA			
							A			
							F			
							B			
							C			

Relinquished by: (Signature)	Received by: (Signature)	Date Time
[illegible]		
Relinquished by: (Signature)	Received by: (Signature)	Date Time
Relinquished by: (Signature)	Received by: (Signature)	Date Time
Relinquished by: (Signature)	Received by: (Signature)	Date Time
Received for Laboratory by: (Signature)	Norman Mead	10-19-84 11

Method of Shipment: [illegible]

E-CLOS F&B 4 8 81

ECOLOGICAL ANALYSTS, INC.

REPORT/ANALYSIS REVIEW RECORD
LEVEL NO. 2

CLIENT Ground/Water Technol. DATE SUBMITTED 19 Oct 84

PROJECT NUMBER Direct DATE DUE TO CLIENT 8 Nov 84

PROGRAM Chemistry TYPE REPORT EA# 7635-7641

AUTHOR H. James Reisinger TYPE or ANALYSIS Chemical

REPORT/ANALYSIS CHECKLIST

QA/QC ITEM	REVIEWER	DATE
1. Samples/data collected, transported, and received according to study plan requirements.	N/A	
2. Samples prepared and processed according to study plan requirements.	N/A	
3. Samples and data collected and analyzed using calibrated equipment.	MM Robison	9 Nov 84
4. Quality control activities completed.	MM Robison	9 Nov 84
5. Data checked for correctness, source identification, and data confirmation.	MM Robison	9 Nov 84
6. Calculations checked:		
- Hand calculations checked by reviewer.	MM Robison	9 Nov 84
- Documented and verified computer programs used.	MM Robison	9 Nov 84
7. Results reviewed for compliance with study plan requirements.	N/A	
8. Reported results and facts checked against original sources.	MM Robison	9 Nov 84
9. Figures and tables checked for correct presentation of data.	MM Robison	9 Nov 84

	AUTHOR	DATE
10. Commentary reviewed and resolved.	[illegible]	[illegible]

11. All study plan and quality assurance/control requirements have been met and the report/analysis is approved:

PROGRAM MANAGER DATE

PROJECT MANAGER DATE

[illegible] [illegible]
DIRECTOR DATE

FILED BY PROJECT MANAGER

EA-QA-07

611 CASCADE WEST PARKWAY, S.E. • GRAND RAPIDS, MICHIGAN 49506 • (616) 942-0970

EDI ENGINEERING & SCIENCE
ENGINEERS / GEOLOGISTS / BIOLOGISTS / CHEMISTS

August 30, 1985
20448

Mr. Tom Applegate
Fisher Guide Division
1400 Lowell Street
Elyria, OH 44035

Dear Mr. Applegate:

Enclosed are the results of the additional field and laboratory studies for the design of a holding cell for non-hazardous sludges at your Elyria, Ohio plant. The Solid Waste Disposal Licenses and Regulations (OAC-3745-27) were used as a guide for the study.

Three soil borings, SB1, SB2, and SB~~3~~5 and one observation well were drilled to depths ranging from 9.5 to 22 feet on 7/17/85 and 7/18/85. SB-3 and SB-4 were not drilled because of difficult access. Locations of the borings and well were determined by taping and are shown in the enclosed blueprint.

Soils encountered include silty clays with traces of sand and gravel, and sand mixed with silt and clay. Sandstone was encountered at 9.1, 5.5, and 11.3 feet below grade in SB-1, OW-1 and SB-5 respectively. In SB-2 siltstone was encountered at 21.0 feet below grade. Groundwater depths as measured in the borings ranged from 5.85 to 11.5 feet below ground surface. Standard penetration resistances indicated clay with a very stiff to hard consistency and very dense sand.

Field percolation rates were as follows:

SB-1 at 30"	1.63×10^{-3} cm/sec.
SB-1 at 6.2'	9.53×10^{-3} cm/sec.
SB-2 at 30"	1.78×10^{-4} cm/sec.
SB-5 at 7.5'	9.53×10^{-3} cm/sec.

28z1/tdm

Hydrometer analysis and Atterberg limit tests were run on 3 representative samples to determine the textural classification according to the Unified Soil Classification System. Results of these tests are attached. The Unified Soil Classification System designation for the soils tested are as follows:

SB-1 at 8' - SM (silty sand)
SB-2 at 16.5' - SC/SM (clayey sand/silty sand)
SB-5 at 4' - CL (inorganic clay of low to medium plasticity, sandy or silty clays)

A groundwater sample was taken from OW-1 on 7/19/85 for analysis. Parameters tested for include those listed in Section 06 of OAL-3745-27 Solid Waste Disposal Facility Plan Approval. None of the parameters tested exceeded the National Interim Primary Regulations for Drinking Water. Iron at 1.1 mg/l, however, and manganese at 0.45 mg/l exceeded the National Secondary Regulations for drinking water of 0.3 mg/l and 0.05 mg/l for iron and manganese respectively. The National Secondary Regulations are for aesthetic qualities and are not federally enforceable.

Please contact me with any questions you have regarding these results.

Sincerely,

EDI ENGINEERING AND SCIENCE

Jennifer Kilgore

Jennifer Kilgore
Design Engineer

Robert Masselink

Robert L. Masselink, P.E.
Project Manager

/tdm

cc: Mr. Joe Fannon

28z1/tdm

SOIL BORINGS

28z1/tdm

SHEET 1 OF 4

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CLIENT Fisher Guide

PROJECT NO. 20448

DATE 7-18-85

PERMIT NO.

PROJECT Fisher Guide

LOCATION Elyria, Ohio

EQUIPMENT GME 45B

TECHNICIAN B. Frier

BORING NO. SB - 1

SURFACE ELEV. --

HOLE PLUGGED WITH Excavated soils and benseal.

BORING LOCATION

BORING DEPTH FROM	BORING DEPTH TO		DEPTH OF TEST	NO. BLOWS 1st 6 IN.	NO. BLOWS 2nd 6 IN.	NO. BLOWS 3rd 6 IN.	NO. BLOWS LAST 12 IN.
0.0	0.5	TOPSOIL					
0.5	2.5	TOPSOIL AND SAND - trace fine gravel	2½				
2.5	3.5	CLAY - brown, silty, trace sand	5				
3.5	7.0	CLAY - dark brown, slightly mottled with grey, occasional	7.5				
		shale and coarse sand.	9.2	100/4"			
7.0	8.0	SANDSTONE - grey, weathered, trace clay					
8.0	9.2	CLAY - grey, silty, some fine sand, sandstone pieces.					
9.2	9.5	SANDSTONE					
		Note: Moved hole 5' north and drilled 30" hole for perc					
		test.					
		Percolation rate at 6.2' - 9.53×10^{-3}					
		Percolation rate at 30" depth - 1.63×10^{-3} cm/sec					

GROUNDWATER

ENCOUNTERED AT 8.0 FT.

AFTER COMPLETION 7'8" FT.

AFTER 24 HRS 5'4" FT.

BORING CAVE IN 7'9" FT.

WELL DATA

CASING USED: TYPE

DIAMETER

LENGTH

SCREEN LENGTH & SLOT SIZE

HT. ABOVE GROUND

SHEET 2 OF 4

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CLIENT Fisher Guide

PROJECT NO. 20448

DATE 7-17-85

PERMIT NO.

PROJECT Fisher Guide

LOCATION Elyria, Ohio

EQUIPMENT GME 45B

TECHNICIAN B. Frier

BORING NO. SB-2

SURFACE ELEV. --

HOLE PLUGGED WITH Excavated soils and benseal.

BORING LOCATION

BORING DEPTH FROM	BORING DEPTH TO		DEPTH OF TEST	NO. BLOWS 1st 6 IN.	NO. BLOWS 2nd 6 IN.	NO. BLOWS 3rd 6 IN.	NO. BLOWS LAST 12 IN.
0.0	0.5	TOPSOIL					
0.5	7.0	CLAY - brown and grey mottled, silty, trace sand, some roots	2½				
7.0	7.5	CLAY - grey, silty, some sand	5				
7.5	14.0	SAND - grey, with pieces of sandstone, silty	7.5				
14.0	16.0	CLAY - reddish brown, silty	10	33	52	51	103
16.0	21.0	SAND - dark brown with silt and clay	12.5	31	32	29	61
21.0	22.0	SILTSTONE - dark brown with fine sand	15				
			17.5	27	28	41	69
		Note: Moved hole 5' east and drilled 30" hole for	20	32	40	78	118
		perc test.	21.6	100/3"			
		Percolation rate - 1.78×10^{-4} cm/sec.					

GROUNDWATER

ENCOUNTERED AT -- FT.

AFTER COMPLETION -- FT.

AFTER 12 HRS 10 FT.

BORING CAVE IN FT.

WELL DATA

CASING USED: TYPE

DIAMETER

LENGTH

SCREEN LENGTH & SLOT SIZE

HT. ABOVE GROUND

SHEET 3 OF 4

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CLIENT Fisher Guide

PROJECT NO. 20448

DATE 7-17-85

PERMIT NO.

PROJECT Fisher Guide

LOCATION Elyria, Ohio

EQUIPMENT GME 45B

TECHNICIAN B. Frier

BORING NO. SB - 5

SURFACE ELEV. --

HOLE PLUGGED WITH Excavated soils and benseal.

BORING LOCATION

BORING DEPTH FROM	BORING DEPTH TO		DEPTH OF TEST	NO. BLOWS 1st 6 IN.	NO. BLOWS 2nd 6 IN.	NO. BLOWS 3rd 6 IN.	NO. BLOWS LAST 12 IN.
0.0	0.5	TOPSOIL					
0.5	9.0	CLAY - light brown to brown and grey mottled, little silt,	2.5	6	7	11	18
		some fine to coarse sand, trace shale.	5	7	14	18	32
9.0	11.3	SAND - grey, fine, pieces of sandstone, trace clay, moist	7.5	13	19	19	38
11.3	11.5	SANDSTONE - grey, wet	10	24	28	30	58
			11.2	100/3"			
		Note: Moved 5' east and drilled hole to 7.5'. Installed					
		temporary well for deep perc test.					
		Percolation rate 9.53 X 10^{-3} cm/sec					

GROUNDWATER

ENCOUNTERED AT 11.5 FT.

AFTER COMPLETION 10'8" FT.

AFTER 1/2 HRS 9.5' FT.
After 1 hr 8.0'

BORING CAVE IN FT.

WELL DATA

CASING USED: TYPE

DIAMETER

LENGTH

SCREEN LENGTH & SLOT SIZE

HT. ABOVE GROUND

EDI ENGINEERING & SCIENCE
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611 CASCADE W. PKWY. S.E., GRAND RAPIDS, MI 49506, (616) 942-0970

Well/Boring No.: OW-1
Client: Fisher Guide
Project No.: 20448
Permit No.:
Date Started 7/18 Finished 7/18/85

Well / Boring Log Sheet

County	Township	Fraction	Section	T	R
Elyria, OH		1/4 1/4 1/4			

Contractor: Stearns
Address: Dutton, MI.
Equipment: CME 45B
Supervisor: B. Frier

Drilling Method(s) **Depth**
Hollow Stem Auger

Grouting/Seal

Depth	To	Material
7.0	16.5	Sand
5.0	7.0	Bentonite Pellets
0	5.0	Bentonite Grout

Development:

Water Level: 5.85 Ft. Below: TOC
Measured On:

Screen:
Manufacturer:
Material: PVC
Model:
Slot/Gauze: 0.010 Dia.: 2"
Length: 5'
Depth Set: 11.5' To: 16.5'

Casing

Dia.	Type	Depth Set
2"	PVC	+3.1 To 11.5
		To

Elevation
Casing: 217.14
Ground: 214.0
Ref. Pt.: Plant Datum

Remarks (include here, other data available)

Location Sketch

Thick-ness	Depth To Base	Description	Remarks
0.5	0.5	TOPSOIL	
8.5	9.0	CLAY - brown, silty, trace med to coarse sand, gravel	
		pieces sandstone grades grey at 7.5'	
2.0	11.0	CLAY - grey, sandy, with pieces sandstone	
5.5	16.5	SANDSTONE - wet	

ATTERBERG LIMIT TESTS
HYDROMETER TESTS

CLIENT - GM ELYRIA
JOB NO. - 20448
BORING NO. - 2
DEPTH - 16.5 18.5
TESTED - BY - CAROLINA

WILLIAMS AND WORKS, INC.
HYDROMETER GRAIN SIZE ANALYSIS

HYDROMETER NO = 152 H SAMPLE WT = 50.1 GRAMS DISPERSING AGENT = NA(PO3)4
ZERO CORR = 3.0 UNITS SPECIFIC GRAVITY = 2.67 CONCENTRATION = 5.0 GM/L
MENS CORR = 1.0 UNITS A = 1.00

HYDROMETER TEST RUN ON SAMPLE PASSING NO. 10 SIEVE
PERCENT OF TOTAL SAMPLE PASSING NO. 10 SIEVE = 93.0

ELAPSED TIMES (MIN)	TEMP DEG(C)	*HYDROMETER READING* ACTUAL R(A)	CORRECTED R(C)	MENS	L	K	*PERCENT FINER* TEST SAMPLE	ENTIRE SAMPLE	D-(MM)
.50	22.0	27.0	24.4	28.0	11.71	.0133	48.5	45.1	.0642
1.00	22.0	25.0	22.4	26.0	12.04	.0133	44.5	41.4	.0460
2.00	22.0	23.5	20.9	24.5	12.28	.0133	41.5	38.6	.0329
4.00	22.0	22.0	19.4	23.0	12.53	.0133	38.5	35.8	.0235
8.00	22.0	18.5	15.9	19.5	13.10	.0133	31.6	29.4	.0170
16.00	22.0	17.0	14.4	18.0	13.35	.0133	28.6	26.6	.0121
30.00	22.0	16.0	13.4	17.0	13.51	.0133	26.6	24.8	.0089
60.00	22.0	15.0	12.4	16.0	13.68	.0133	24.6	22.9	.0063
120.00	22.0	13.0	10.4	14.0	14.00	.0133	20.7	19.2	.0045
240.00	22.0	12.0	9.4	13.0	14.17	.0133	18.7	17.4	.0032
480.00	22.0	.0	-2.6	1.0	16.14	.0133	-5.2	-4.8	.0024
1440.00	22.0	9.0	6.4	10.0	14.66	.0133	12.7	11.8	.0013

GRAIN-SIZE SUMMARY
(PERCENTS)

SAND (GREATER THAN .074MM) = 53.3
SILT (.074MM TO .005MM) = 26.4
CLAY,COLLOIDS + GELS (LESS THAN .005MM) = 20.3

FROST SUSCEPTIBILITY (LESS THAN .02MM) = 32.6

Unified Soil Classification - SC-SM

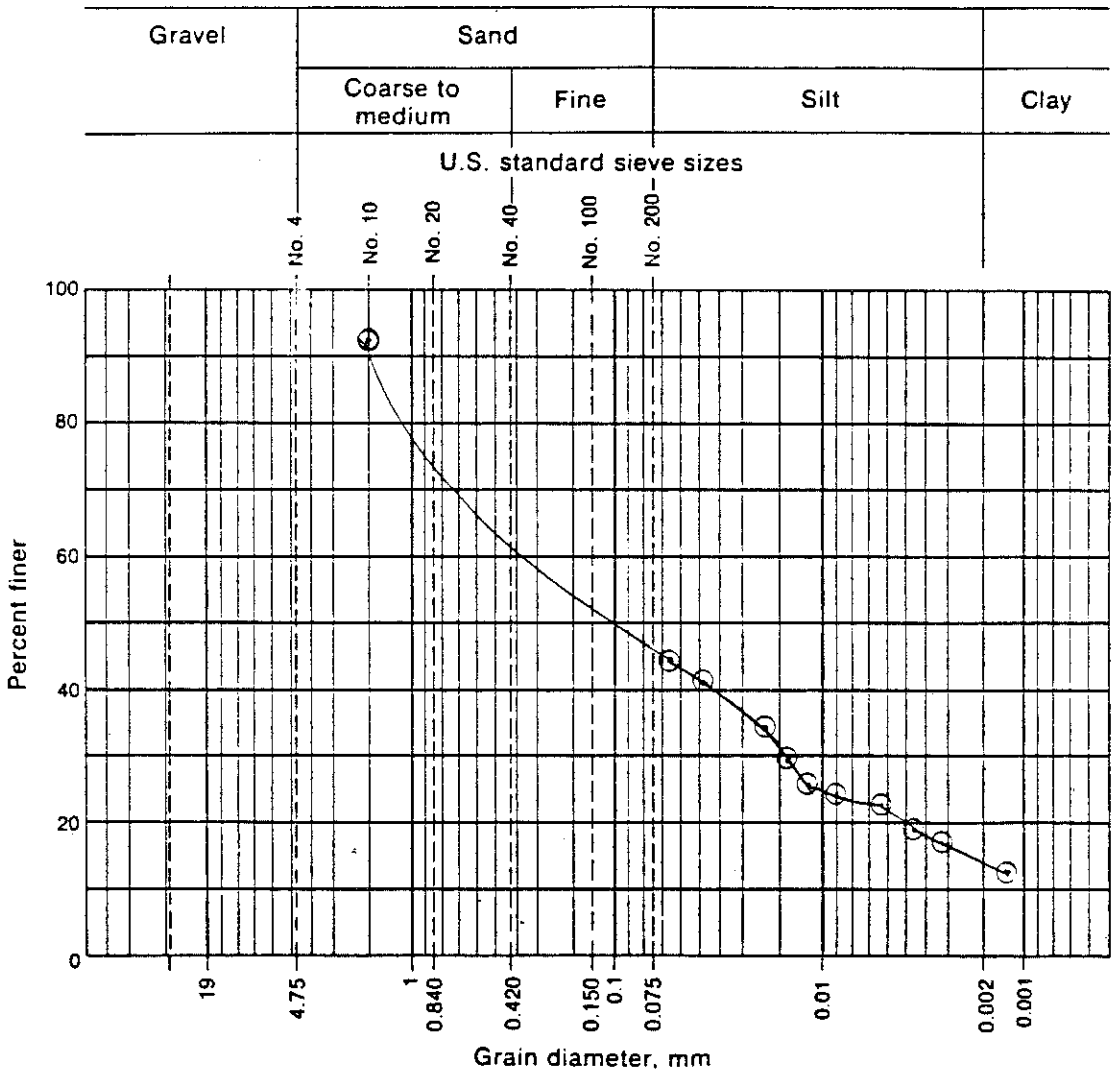
GRAIN SIZE DISTRIBUTION Data Sheet 6

Project Fisher Guide Job. No. 20448

Location of Project Elyria, OH Boring No. 2 Sample No. -

Description of Soil Sand - Dk. brown w/ silt and clay. Depth of Sample 16.5-18.5

Tested By. C. Mallory Date of Testing -



Visual soil description Sand - dark brown with silt and clay.

Soil classification:

USCS System SC-SM

ATTERBERG LIMITS DETERMINATION

Data Sheet 3

Project General Motors Job No. 20448

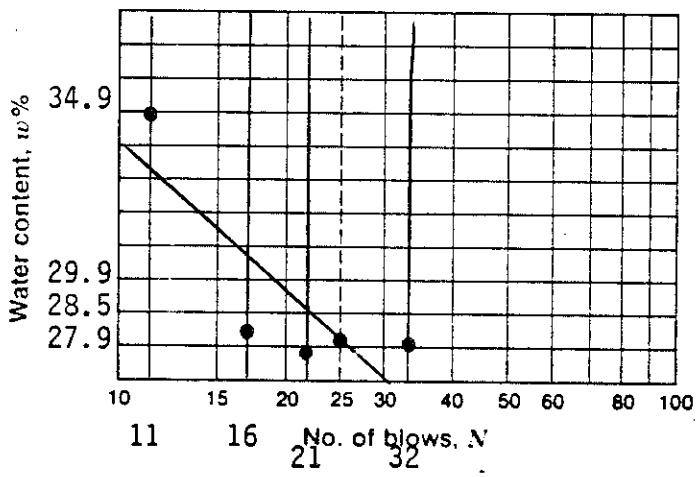
Location of Project Elyria, Ohio Boring No. 2 Sample No. 1

Description of Soil SAND - dark brown with silt and clay

Depth of Sample 16.5 Tested By Mallory Date Aug 6, 1985

Liquid Limit Determination

Can no.	5	34	6	2		
Wt. of wet soil	5.9	5.5	6.8	8.5		
Wt. of dry soil	4.6	4.3	5.3	6.3		
Wt. of can	-	-	-	-		
Wt. of dry soil	-	-	-	-		
Wt. of moisture	1.3	1.2	1.5	2.2		
Water content, w%	28.1	27.9	28.5	34.9		
No. of blows, N	32	21	16	11		



Flow index F_i = _____

Liquid limit = 28.2

Plastic limit = 23.3

Plasticity index I_P = 6.6

Plastic Limit Determination

Can no.	-			
Wt. of wet soil	9.0			
Wt. of dry soil	7.3			
Wt. of can	-			
Wt. of dry soil	-			
Wt. of moisture	1.7			
Water content, $w\% = w_P$	23.3			

CLIENT - GM ELYRIA
JOB NO. - 20448
BORING NO. - 5
DEPTH - 4-5.5
TESTED - 080585 BY - CAROLINA

WILLIAMS AND WORKS, INC.
HYDROMETER GRAIN SIZE ANALYSIS

HYDROMETER NO = 152 H SAMPLE WT = 50.1 GRAMS DISPERSING AGENT = NA(PO3)4
ZERO CORR = 3.0 UNITS SPECIFIC GRAVITY = 2.70 CONCENTRATION = 5.0 GM/L
MENS CORR = 1.0 UNITS A = .99

HYDROMETER TEST RUN ON SAMPLE PASSING NO. 10 SIEVE
PERCENT OF TOTAL SAMPLE PASSING NO. 10 SIEVE = 88.5

ELAPSED TIMES (MIN)	TEMP DEG(C)	*HYDROMETER READING* ACTUAL R(A)	CORRECTED R(C)	MENS	L	K	*PERCENT FINER* TEST SAMPLE	ENTIRE SAMPLE	D-(MM)
.50	22.0	33.0	30.4	34.0	10.72	.0131	60.0	53.1	.0609
1.00	22.0	32.5	29.9	33.5	10.81	.0131	59.0	52.2	.0432
2.00	22.0	32.0	29.4	33.0	10.89	.0131	58.0	51.4	.0307
4.00	22.0	31.0	28.4	32.0	11.05	.0131	56.1	49.6	.0219
8.00	22.0	30.0	27.4	31.0	11.22	.0131	54.1	47.9	.0156
16.00	22.0	28.5	25.9	29.5	11.46	.0131	51.1	45.2	.0111
30.00	22.0	27.0	24.4	28.0	11.71	.0131	48.2	42.6	.0082
60.00	22.0	25.0	22.4	26.0	12.04	.0131	44.2	39.1	.0059
120.00	22.0	23.5	20.9	24.5	12.28	.0131	41.3	36.5	.0042
240.00	22.0	20.0	17.4	21.0	12.86	.0131	34.3	30.4	.0030
480.00	22.0	.0	-2.6	1.0	16.14	.0131	-5.1	-4.5	.0024
1440.00	22.0	11.5	8.9	12.5	14.25	.0131	17.6	15.5	.0013

GRAIN-SIZE SUMMARY
(PERCENTS)

SAND (GREATER THAN .074MM)	=	46.4
SILT (.074MM TO .005MM)	=	15.7
CLAY,COLLOIDS + GELS (LESS THAN .005MM)	=	37.9
FROST SUSCEPTIBILITY (LESS THAN .02MM)	=	49.2

Unified Soil Classification - CL

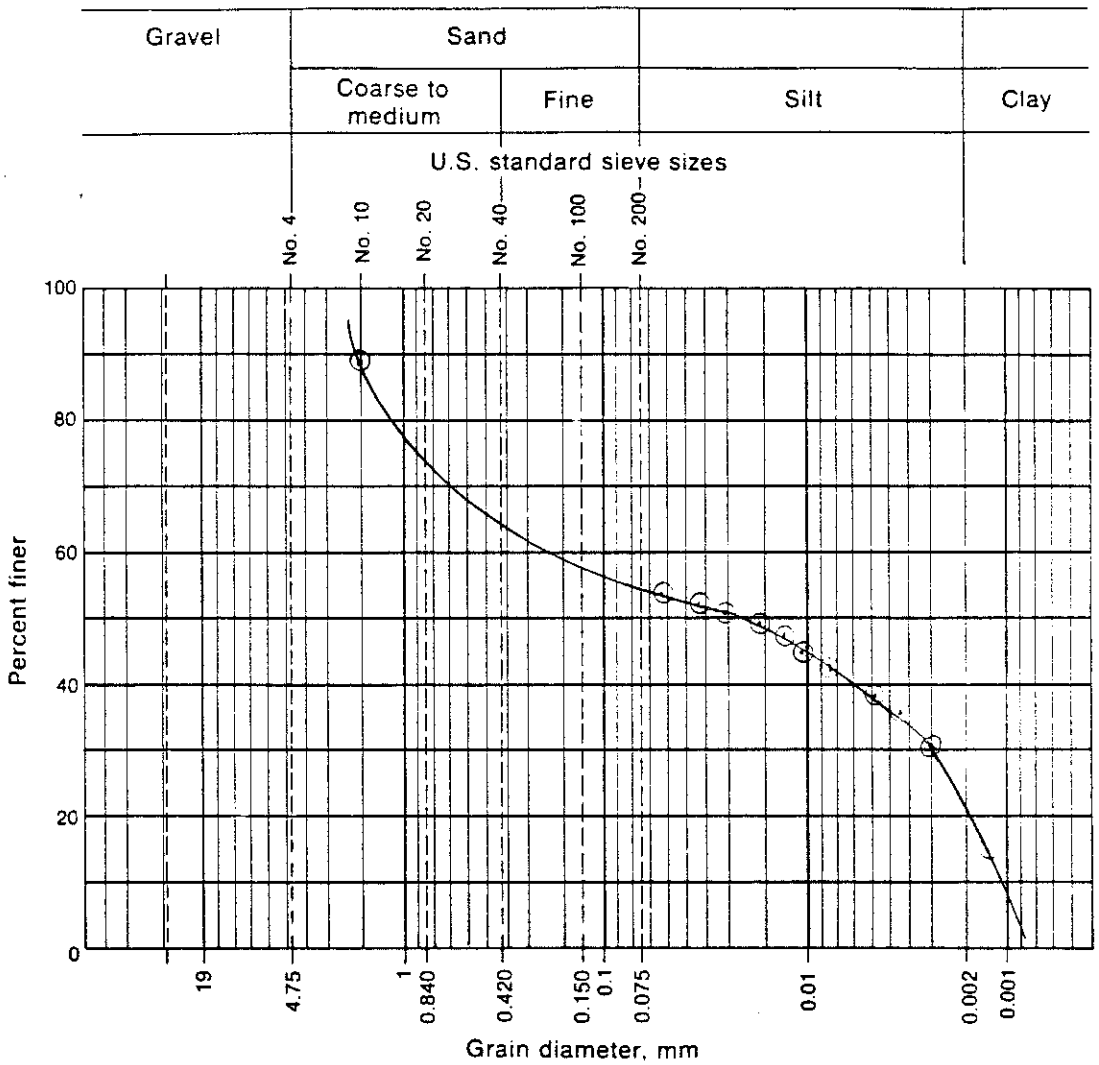
GRAIN SIZE DISTRIBUTION Data Sheet 6

Project Fisher Guide Job. No. 20448

Location of Project Elyria, OH Boring No. 5 Sample No. --

Description of Soil Clay, mottled, silty, Sandy. Depth of Sample 4-5.5

Tested By. C. Mallory Date of Testing



Visual soil description Clay - light brown to brown and grey mottled, little silt, some fine to coarse sand, trace shale pieces.

Soil classification:

USCS System CL

ATTERBERG LIMITS DETERMINATION Data Sheet 3

Project General Motors Job No. 20448

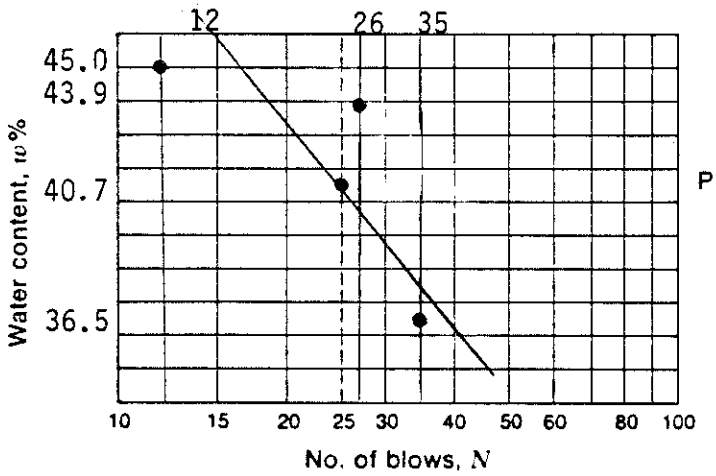
Location of Project Elyria, Ohio Boring No. 5 Sample No. 1

Description of Soil CLAY - brown and grey mottled, little silt, some fine to coarse sand, trace shale

Depth of Sample 4-5.5 Tested By Mallory Date Aug 6, 1985

Liquid Limit Determination

Can no.	32	16	13			
Wt. of wet soil	7.1	5.6	5.8			
Wt. of dry soil	5.2	3.9	4.0			
Wt. of can	-	-	-			
Wt. of dry soil	-	-	-			
Wt. of moisture	1.9	1.7	1.8			
Water content, w%	36.5	43.9	45.0			
No. of blows, N	35	26	12			



Flow index F_i = _____

Liquid limit = 40.7

Plastic limit = 18.9

Plasticity index I_P = 21.8

Plastic Limit Determination

Can no.				
Wt. of wet soil	8.8			
Wt. of dry soil	7.4			
Wt. of can	-			
Wt. of dry soil	-			
Wt. of moisture	1.4			
Water content, $w\% = w_P$	18.9			

CLIENT - GM ELYRIA
JOB NO. - 20448
BORING NO. - 2
DEPTH - 8
TESTED - 080685 BY - CAROLINA

WILLIAMS AND WORKS, INC.
HYDROMETER GRAIN SIZE ANALYSIS

HYDROMETER NO = 152 H SAMPLE WT = 50.7 GRAMS DISPERSING AGENT = NA(PO3)4
ZERO CORR = 3.0 UNITS SPECIFIC GRAVITY = 2.67 CONCENTRATION = 5.0 GM/L
MENS CORR = 1.0 UNITS A = 1.00

HYDROMETER TEST RUN ON SAMPLE PASSING NO. 10 SIEVE
PERCENT OF TOTAL SAMPLE PASSING NO. 10 SIEVE = 100.0

ELAPSED TIMES (MIN)	TEMP DEG(C)	*HYDROMETER READING* ACTUAL R(A)	CORRECTED R(C)	MENS	L	K	*PERCENT FINER* TEST SAMPLE	ENTIRE SAMPLE	D-(MM)
.50	22.0	26.0	23.4	27.0	11.87	.0133	45.9	45.9	.0647
1.00	22.0	25.0	22.4	26.0	12.04	.0133	44.0	44.0	.0460
2.00	22.0	24.0	21.4	25.0	12.20	.0133	42.0	42.0	.0328
4.00	22.0	21.0	18.4	22.0	12.69	.0133	36.1	36.1	.0236
8.00	22.0	20.0	17.4	21.0	12.86	.0133	34.2	34.2	.0168
16.00	22.0	17.0	14.4	18.0	13.35	.0133	28.3	28.3	.0121
30.00	22.0	13.0	10.4	14.0	14.00	.0133	20.4	20.4	.0091
60.00	22.0	11.0	8.4	12.0	14.33	.0133	16.5	16.5	.0065
120.00	22.0	10.0	7.4	11.0	14.50	.0133	14.5	14.5	.0046
240.00	22.0	8.0	5.4	9.0	14.82	.0133	10.6	10.6	.0033
480.00	22.0	.0	-2.6	1.0	16.14	.0133	-5.1	-5.1	.0024
1440.00	22.0	7.5	4.9	8.5	14.91	.0133	9.6	9.6	.0014

GRAIN-SIZE SUMMARY
(PERCENTS)

SAND (GREATER THAN .074MM)	=	53.3
SILT (.074MM TO .005MM)	=	31.7
CLAY,COLLOIDS + GELS (LESS THAN .005MM)	=	15.0
FROST SUSCEPTIBILITY (LESS THAN .02MM)	=	35.2

Unified Soil Classification - SM

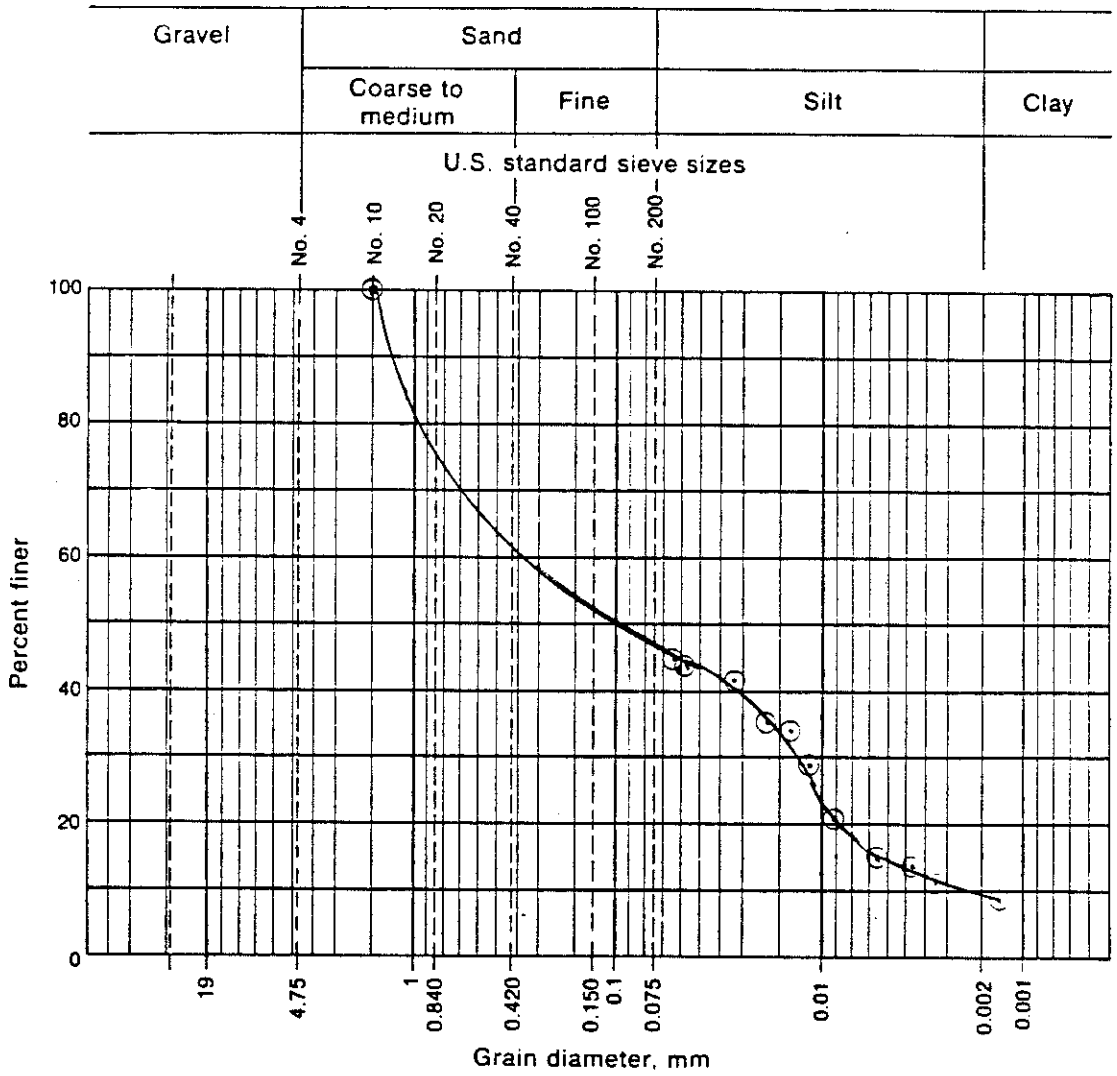
GRAIN SIZE DISTRIBUTION Data Sheet 6

Project Fisher Guide Job. No. 20448

Location of Project Elyria, OH Boring No. 2 Sample No. 1

Description of Soil Sand w/ silt Depth of Sample 8

Tested By. C. Mallory Date of Testing -



Visual soil description Sand with pieces of sandstone, silty

Soil classification:

USCS System SM

GROUNDWATER QUALITY

ANALYTICAL SERVICES
EDI LABORATORY REPORT

CLIENT: G.M. FISHER GUIDE DIVISION
PROJECT NO.: 25475
LOCATION: ELYRIA, OHIO (20448)
SAMPLED BY: BRETT FRIER
DESCRIPTION: GROUNDWATER QUALITY STUDY

DATE SAMPLED: 07/19/85 TIME: PM
DATE RECEIVED: 07/23/85 TIME: 12:00 PM
DATE COMPLETED: 08/15/85
SCHEDULED COMPLETION: 8/15/85
ANALYST: PG,MK,MB
QUALITY CONTROL REVIEW BY: DMF
WORKSHEET NO: 30

	WELL #1	DETECTION LIMIT	UNITS
EDI SAMPLE NO:	53789		
ALUMINUM,TOTAL	<0.30	0.30	mg/l
ARSENIC,TOTAL	2.6	2.0	ug/l
BARIUM,TOTAL	0.11	0.10	mg/l
CADMIUM,TOTAL	<0.01	0.01	mg/l
CALCIUM	100	3.2	mg/l
COPPER,TOTAL	<0.01	0.01	mg/l
CHROMIUM,HEXAVALENT	<0.05	0.05	mg/l
CHROMIUM, TRIVALENT	<0.05	0.05	mg/l
IRON,TOTAL	1.1	0.01	mg/l
LEAD,TOTAL	<0.02	0.02	mg/l
MAGNESIUM	28	0.3	mg/l
MANGANESE	0.46	0.01	mg/l
MERCURY,TOTAL	0.20	0.20	ug/l
NICKEL,TOTAL	<0.01	0.01	mg/l

ANALYTICAL SERVICES
EDI LABORATORY REPORT

CLIENT: G.M. FISHER GUIDE DIVISION
PROJECT NO.: 25475
LOCATION: ELYRIA, OHIO (20448)
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DATE COMPLETED: 08/15/85
SCHEDULED COMPLETION: 8/15/85
ANALYST: PG,MK,MB
QUALITY CONTROL REVIEW BY: DMF
WORKSHEET NO: 31

	WELL #1	DETECTION LIMIT	UNITS
EDI SAMPLE NO:	53789		
SELENIUM,TOTAL	<2.0	2.0	ug/l
SILVER,TOTAL	<0.01	0.01	mg/l
SODIUM	31.	0.70	mg/l
ZINC,TOTAL	0.10	0.02	mg/l
CHROMIUM,TOTAL	<0.01	0.01	mg/l

ANALYTICAL SERVICES
EDI LABORATORY REPORT

CLIENT: G.M. FISHER GUIDE DIVISION
PROJECT NO.: 25475
LOCATION: ELYRIA, OHIO (20448)
SAMPLED BY: BRETT FRIER
DESCRIPTION: GROUNDWATER QUALITY STUDY

DATE SAMPLED: 07/19/85 TIME: PM
DATE RECEIVED: 07/23/85 TIME: 12:00 PM
DATE COMPLETED: 08/15/85
SCHEDULED COMPLETION: 8/15/85
ANALYST: PG,NJB,MB
QUALITY CONTROL REVIEW BY: DMF
WORKSHEET NO: 32

	WELL #1	DETECTION LIMIT	UNITS
EDI SAMPLE NO:	53789		
CARBON,TOTAL ORGANIC	<5.0	5.0	mg/l
CHLORIDE	18	1.0	mg/l
CONDUCTIVITY @ 25 *C	725	5.0	umhos/cm
NITROGEN, AMMONIA	1.0	0.05	mg/l
NITROGEN, NITRATE	<0.05	0.05	mg/l
NITROGEN, (TKN)	1.0	1.0	mg/l
pH VALUE	7.4	-----	std. units
PHENOL,TOTAL	<0.01	0.01	mg/l
SULFATE	97	5.0	mg/l
TOX	48	10	ug/l as Cl

CLOSURE PLAN
HAZARDOUS WASTE MANAGEMENT FACILITIES

FISHER GUIDE DIVISION
GENERAL MOTORS CORPORATION
ELYRIA, OHIO, PLANT

PREPARED IN ACCORDANCE WITH REQUIREMENTS OF
40 CFR 264.112, 113, 114, 115, 142, 228

March 18, 1985

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TECHNICAL ASSESSMENT OF CHEMFIX PROCESS

I. GENERAL INFORMATION

Under the U.S. EPA regulations, 40 CFR 264 Subpart G, Section 264.112, the Fisher Guide, Elyria, Ohio, Plant, an interim treatment, storage, and disposal facility, is required to keep on record a written closure plan addressing its hazardous waste management facilities. This closure plan thus details those activities necessary to permanently close three (3) F006 sludge dewatering surface impoundments and associated piping, and two toluene diisocyanate treatment tanks at the Elyria plant. This closure plan also addresses the partial closure of two hazardous waste drum storage areas. These areas will be closed as TSD facilities, but will continue to be operated under generator status for interim storage of hazardous wastes prior to shipment off-site for disposal.

EPA ID #	OHD004301091
Name of Facility:	General Motors Corporation Fisher Guide Division (Formerly Fisher Body Division) Elyria Plant
Facility Operator:	Same
Mailing Address:	P.O. Box 4025 Elyria, Ohio 44036
Facility Contact:	Thomas Applegate 216/329-1257

This closure plan is designed to minimize or eliminate threats to human health and the environment, and to ensure that the facility will not require further maintenance and controls. It will be designed to avoid escape of hazardous wastes and hazardous waste constituents via leachate, contaminated rainfall, or waste decomposition products emitted to the ground or surface waters.

II. FACILITY DESCRIPTION

A. General Description

The General Motors Corporation, Fisher Guide Division, Elyria Plant is located in Lorain County, Ohio, at 1400 Lowell Street, in the town of Elyria.

This plant manufactures approximately 1,600 automotive component parts for General Motors vehicles. These parts include assorted plastic and metal automotive hardware, plastic interior/exterior trim, urethane foam seat backs, cushions, and arm rests. The processes involved in these manufacturing activities include machining, stamping, forming and welding of metal parts, metal coating, prime/finish painting, thermoforming and injection molding of thermoplastic parts, and foam molding.

Fisher Guide operates its own wastewater treatment facility at the Elyria Plant. All process wastewater from plant operations is discharged to this facility. Wastewater treatment includes hexavalent chrome reduction, pH adjustment, metals precipitation, water/solids separation, sludge dewatering, oil emulsion breaking, and oil/water separation. The effluent from the wastewater treatment operation is discharged to a storm sewer, and is regulated under NPDES permit #S301*BD. No wastes from outside sources are accepted for treatment, storage, or disposal at this facility.

The waste water treatment plant also incorporates two open concrete tanks for the purpose of decontaminating inactive production equipment. Demolished piping, tankage, and assorted plating equipment are occasionally placed in these tanks for the purpose of rinsing them prior to disposal. This treatment process is considered to be part of the waste water treatment process, and thus regulated under the Clean Water Act. Consequently, these decontamination tanks were erroneously incorporated into the plant's Part A Hazardous Waste Permit Application as hazardous waste treatment code #T04. Therefore, these tanks will not be addressed in this closure plan.

The electroplating operations within the manufacturing facility utilize five steel tanks for the temporary holding of spent plating solutions prior to treatment at our waste water treatment facility. The primary purpose of these tanks is to provide the necessary retention time to permit the concentrated solutions to be metered slowly to the waste water treatment plant. Since these tanks are also considered part of the waste water treatment process their inclusion into the plant Part A Application, as hazardous waste storage code #S02, was also erroneous. For this reason these tanks will not be addressed in this closure plan either.

The wastewater treatment facility incorporates three (3) sludge dewatering impoundments located south of the manufacturing building. These impoundments are used to dewater metal hydroxide wastewater treatment sludge (F006 U.S. EPA Waste ID Code) resulting from electroplating operations. The dewatering beds are hazardous waste surface impoundments, and as such are identified on the plant Part A Application by the process codes S04 and T02.

The location and construction of the three (3) sludge dewatering impoundments are shown in the attached drawing at the back of this report in Exhibit A. Each impoundment is 200 feet wide by 500 feet long, and is enclosed entirely by earthen berms. The bed of each impoundment is comprised of successive layers of sand and gravel above a network of four inch (4") drain tiles. This underdrain system allows the water in the sludge to percolate into the drainage network and be conveyed by gravity to the storm sewer.

Each impoundment has a useful sludge holding depth of up to four feet (4'), with a maximum capacity of 15,000 cubic yards of sludge. The dewatering system is capable of yielding a sludge solids content of up to 36 percent by weight.

The plant also incorporates a treatment facility for neutralizing non-reacted raw materials used in urethane foam molding (toluene diisocyanate). This facility consists of two open concrete tanks into which open drums of waste raw materials are placed and allowed to fully react. The neutralization of toluene diisocyanate (TDI) is assisted by the addition of water at this site. Fully reacted foam is subsequently disposed off-site in an approved landfill. This treatment process is identified on the plant Part A Application as hazardous waste treatment process code #T04.

Drummed hazardous wastes generated within the manufacturing plant are stored in 55 gallon drums in the marshalling area at column Y-8 within the plant prior to being transferred to an outdoor storage pad located at the east side of the coal car unloading area. Hazardous waste stored at these sites consists of waste paints, cleaners, and solvents from production and maintenance operations. All drums placed in the outside drum storage pad are subsequently removed by contracted waste hauler and disposed in a manner appropriate for each waste. These drum storage areas are collectively identified on the plant Part A Application as hazardous waste storage code #S01.

B. Proposed Facility Changes

Prior to July 31, 1984, the wastewater treatment plant processed approximately 945,000 gallons of wastewater daily. At this rate, an estimated 55,000 gallons per day of sludge slurry, at two (2) percent solids, was pumped to the sludge dewatering impoundments. This equated to approximately 16 tons of 30 percent solids sludge generated each day, for an estimated annual sludge production rate of 4,800 tons. As of July 31, 1984, the Elyria Plant discontinued the majority of its electroplating operations. Consequently, the sludge loading of the wastewater treatment plant has been reduced to the extent that sludge dewatering could be accomplished by means other than the three existing sludge dewatering impoundments.

Fisher Guide is pursuing a revision to the operating scheme of the wastewater treatment facility to include a plate filter press for the dewatering of sludge as it is produced. This will eliminate the need for the three dewatering impoundments and will allow for their final closure. It will also pave the way for the Elyria Plant to withdraw its Part A Application and change its operating status from an interim TSD facility to Generator status. The projected date for final closure of the impoundments is October 24, 1986, and withdrawal of TSD status will follow shortly thereafter.

A groundwater monitoring program encompassing the three sludge dewatering impoundments has revealed that these impoundments may be adversely affecting groundwater quality. In compliance with Ohio EPA Hazardous Waste Rule 3745-65-93(d)(2), Fisher Guide has implemented a groundwater quality assessment program designed to assess whether hazardous wastes have entered the groundwater from these impoundments, and if so, the rate and extent of migration of those wastes. This program is expected to be completed prior to implementation of this closure plan. If groundwater quality is being adversely impacted by the sludge dewatering impoundments, it is Fisher Guide's intention to develop final closure of these impoundments as a corrective action so that the requirements of Federal Regulation 40 CFR 264.100 can be met.

III. MAXIMUM INVENTORY

A. Sludge Dewatering Impoundments

On December 18, 1983, sludge dewatering impoundments #2 and #3 each contained approximately 13,000 and 15,000 cubic yards of sludge, respectively. Impoundment #1, which is still receiving sludge slurry, contained approximately 8,500 cubic yards on August 29, 1984. It is expected that impoundment #1 will reach its maximum capacity of 15,000 cubic yards by June 1985. At this point sludge slurry may be directed back into impoundment #2 for a limited period of time until the filter press installation is completed at the waste water treatment plant. Once this is complete no further additions will be made to the impoundments and they will be allowed to fully dewater. Accounting for volume reductions due to continued dewatering of the sludge, the estimated maximum volume of raw sludge that will be addressed in this closure plan is 45,000 cubic yards. The Chemfix process characteristicaly produces a 5-10 percent increase in sludge volume during the treatment process. Consequently the total sludge inventory for disposal after treatment will be approximately 50,000 cubic yards.

B. Drum Storage Areas

The drum marshalling area within the plant has a maximum capacity of 168 drums. The outside drum storage pad has a maximum capacity of 280 drums. This drum storage capacity will remain the same after closure.

C. TDI Neutralization Facility

The treatment facility for non-reacted urethane foam is no longer being used for the treatment of toluene diisocyanate. There are no drums of hazardous waste stored at this site, and the only hazardous waste that may be present would be in the form of potentially contaminated concrete walls. The two tanks included in this facility measure 25'x 10'x 4'. The volume of concrete comprising these tanks is estimated at 22 cubic yards.

IV. CLOSURE ACTIVITIES

Dewatering Impoundments

A. Closure Abstract

The final closure of the three (3) hazardous waste sludge dewatering impoundments will be accomplished utilizing a chemical fixation/stabilization method (Chemfix Technologies, Inc.) to treat the entire volume of F006 sludge and convert it to a non-hazardous (delisted) waste.

The affect of the CHEMFIX process on representative samples of sludge taken from the Elyria dewatering impoundments has been subjected to extensive analytical testing. A thorough technical assessment of the CHEMFIX process as applied to the Elyria sludge can be found in Exhibit C of this document. A petition for a permanent delisting of this sludge as a hazardous waste, after treatment utilizing the CHEMFIX process, was submitted to the U.S. EPA on June 21, 1984. Recent meetings with the U.S. EPA indicate that a determination of the acceptability of this sludge for a permanent exclusion will be made as early as April 15, 1985. If deemed acceptable, it will be posted in the Federal Register for public comment. Final approval for a permanent exclusion could come as early as October 1985. This closure plan is, of course, contingent upon successful permanent exclusion of the waste by the U.S. EPA.

Subsequent to being rendered non-hazardous by the CHEMFIX process, the sludge will be disposed of in a specially prepared on-site solid waste disposal cell. This disposal cell will be designed and built in compliance with all Ohio State solid waste disposal regulations. The dewatering impoundments, after being emptied of sludge, will be decontaminated and restored to match the surrounding terrain.

Closure activities will be conducted in a single campaign, and will address each dewatering impoundment sequentially. Closure is expected to begin in late spring of 1986, and continue for approximately six (6) months. After closure, the three (3) impoundments will be eliminated from Elyria's wastewater treatment scheme, and removed from further regulation under interim TSD status.

Prior to commencing closure activities, it is understood that Fisher Guide will obtain or revise the necessary air, water, and solid waste permits, as required by the State of Ohio, to conduct the described closure activities.

B. Disposal Cell Preparation

The new cell that will be created for the permanent disposal of the CHEMFIX treated solid waste will be located directly south of the existing dewatering impoundments. A plot plan and construction sketches of the proposed site can be found in Exhibit B. Detailed engineering of the disposal cell will be completed prior to 7/31/85, and will be submitted with an application for a solid waste disposal cell construction permit.

The site will be sized to store approximately 50,000 cubic yards of non-hazardous solid waste. The dimensions of the site will be approximately 250 feet wide by 500 feet long by 16 feet high. Its construction will be such that all solid wastes deposited at the site will be located at or above grade. This will situate all waste at least seven (7) feet above the seasonally high water table per existing boring log #B-4.

Prior to commencing closure, the site of the proposed disposal area will first be evaluated from a hydrogeological standpoint to assure that it conforms to the siting requirements of Ohio State Solid Waste Disposal Regulation 3745-37. This shall include test borings as well as the installation of groundwater monitoring wells for future verification of groundwater quality. The results of the hydrogeologic study will be submitted to the Ohio EPA for review prior to beginning design engineering of the site.

Following issuance of a solid waste permit by the State of Ohio, the proposed site will be cleared of all trees and scrub brush. It will then be graded to 1.6 degrees of descending relief across the site from south to north, and finally mechanically compacted. The surface water run-off from the disposal cell will drain to open trenches surrounding the disposal site. The trenches will be served by a new underground sewer pipe which will direct all site run-off to existing wastewater outfall #001, regulated by NPDES permit #S301*BD. This is the same outfall currently serving the dewatering impoundments.

The waste treated by the CHEMFIX process will be pumped in a semi-solid state directly onto the compacted cell surface. As it sets up, additional layers will be added until the design height is reached. It will not be necessary to provide side walls during the filling operation since the CHEMFIX product rapidly sets up to a viscous non-flowing state, and cures to a structurally sound and self-supporting material within 48 hours.

C. Description of the CHEMFIX Process

The CHEMFIX process is one of many proprietary processes comprising stabilization of wastes by chemical reaction. The generic term is chemical fixation/stabilization.

The CHEMFIX process is based on the use of liquid soluble silicates and silicate setting agents. The exact combination and proportions of reagents are determined for each particular waste to be treated. The two (2) part, inorganic chemical system reacts with polyvalent metal cations, waste components, and also within itself to produce a chemically and physically stable solid. The resultant cross-linked, three (3) dimensional polymeric matrix displays properties of good stability, high melting point, and a rigid, friable texture similar to those of most clay soils.

Three (3) classes of interactions can be described. First are the rapid reactions between soluble silicates and the polyvalent metal ions to produce insoluble metal silicates. Second are the reactions between the soluble silicates and the reactive components of the setting agent and the waste and/or water.

The CHEMFIX reagents become dispersed and dissolved throughout the aqueous phase when they are first blended with a waste. Reactions occur involving the reagents, polyvalent cations in the waste and some of the water. As a result of these reactions, inorganic polymer chains form throughout the aqueous phase, the chains grow in three (3) dimensions and physically entrap the organic colloids within the micro-structure of the CHEMFIX product matrix. The pore diameters of this matrix are too small to permit any significant migration of the organic colloids.

Reactions involved in the CHEMFIX process begin immediately upon reagents addition, and continue to completion regardless of placement conditions. The CHEMFIX product will solidify when completely submerged under water or at varying depths of placement under anaerobic conditions.

During CHEMFIX processing, the water soluble silicates are reacted with complex cations in the presence of a silicate setting agent. At least two (2) general types of reactions occur.

1. Amorphous, colloidal silicates precipitate. These silicates are extremely complex, and the chemical formulae will vary depending upon, among others: (a) pH, (b) availability and concentrations of cations, and (c) temperature. All three (3) of these vary as the reactions proceed and, therefore, various silicates are formed. Silicate anions have the form of double trigonal and tetragonal rings of the $(Si_6O_{15})^{-6}$, $(Si_8O_{20})^{-8}$, and $(Si_8O_{18}(OH)_2)^{-6}$ compositions.
2. SiO_2 acts as a precipitating agent. The metallic precipitates are generally developed within the physical structure formed during the formation of the amorphous colloids. This seals off the faces of those particles which make them impermeable to water.

In summary, most of the heavy metals contained in the waste become part of the complex silicates. Some of the heavy metals precipitate within the structure of the complex molecules. A very small percentage (estimated to be less than 1%) of the heavy metals precipitate between the complex silicates and are not chemically immobilized.

Some organics may occur in the raw state as particles larger than colloidal. During CHEMFIX treatment, all the waste is pumped through processing equipment which creates sufficient shear to emulsify the organic constituents. Emulsified organics become immobilized as described above.

If an organic constituent were not to become emulsified, it would still pass through the processing equipment within the gel that is created.

This mixture is discharged to a prepared storage cell in which the gel continues to set. Cementitious reactions create a solid which, though friable, encases within its macro-structure organic substances which might have escaped emulsification. Such substances would be immobilized by the impermeability of the mass. Theoretically, migration could occur, but the rate would be extremely slow.

Water contained in wastes which are treated by the CHEMFIX process is involved in a number of processes.

- A portion of the water is involved in hydration reactions similar to those in cement reactions.
- A portion of the water equilibrates with the environment through evaportion.

There are no side streams or discharges resulting from the CHEMFIX process. During processing, all the waste is pumped into the reaction vessel wherein the reagents immediately react to form a gel. This gel is discharged into the receiving area. Even at this early time, the water contained cannot drain away. There is no free water in the CHEMFIX product. Some of the water becomes part of the solids, but most of the water is physically bound in the hydrophillic CHEMFIX product, and although it can evaporate, it cannot be defined as free water.

D. Description of CHEMFIX Processing Equipment

In practice, the processing is done in mobile, trailer-mounted equipment. At the Fisher Guide facility, the raw waste will be pumped from the impoundments where it is stored and delivered to the processing unit at rates of 300 to 500 gpm. Predetermined and monitored amounts of the required reagents are thoroughly mixed into the waste within the processing unit. The treated material is discharged from the processing unit into a specially prepared discharge area where the slower chemical reactions reach completion over a period of less than 48 hours. The discharge area will be designed and prepared in such a way that it can serve as the final depository for the treated waste in full compliance with Ohio EPA Solid Waste Regulations.

The optimum reagent level refers to the amount of each reagent required to produce desired chemical and physical parameters of the end product, i.e., leachate quality, permeability, compressive strength, etc. The chemical conversion of the constituents of concern into an inert species will occur at reagent levels much less than designated "optimum", and within a wide range of reagent ratios. In practice, the reagent feed rates are controlled in such a manner as to fall well within tolerance limits of "optimum ratio".

A Quality Assurance Chemist will be assigned to the closure project and will continue to regularly monitor the waste being processed as well as the finished CHEMFIX product. Each day's production will be isolated until test results show the waste has been properly processed.

When the waste is granted an exclusion, Fisher Guide plans to permanently dispose of the waste in the specially prepared storage cell. This is the preferred disposal option because it offers economic incentive when compared to off-site disposal, and will allow Fisher Guide to control the legal and environmental destiny of the storage impoundment on a long-term basis. This control would not be possible if the waste were commingled with other generators' waste at a secure Class I landfill.

E. Closure Procedure

Upon approval by the U.S. EPA of the Petition for Exclusion, approval of this closure plan by the Ohio EPA and the U.S. EPA (Region V), and implementation of an alternate method of dewatering the plant wastewater sludge, the Fisher Guide Elyria Plant will begin preliminary preparations for closure of the three (3) dewatering impoundments.

These preliminary preparations will include site investigation, design engineering, and construction of the new solid waste disposal cell during late 1985 and early 1986. In 1986, prior to commencing closure, the Chemfix Technologies, Inc. mobile treatment unit will be mobilzed on site. Following these preparations, closure of the impoundments will commence. The procedure to be followed for closure is described in this section, and the closure sequence will be executed according to the closure schedule outlined in section V.

Closure activities will begin with impoundment #3, proceed to impoundment #2, and finish with impoundment #1. Each impoundment will be addressed using the same procedure. This closure procedure is described as follows:

The sludge in the first impoundment will be hydraulically and mechanically agitated to a homogeneous state using a cable operated drag box. The mechanical energy imparted to the hydroscopic metal hydroxide sludge converts it to a pumpable state compatible with the CHEMFIX processing system. Depending on the extent of dewatering that has occurred in the impoundment, it may be necessary to introduce a small amount of water into the impoundment to assist in the reliquification process.

Once this is completed, the sludge will be pumped from the impoundment to the mobile treatment unit using centrifugal cutter-type pumps. Within the treatment unit, the sludge and CHEMFIX reagents (liquid and dry) will be combined in a common mix chamber. After being thoroughly mixed, the newly formed CHEMFIX product will be pumped from the process unit to the newly prepared disposal cell using diesel centrifugal pumps.

The CHEMFIX product, immediately after discharge from the process unit, appears as an extruded semi-solid. It will develop significant unconfined compressive strength within two (2) hours, and cure to a load bearing clay-like material within 48 hours. Because of the physical characteristics of the CHEMFIX product, storage cell deposition will be conducted on a batch basis across the face of the landfill. Approximately one (1) or two (2) day's processed material from the processing unit will be deposited in the storage cell at a single point. The discharge pipe will then be moved to another location in the cell, and processing will continue. The newly deposited material will be allowed to cure for 48 hours prior to handling. After the curing process is complete, the hardened material will be spread across the fill site using a dozer or front end loader. The process unit discharge pipe will always be positioned in such a way that newly treated material will not be discharged beyond the perimeter of the site.

After all sludge and sludge residues that are amenable to the CHEMFIX process have been removed and treated, decontamination of the impoundment will begin. This will entail the removal of all remaining sludge residues and contaminated gravel from the dewatering impoundment by means of conventional excavation. The excavated material will be hauled to and disposed within a secure hazardous waste landfill. Following this, analytical testing of the impoundment will be conducted to determine if subsoils and/or the underdrain system will have to be removed. The methodology for this testing is provided in detail in section IV(F).

The underground sludge piping between the wastewater treatment plant and the three dewatering impoundments will be pressure cleaned and capped to prevent further use.

After the impoundment has been decontaminated to acceptable levels, the side walls will be destroyed, the entire impoundment will be graded to match the surrounding terrain, and six (6) inches of soil will be deposited on the site. Seeding of the site will be conducted immediately thereafter, or as weather permits. If the underdrain system is left in tact, the drain valve to the NPDES outfall #001 will be locked in the open position to provide continued drainage of the site. The existing groundwater monitoring wells for this facility will be left in operation. Post closure groundwater monitoring, if necessary, will be conducted per federal and state requirements.

After all treatable sludge in the three dewatering impoundments has been processed through the CHEMFIX unit, the processing equipment will be decontaminated and demobilized from the site.

Following the final addition of CHEMFIX material to the new disposal site, it will be allowed to set for 48 hours to assure proper curing of the entire mass. The site will then be graded to provide a one (1) to four (4) slope on all sides and a minimum of 1.6 degrees of descending relief across the top of the site from south to north. This will provide the necessary surface run-off as well as erosion resistance.

After grading of the cured CHEMFIX material is complete, the entire site will be covered with eighteen (18) inches of clay followed by six (6) inches of topsoil, and then seeded with at least 100 pounds per acre of shallow root grass seed. This construction will provide an impermeable cap over the entire volume of CHEMFIX treated sludge.

The closure process will be carried out under the supervision of Fisher Guide and CHEMFIX personnel, and will be conducted within an area secured by perimeter fencing and periodic security patrols.

F. Site Testing

After removal and treatment of all sludge, sludge residues, and contaminated layers of sand from each dewatering impoundment, an analytical study of the remaining underdrain system and subsoils will be undertaken. This will be done to determine if any underlying materials must be removed to assure that the impoundment will not have any deleterious impact upon groundwater quality. This study will involve core sampling and stratified testing of the underdrain materials and impoundment subsoils. Sixteen core samples will be taken from the bed of each impoundment (four per quadrant), and subjected to stratified testing to determine the extent of contamination, if any, that has occurred due to exposure to sludge leachate during normal operation of the dewatering impoundment.

Sample locations will be laid out in a grid pattern as shown in Figure 1. These locations will be surveyed using a transit and catalogued to assure precise and reproducible identification of each impoundment. The four (4) core samples taken from each quadrant will be sampled at progressively greater depths relative to the impoundment. Composite samples will be formed for each representative depth illustrated in figure #2.

All composite samples will be tested for the metals listed in the State of Ohio Drinking Water Standards, the results will be compared to a concentration level equal to 30 times the Drinking Water Standards. All underdrain materials and subsoils that exceed these minimum criteria will be removed and disposed of in a secure hazardous waste landfill. All materials whose leachate falls between 15 and 30 times the Ohio Drinking Water Standards will be excavated and disposed in an approved off-site solid waste landfill. Those materials having a leachate value less than 15 times ODWS's will be left in place.

The extent of removal of the underdrain system and subsoils cannot be estimated at this time since the extent of contamination, if any, will be determined during the closure process. The estimated volume of material comprising the underdrain system of each impoundment is 3,700 cubic yards of sand and gravel. If it becomes necessary to remove subsoils, the volume to be excavated will increase by 3,700 cubic yards per foot of contaminated soil that must be removed from each 200 foot by 500 foot impoundment.

The following procedure will be utilized in removing any contaminated soil.

1. The subsoil will be removed by a contractor who will supply the labor, equipment and material necessary for the safe excavation, transportation, and disposal of the subsoil.
2. The contractor will be responsible for complying with the applicable federal, state, and local laws and regulations for the collection, transportation, and disposal of the subsoil.
3. The contractor will be prepared to contain and recover any spills that may occur while handling the subject material.
4. The contaminated soils will be removed and disposed of in an approved landfill.

G. Closure Cost

The cost of closure of the dewatering impoundments includes all activities relating to the final disposition of the treated sludge. This estimate assumes preclosure activities will commence in 1985, and final closure to take place during the summer of 1986. The closure cost associated with the dewatering impoundments is estimated at $2,744,000. A closure cost summary of the total plant closure is detailed at the back of this section.

Drum Storage Areas

A. Closure Procedure

The closure of both drum storage pads as TSD facilities will entail the removal of all existing drums that are in storage at the time of closure. This will assure that all wastes stored in excess of 90 days are removed from the plant at the time of closure. Since all wastes stored in these areas are contained in sealed drums, there is no need for decontamination of the facility. All subsequent storage of hazardous waste at this site will be conducted in conformance with the requirements for generator status, and will not exceed 90 days.

B. Closure Cost

The estimated cost of closure of both storage areas assumes that an average number of drums will be present at the time of closure. The associated cost for partial closure of the drum storage areas is estimated to be $36,000. This is incorporated into the total closure cost summary outlined at the end of this section.

TDI Neutralization Facility

A. Closure Procedure

The neutralization of non-reacted urethane foam raw materials has been discontinued at the Elyria plant. These materials are now placed in drums and shipped off-site for treatment and disposal. All drums containing toluene diisocyanate have been removed from the neutralization facility, and the treatment tanks have been rough cleaned awaiting final closure.

Final closure will commence with pumping all standing water from the two concrete treatment tanks to the waste water treatment plant. After this the interior surfaces will be thoroughly cleaned with an industrial cleaner, followed by analytical testing for hazardous waste characteristics and TDI. If no contamination exists the tanks will be punctured, filled with dirt, and seeded. If contamination still exists, steps will be taken to demolish and remove the tanks from the site as a hazardous waste.

B. Closure Cost

The estimated cost of closure of the TDI neutralization facility includes only decontamination of the inactive tanks, since no wastes are currently stored at this site. This assumes a worst case scenario requiring demolition and disposal of the concrete tanks. The estimate for this work is $18,000. This is incorporated into the total closure cost summary detailed at the end of this section.

TOTAL CLOSURE COST SUMMARY

Dewatering Impoundments

1.	Solid waste permit acquisition	5,000
2.	Construction and closure of on-site solid waste disposal cell	375,000
3.	Sludge removal and treatment with Chemfix Process	1,350,000
4.	Dewatering impoundments closure:	
	a.) Removal and disposal of underdrain system	
	Excavation & hauling 9300 cu yd x $15	140,000
	Disposal (Haz Waste) 9300 cu yd x $65	605,000
	State tax 0.5 x 9300 cu yd x $3	14,000
	b.) Removal and disposal of six inches of subsoil	
	Excavation & hauling 5500 cu yd x $10	55,000
	Disposal (Non Haz Wste) 5500 cu yd x $20	110,000
	c.) Final top-soil cap and seeding	40,000
5.	Miscellaneous site testing, analytical work, and closure certification	50,000
		2,744,000

TDI Neutralization Facility

1.	Draining and cleaning tanks	1,000
2.	Sampling and testing tanks walls	4,000
3.	Demolition of tanks	2,000
4.	Hauling and disposal of debris	9,000
	Cover and seed remaining site	1,500
	Closure certification	500
		18,000

Drum Storage Areas

1.	Removal and disposal of all drums in storage	35,500
2.	Closure certification	500
		36,000

TOTAL CLOSURE COST ..... $ 2,798,000

V. CLOSURE SCHEDULE

A. Dewatering Impoundments

The nature of the Chemfix process requires that closure of the dewatering impoundments be conducted during clement weather conditions. This in addition to the fact that delays have been encountered in the federal delisting process has effectively precluded closure before 1986. Consequently, Fisher Guide intends to commence closure activities by early spring of 1986, and achieve final closure of the dewatering impoundments by October 24, 1986.

Actual closure of the impoundments will be conducted during 1986. However, considerable preparation for closure will be done during 1985. These preclosure activities include:

1. Hydrogeologic investigation of proposed solid waste disposal cell site.
2. Design engineering of the proposed solid waste disposal cell.
3. Preparation and submittal of an application for an Ohio permit to install a solid waste disposal facility.
4. Installation of a plate filter press to dewater waste water treatment plant sludge as it is produced.
5. Discontinuation of sludge additions to the dewatering impoundments.

CLOSURE SCHEDULE

SLUDGE DEWATERING IMPOUNDMENTS

#1 - Construction of solid waste disposal cell

#2 - Mobilization of Chemfix equipment

#3 - Treatment of impoundment #3

#4 - Sampling and analytical testing of impoundment #3

#5 - Decontamination of impoundment #3

#6 - Treatment of impoundment #2

#7 - Sampling and analytical testing of impoundment #2

#8 - Decontamination of impoundment #2

#9 - Treatment of impoundment #1

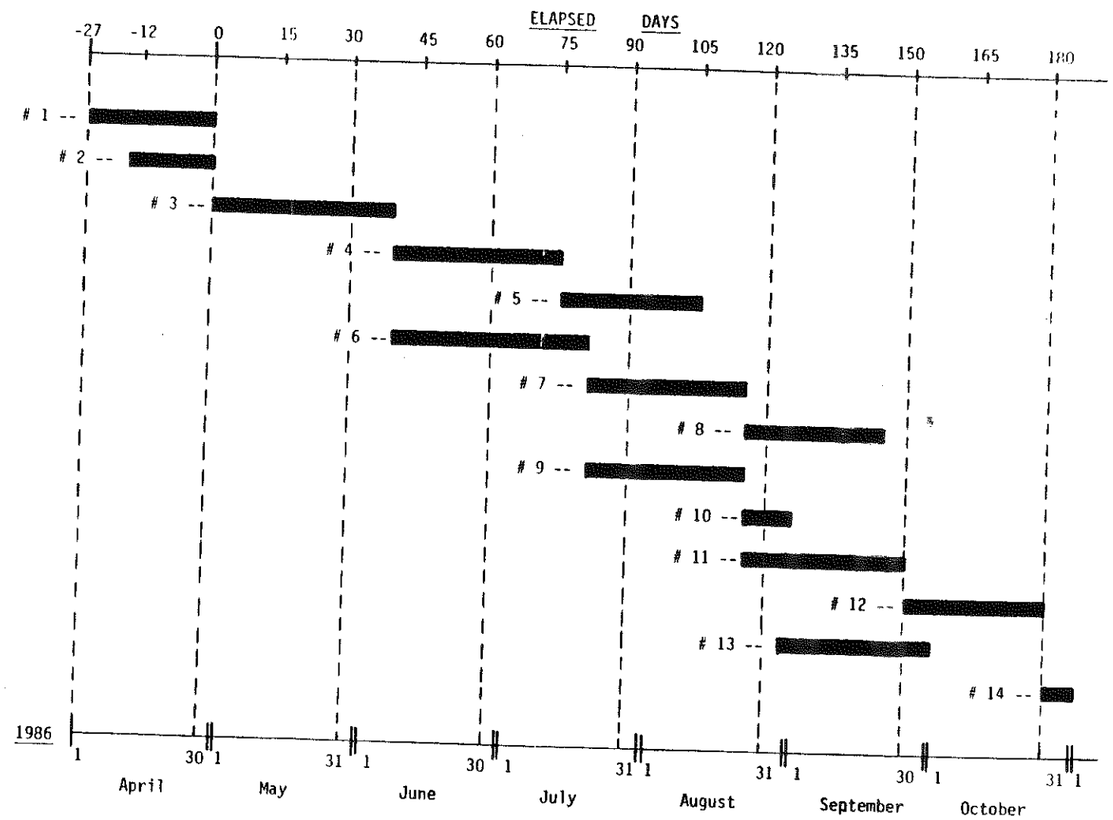
#10 - Decontamination and demobilization of Chemfix equipment

#11 - Sampling and analytical testin of impoundment #1

#12 - Decontamination of impoundment #1

#13 - Closure of solid waste disposal cell

#14 - Site inspection by certified engineer



CLOSURE SCHEDULE

DRUM STORAGE AREAS AND TDI NEUTRALIZATION FACILITY

#1 - Removal of all drums in both drum storage areas

#2 - Site inspection and verification of closure - both drum storage areas

#3 - Removal of water and debris from TDI neutralization facility

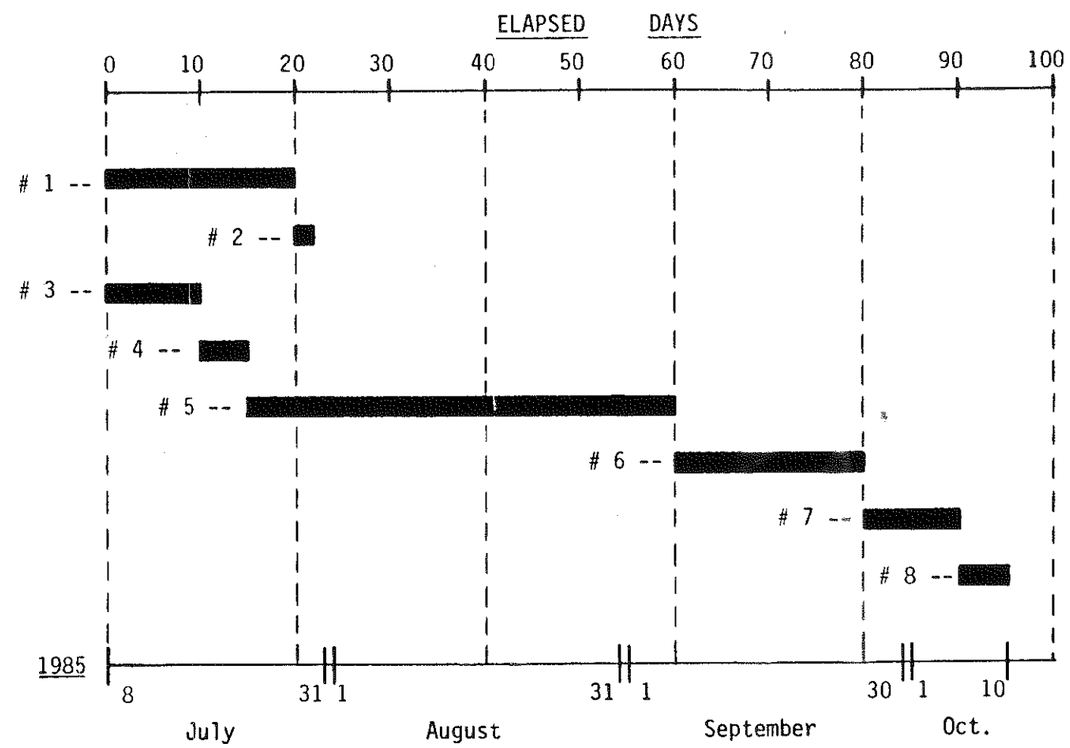
#4 - Wash TDI neutralization tanks

#5 - Sampling and analytical testing of tank surfaces

#6 - Demolition and removal of tanks if required

#7 - Back fill and seeding of tank site

#8 - Site inspection by certified engineer - TDI neutralization facility



The proposed timetable for closure of the dewatering impoundments is illustrated at the back of this section. The required time frame for closure is estimated to be 180 days.

B. Other Hazardous Waste Management Facilities

In addition to the sludge dewatering impoundments, the drum storage areas and the TDI neutralization facilities will undergo final closure as part of this closure plan.

Final closure of these hazardous waste management facilities is expected to occur simultaneous to each other, and will take place in August of 1985. Closure activities will take approximately 35 days. The actual closure schedule for these is shown at the end of this section.

VI. POST CLOSURE CARE

It is intended that no hazardous waste will remain at the Elyria site in excess of 90 days after closure. However, because of the extensive nature of this the dewatering impoundment closure, and the fact that the CHEMFIX process is relatively new, several inspection functions will be continued after closure. First, the site will be inspected periodically to insure that vegetation cover is adequate and that no gross settling of the fill occurs. Second, fences and other access restrictions will be maintained for the life of the facility. Groundwater monitoring will be initiated for the on-site solid waste disposal cell in accordance with State regulation. Post closure monitoring of the closed surface impoundment will be conducted if required. Provisions will be made to counteract any deficient conditions that may be identified during the post closure period.

Notice in Deed and Notice to Local Land Authority

The Fisher Guide Elyria Plant operates solely as a treatment and storage facility. No hazardous wastes are being disposed of at this site. For this reason, notice in the deed is not required as part of this closure. However, the site does incorporate three (3) past F006 sludge disposal areas that predate RCRA. These have been registered with the EPA under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). Notice of these, as well as the new proposed solid waste disposal site, will be incorporated into the necessary transfer documents at the time of transfer.

VII. EXHIBITS

TABLE OF CONTENTS

Exhibit A

1. Impoundments Plot Plan (ELY-100A)
2. Impoundment Construction - FP-WT-144
   Impoundment Construction - FP-WT-119
   Impoundment Construction - FP-WT-120

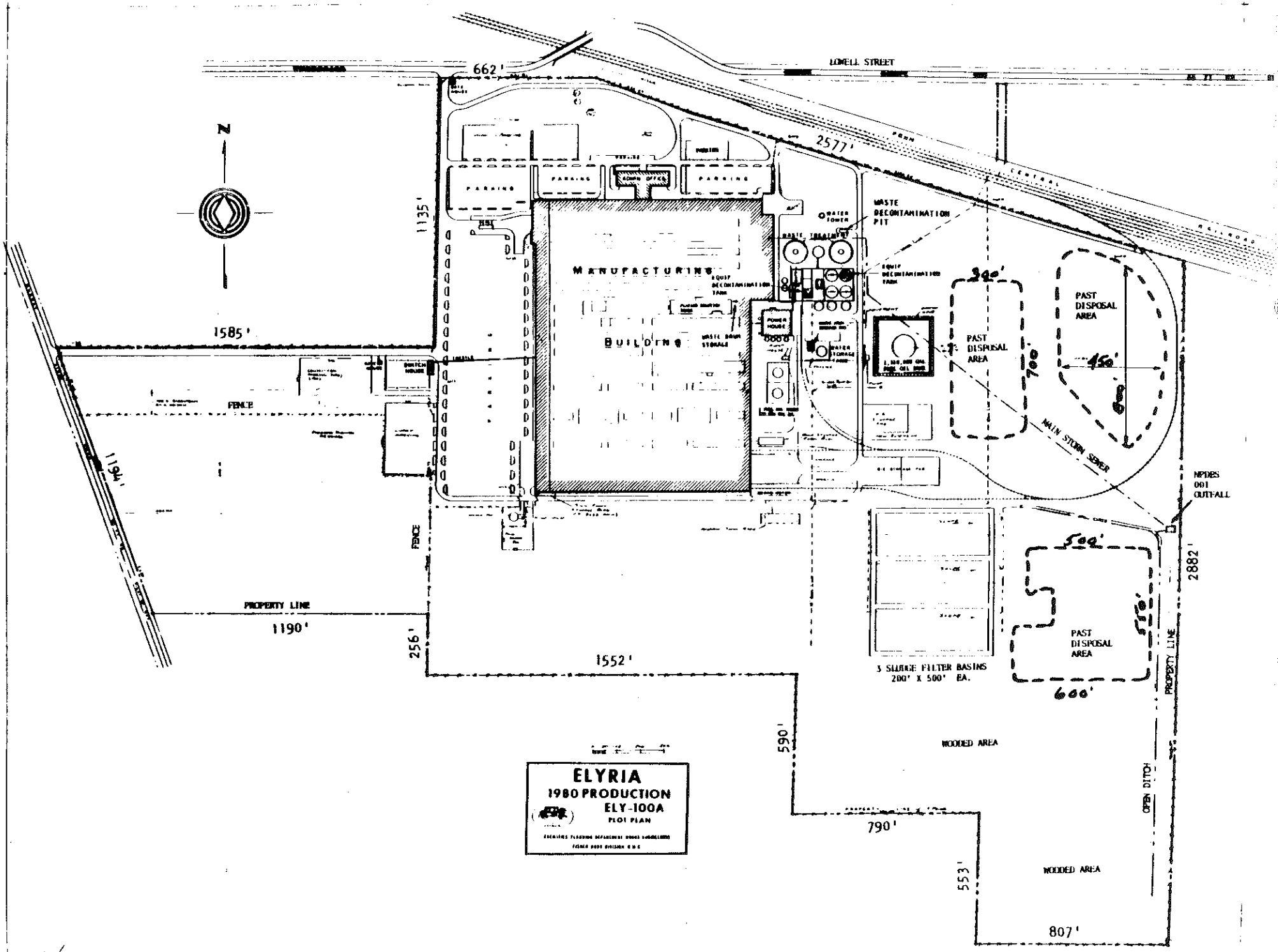
Exhibit B

1. New Disposal Site Location (ELY-100B)
2. New Disposal Site - Plot Plan
3. New Disposal Site - Elevation Drawing

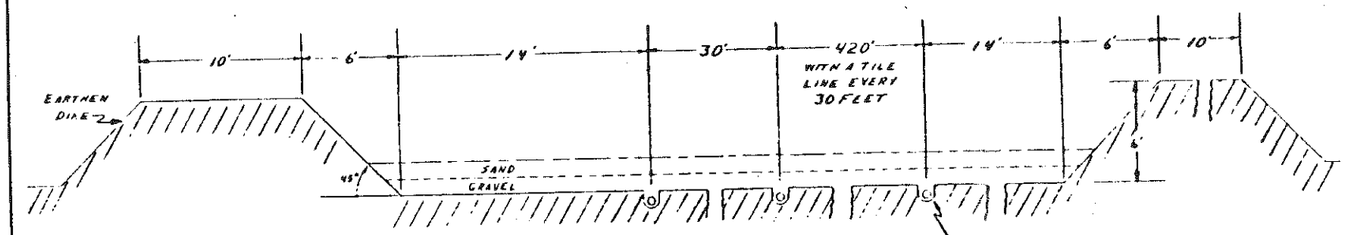
Exhibit C

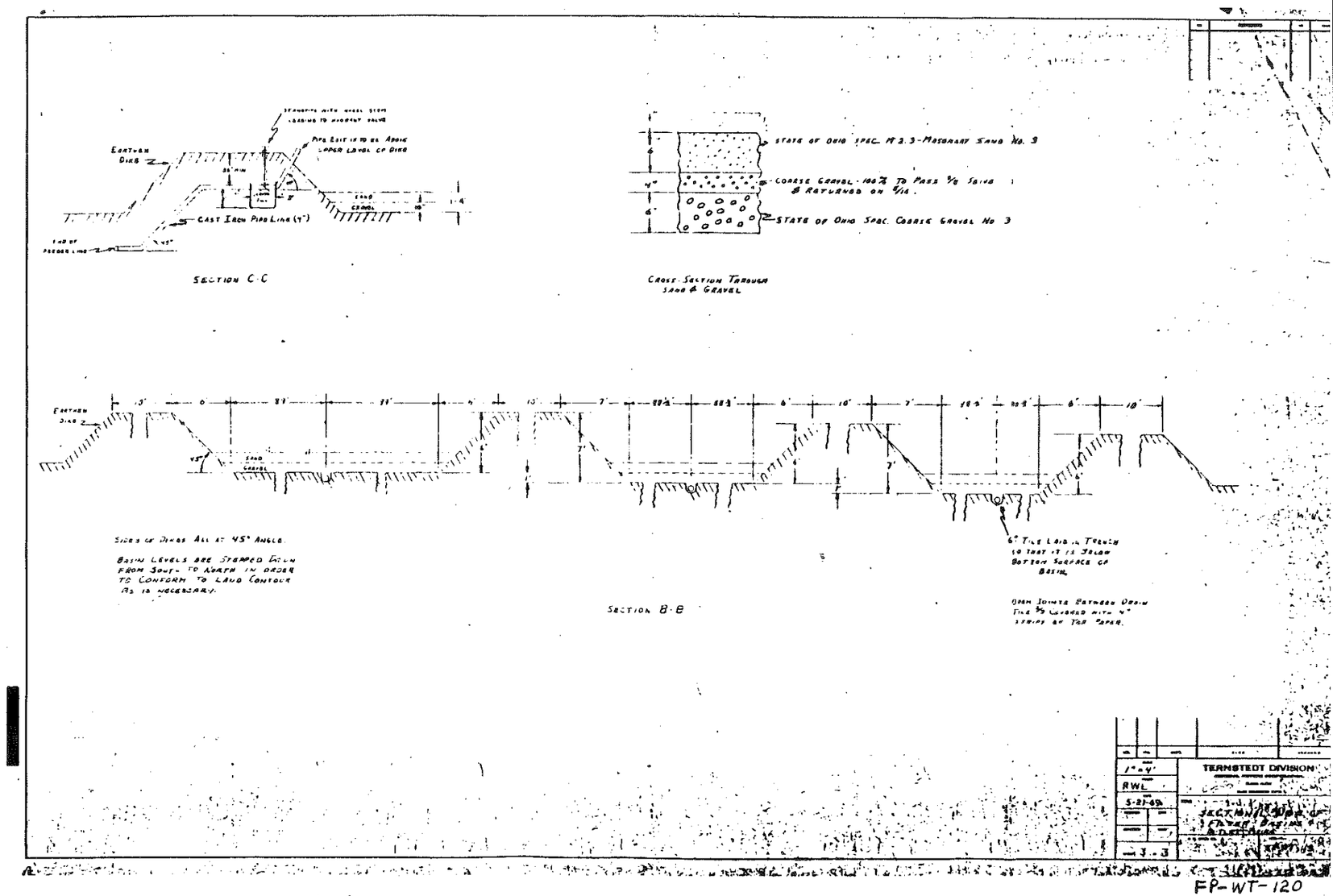
Technical Assessment of CHEMFIX® Process

a. Abstract
b. Sample Acquisition
c. Total Metals - Raw Waste
d. Non-Metallic Constituents - Raw Waste
e. Chemical and Physical Characteristics - Raw Waste
f. Hexavalent Chromium - Raw Waste and CHEMFIX® Product
g. Cyanide - Raw Waste and CHEMFIX® Product
h. Extraction Procedure Results - CHEMFIX® Product
i. Multiple Extraction Procedure Results - CHEMFIX® Product
j. Chemical and Physical Characteristics - CHEMFIX® Product
k. Analytical Quality Control
l. Field Project Quality Control/Quality Assurance
m. Conclusions



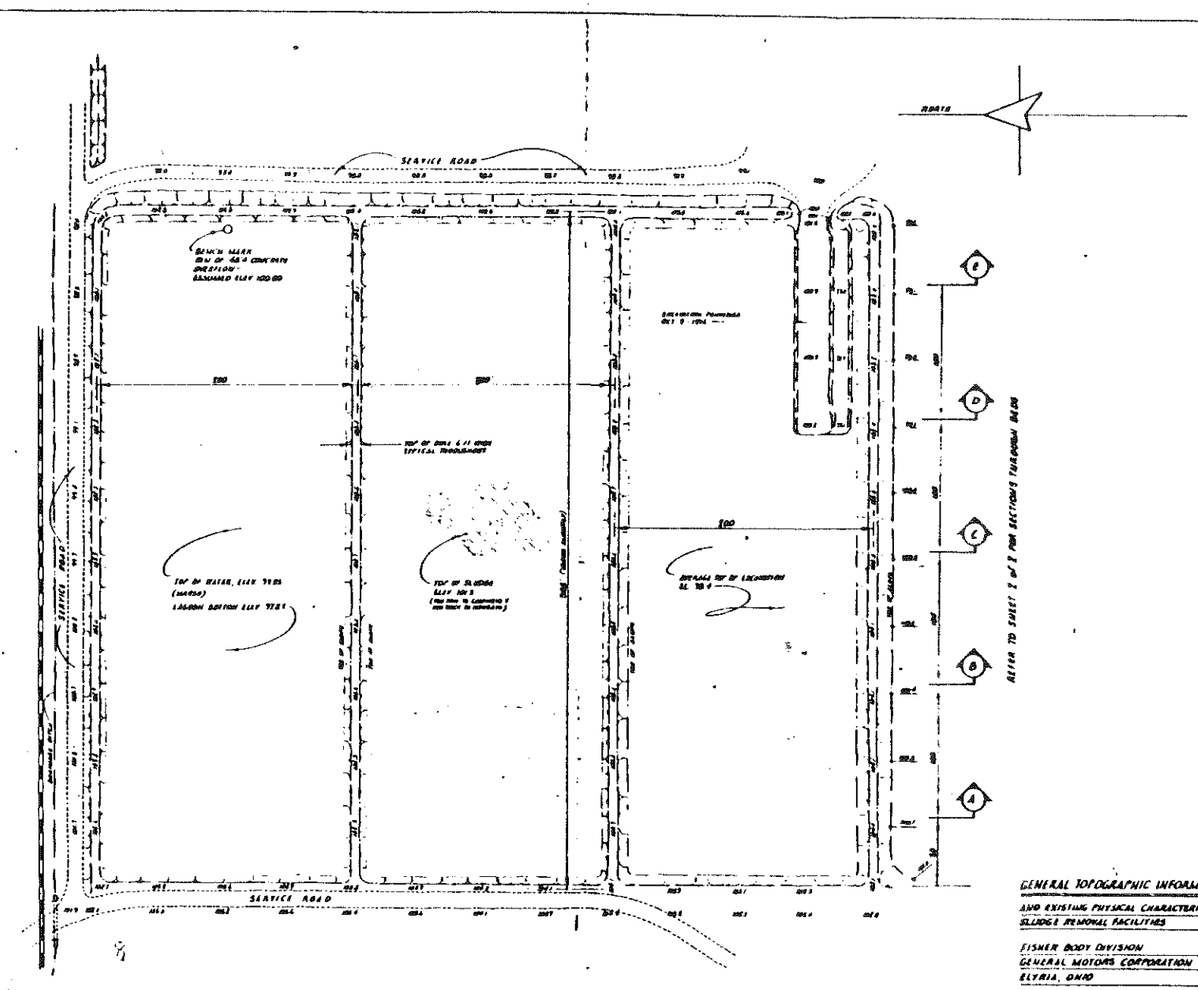
RCRA Permit "Map" FP. WT. 151


10'
6'
14'
30'
420'
WITH A TILE LINE EVERY 30 FEET
14'
6'
10'
EARTHEN DIKE
45°
SAND
GRAVEL
6'
4" TILE LAID IN TRENCH SO THAT IT IS BELOW BOTTOM SURFACE OF BASIN.
SIDES OF DIKES ALL AT 45° ANGLE.
SECTION A-A
OPEN JOINTS BETWEEN DRAIN TILE 2/3 COVERED WITH 4" STRIPS OF TAR PAPER.
DRAINAGE SLOPE L TO R NOT SHOWN. SLOPE MAY BE ACHIEVED BY EITHER LOWERING 6" TILE RUNNING W TO E # (METHOD USED) OR BY LOWERING BASIN BOTTOM AND 6" TILE AT EAST END. IF LATTER COURSE IS FOLLOWED, DIKES AT EAST END MUST BE RAISED ABOVE SIX FEET SO THAT SIX FOOT LEVEL OF FLUID & FILTER MATERIAL MAY BE MAINTAINED AT WEST END.
1" = 4'
RWL
5 21-69
2 - 3
TERNSTEDT DIVISION
GENERAL MOTORS CORPORATION
SECTIONAL VIEW OF FILTER BASIN
FP-WT-119



Earthen Dike
Cast Iron Pipe Line (4")
Pipe Exit is to be Above Upper Level of Dike
Sand
Gravel
Section C-C
State of Ohio Spec. M 2.3-Masonary Sand No. 3
Coarse Gravel - 100% to Pass 5/8 Sieve & Returned on 5/16.
State of Ohio Spec. Coarse Gravel No 3
Cross-Section Through Sand & Gravel
Earthen Dike
Sand
Gravel
Sides of Dikes All at 45° Angle.
Basin Levels are Stepped Down from South to North in order to Conform to Land Contour as is necessary.
Section B-B
6" Tile Laid in Trench so that it is below Bottom Surface of Basin.
Open Joints Between Drain Tile 5/8 Covered with 4" Strips of Tar Paper.
1" = 4'
RWL
5-21-49
TERNSTEDT DIVISION

FP-WT-120



GENERAL TOPOGRAPHIC INFORMATION
AND EXISTING PHYSICAL CHARACTERISTICS
SLUDGE REMOVAL FACILITIES

FISHER BODY DIVISION
GENERAL MOTORS CORPORATION
ELYRIA, OHIO

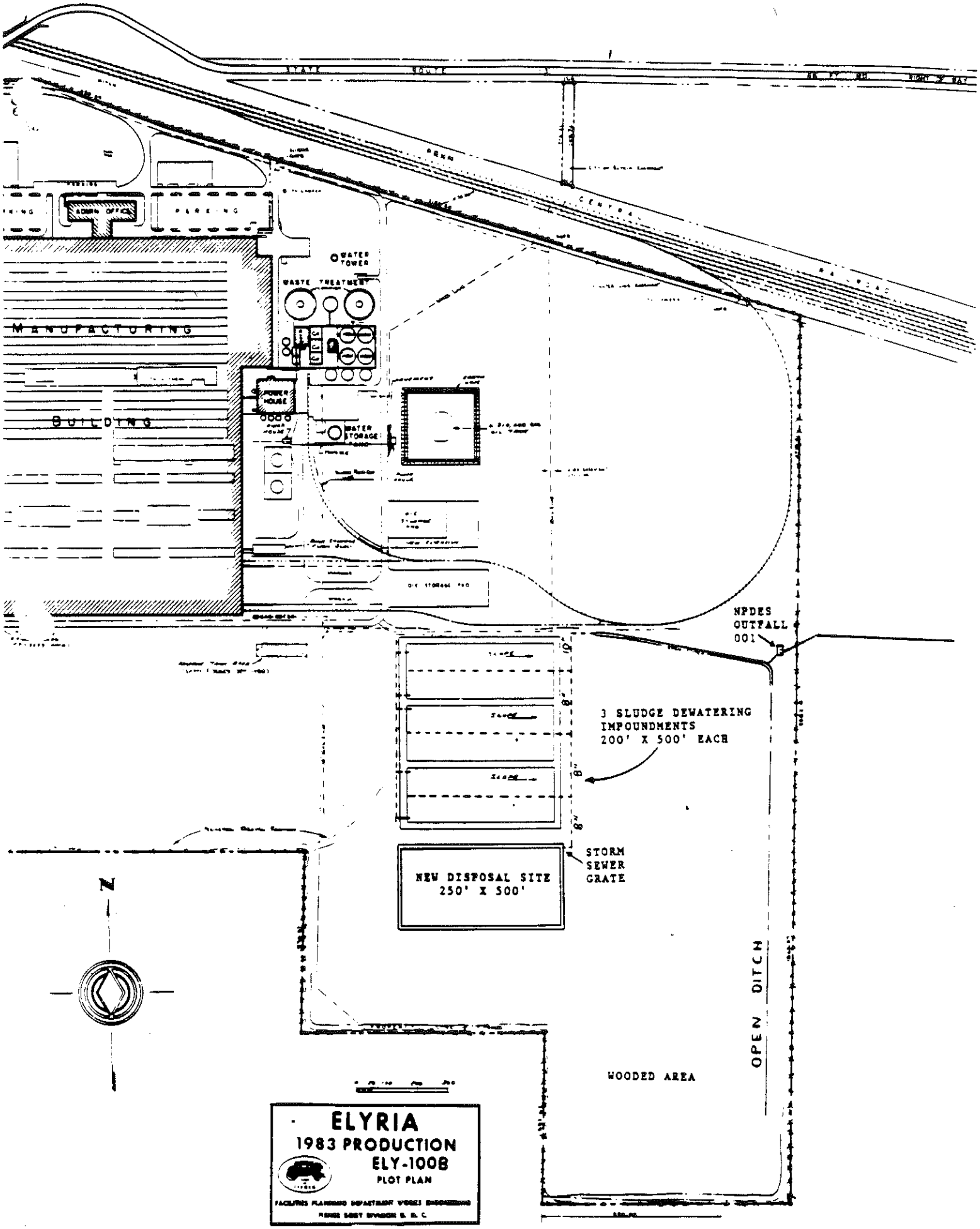
PURCHASE ORDER ELY 577686

OCTOBER, 1976 SCALE 1"=50'

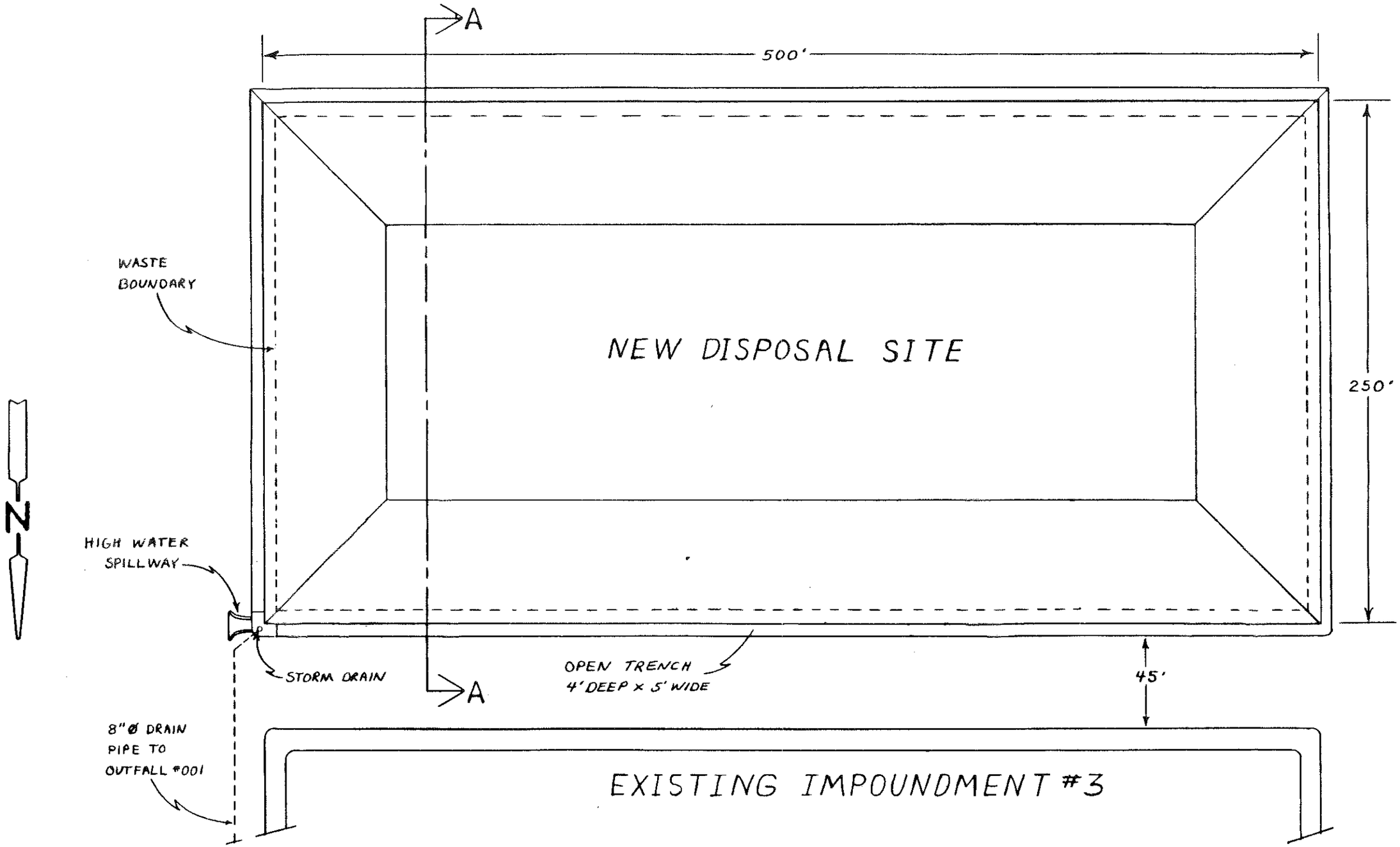
MICHAEL G. HURA, REGISTERED SURVEYOR

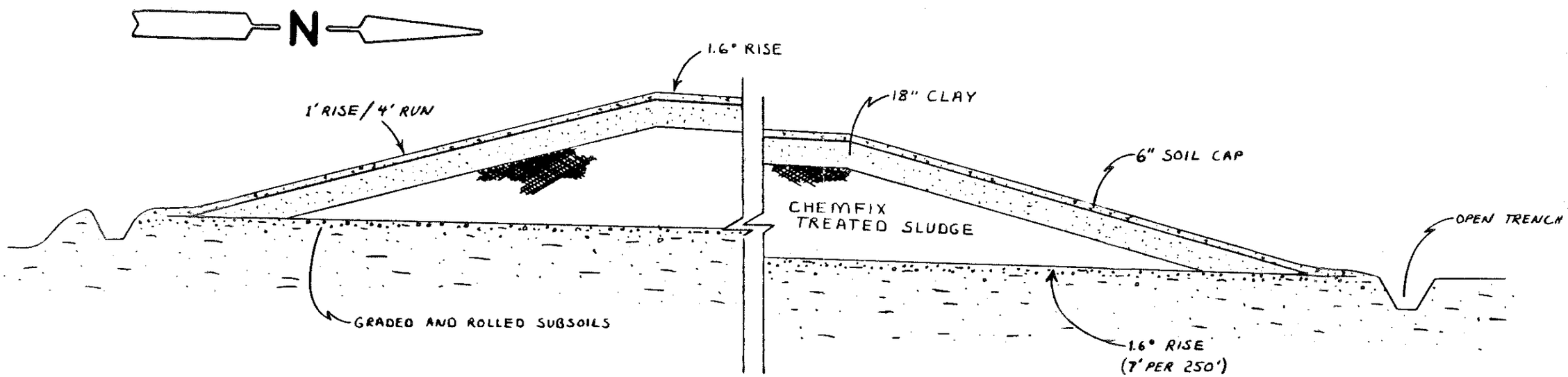
SHEET 1 of 2

FP-WT-144


STATE ROUTE
RAILROAD
CENTRAL
ADMIN OFFICE
PARKING
WATER TOWER
WASTE TREATMENT
MANUFACTURING
BUILDING
POWER HOUSE
WATER STORAGE
NPDES OUTFALL 001
3 SLUDGE DEWATERING IMPOUNDMENTS 200' X 500' EACH
STORM SEWER GRATE
NEW DISPOSAL SITE 250' X 500'
N
OPEN DITCH
WOODED AREA
ELYRIA
1983 PRODUCTION
ELY-100B
PLOT PLAN

SITE PLOT PLAN





SECTION A-A
SITE ELEVATION
- NOT TO SCALE -

EXHIBIT C

TECHNICAL ASSESSMENT OF CHEMFIX® PROCESS

A. Abstract

Presented within this assessment are results of analyses performed on listed electroplating wastes (EPA Hazardous Waste Code F006) and the chemically stabilized materials resulting from CHEMFIX® process treatment of the wastes. Waste material was obtained from three (3) impoundments at the General Motors Corporation - Fisher Guide Division site in Elyria, Ohio, by Chemfix Technologies, Inc. (CTI). These impoundments are designated impoundments #1, #2, and #3.

The untreated wastes were analyzed for the four (4) F006 constituents of concern: cadmium, chromium, nickel, and cyanide, as well as: arsenic, barium, copper, hexavalent chromium, iron, lead, mercury, oil and grease, polychlorinated byphenyls, selenium, silver, total organic carbon, zinc, and the characteristics of ignitability, corrosivity, and reactivity.

CHEMFIX® products resulting from treatment of the wastes from impoundments #1, #2, and #3 were also evaluated. Total alkalinity, cation exchange capacity, and U.S. EPA-specified Extraction Procedure for Toxicity (EP) results are presented which document the non-hazardous nature of the CHEMFIX® products. The CHEMFIX® product is a chemically and physically stable solid with characteristics similar to that of clay soil.

In addition to the EP, the CHEMFIX® product was subjected to the U.S. EPA-specified Multiple Extraction Procedure (MEP). By simulating 1,000 years of an acid rain environment, the MEP demonstrates the long-term stability of the CHEMFIX® product. EP determinations, substituting distilled water for

acetic acid solution, were performed to determine the level of extractable cyanide in the CHEMFIX® product (acetic acid solution inhibits cyanide extractions). Finally, the pressure at which newly-formed CHEMFIX® product, when placed into a Millipore filtration unit, would produce extractable liquid was determined. This showed that no free liquid was produced until at least 10 psig hydrostatic pressure had been exerted upon the material. Thus, at least 19 feet of newly-formed product may be placed in a discharge area before an extractable liquid is produced. No extractable liquid is released after a 48 hour solidification period. Therefore, no extractable liquid will be released by the finished CHEMFIX® product.

B. Sample Acquisition

CTI collected samples during the week of December 18, 1983 from 80 locations within impoundments #2 and #3, and during the week of August 27, 1984 from 40 locations within impoundment #1. Sample point locations and waste depths, as well as total volume estimates for each impoundment, are listed on the following pages.

A grid pattern was developed from which 40 uniformly spaced sample points were obtained for each impoundment. The sample points were surveyed utilizing a transit. Points along north-south and east-west banks were marked and used by personnel onshore to guide the individuals obtaining samples on the impoundments. This system insures a complete, precise, reproducible representation of each individual impoundment, and allows for the identification of possible non-homogeneous areas within the impoundment. In addition, the system provides for later identification of sample point locations.

Samples were taken of the entire vertical section of each impoundment at each grid point. As each sample was obtained, it was placed within a five (5) gallon container and mixed thoroughly. Sludge depth measurements were made at each sample point. For each quadrant, material from every point within the quadrant was composited in a five (5) gallon container to obtain a representative quadrant composite. In addition to the four (4) quadrant composites, from each of the three (3) impoundments, samples were retained for one (1) point in each quadrant. The individual samples on the following pages were obtained for verification of quadrant homogeneity. The composites and individual point samples were taken to Kenner, Louisiana for analysis by CTI's lab, and to be retained for a period of six (6) months.

Since impoundment #1 is currently receiving sludge from plant operations, additional sampling was conducted of this impoundment. This included four (4) samples of the influent sludge flow during a 24 hour period, 19 surface grab samples, and seven (7) core samples taken in the immediate vicinity of the inlet pipe. These samples were all used to form a single composite sample. The sample point locations and the analysis results are shown on the following pages.

SAMPLE QUADRANT LOCATIONS AND DEPTHS

CSS1040-L83

IMPOUNDMENT #1

Sample Number	Quadrant Number	Sludge Depth (Feet)	Sample Number	Quadrant Number	Sludge Depth (Feet)
C1	1	3.5	A6	3	4.0
D1*	1	3.5	B6	3	3.5
C2	1	3.0	A7	3	4.0
D2	1	3.5	B7	3	4.0
C3	1	3.5	A8*	3	3.5
D3	1	3.5	B8	3	4.0
C4	1	3.5	A9	3	3.5
D4	1	3.5	B9	3	4.0
C5	1	3.5	A10	3	3.5
D5	1	3.5	B10	3	4.0
A1	2	3.5	C6	4	3.5
B1	2	3.5	D6	4	3.0
A2	2	3.5	C7	4	3.0
B2	2	4.0	D7	4	3.5
A3	2	3.5	C8	4	3.5
B3*	2	4.0	D8*	4	3.0
A4	2	4.0	C9	4	3.5
B4	2	3.5	D9	4	3.5
A5	2	3.5	C10	4	2.0
B5	2	4.0	D10	4	3.5

Total Volume Estimate = 2.4 Million Gallons

* Individual grab sample retained

SAMPLE QUADRANT LOCATIONS AND DEPTHS

CSS1040-L83

IMPOUNDMENT #2

Sample Number	Quadrant Number	Sludge Depth (Feet)	Sample Number	Quadrant Number	Sludge Depth (Feet)
C1	1	3.5	A6	3	4.0
D1*	1	3.5	B6	3	3.5
C2	1	3.0	A7	3	4.0
D2	1	3.5	B7	3	4.0
C3	1	3.5	A8*	3	3.5
D3	1	3.5	B8	3	4.0
C4	1	3.5	A9	3	3.5
D4	1	3.5	B9	3	4.0
C5	1	3.5	A10	3	3.5
D5	1	3.5	B10	3	4.0
A1	2	3.5	C6	4	3.5
B1	2	3.5	D6	4	3.0
A2	2	3.5	C7	4	3.0
B2	2	4.0	D7	4	3.5
A3	2	3.5	C8	4	3.5
B3*	2	4.0	D8*	4	3.0
A4	2	4.0	C9	4	3.5
B4	2	3.5	D9	4	3.5
A5	2	3.5	C10	4	2.0
B5	2	4.0	D10	4	3.5

Total Volume Estimate = 2.4 Million Gallons

* Individual grab sample retained

SAMPLE QUADRANT LOCATIONS AND DEPTHS

CSS1040-L83

IMPOUNDMENT #3

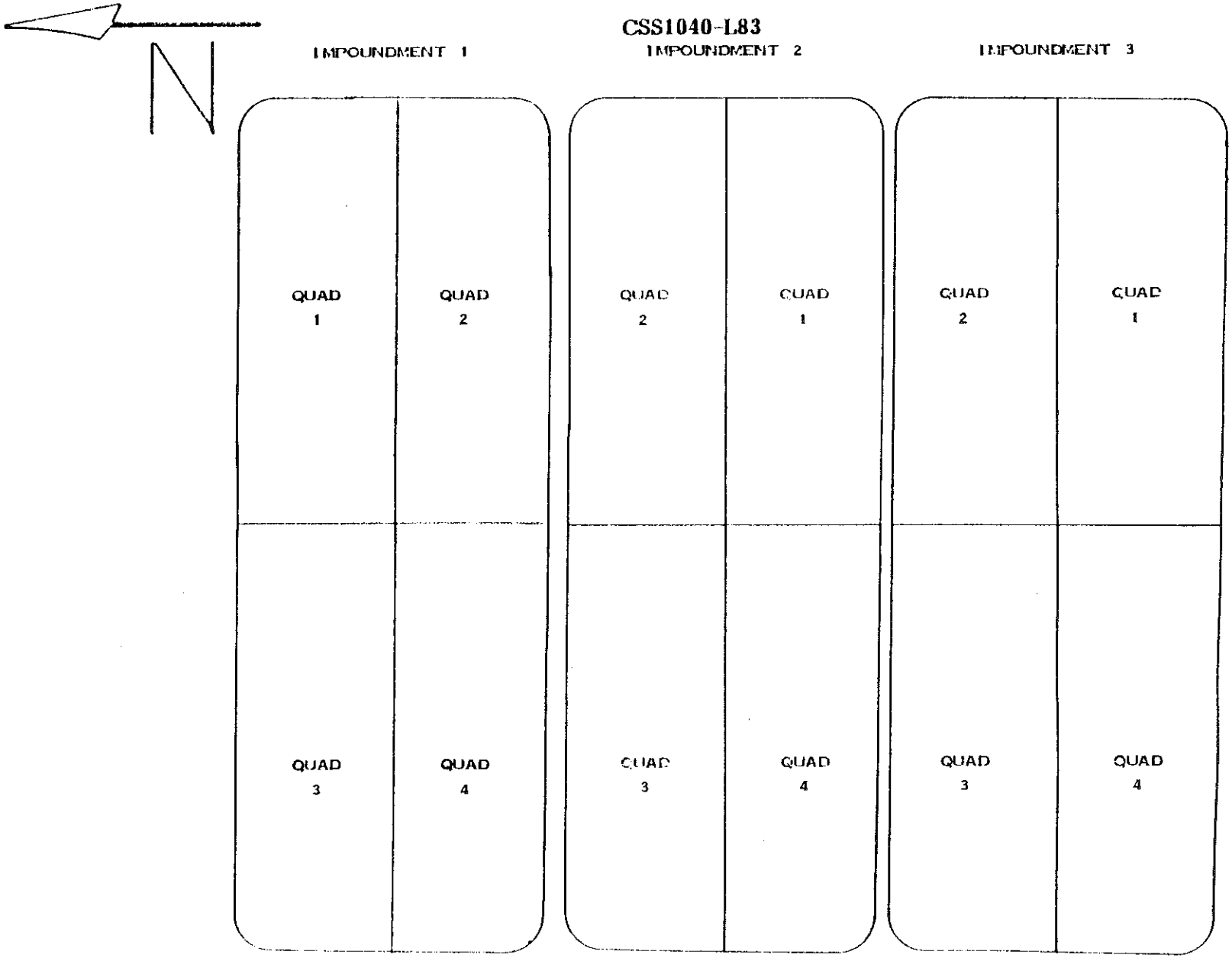
Sample Number	Quadrant Number	Sludge Depth (Feet)	Sample Number	Quadrant Number	Sludge Depth (Feet)
G1	1	4.5	E6	3	5.0
H1	1	3.5	F6	3	3.5
G2	1	5.0	E7	3	4.5
H2	1	3.5	F7	3	4.0
G3*	1	4.5	E8	3	5.0
H3	1	3.5	F8	3	4.0
G4	1	5.0	E9	3	4.5
H4	1	4.0	F9*	3	3.5
G5	1	5.0	E10	3	5.0
H5	1	4.0	F10	3	5.0
E1	2	4.0	G6	4	4.5
F1	2	4.0	H6	4	3.5
E2	2	3.5	G7	4	5.0
F2	2	4.5	H7	4	3.5
E3	2	4.5	G8	4	4.5
F3	2	4.5	H8	4	3.5
E4*	2	5.0	G9	4	4.5
F4	2	5.0	H9*	4	4.0
E5	2	5.0	G10	4	4.5
F5	2	4.0	H10	4	4.5

Total Volume Estimate = 2.9 Million Gallons

*Individual grab sample retained

QUADRANT LOCATIONS

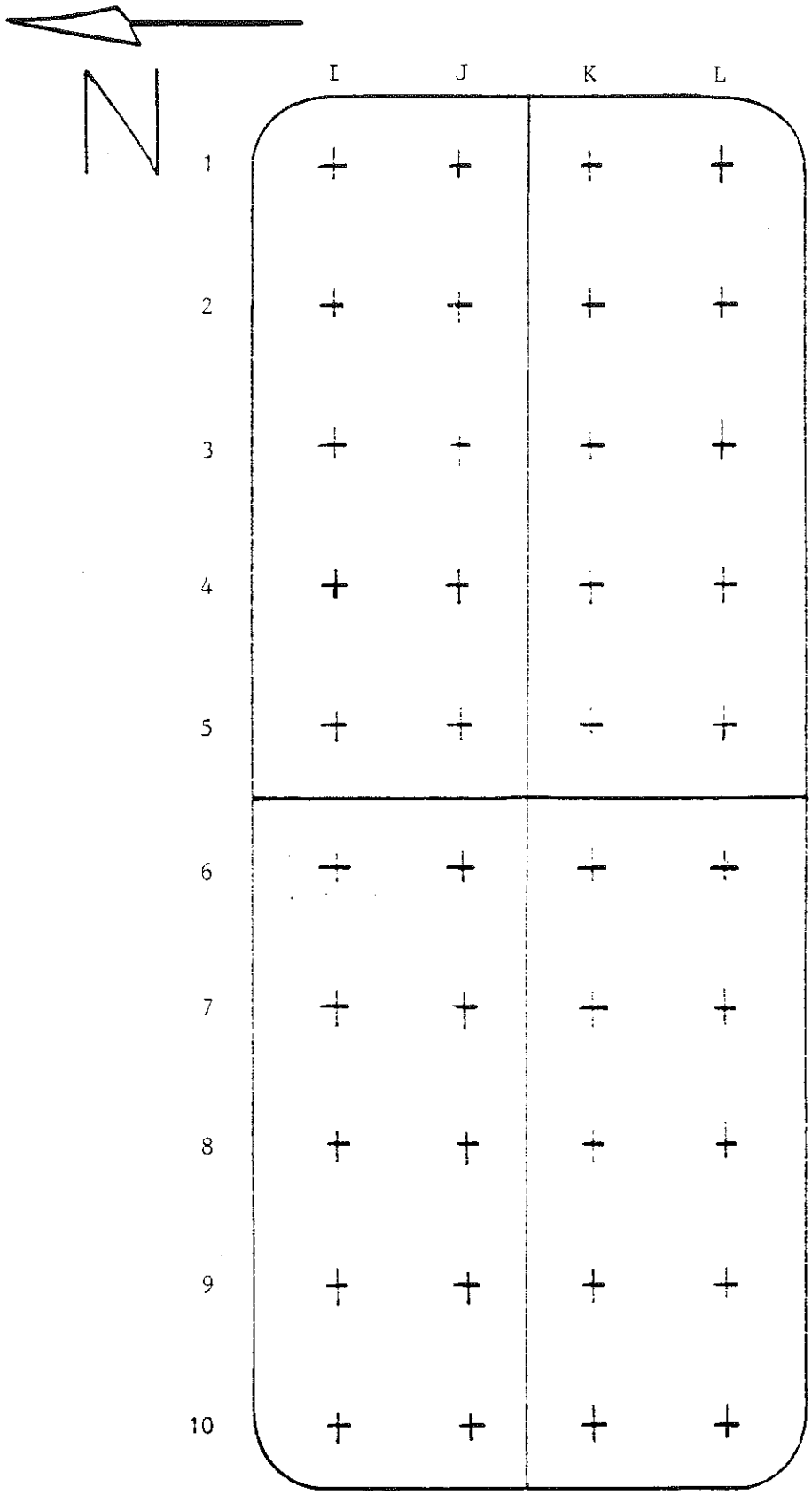
CSS1040-L83



SAMPLE POINT LOCATIONS

CSS1040H84

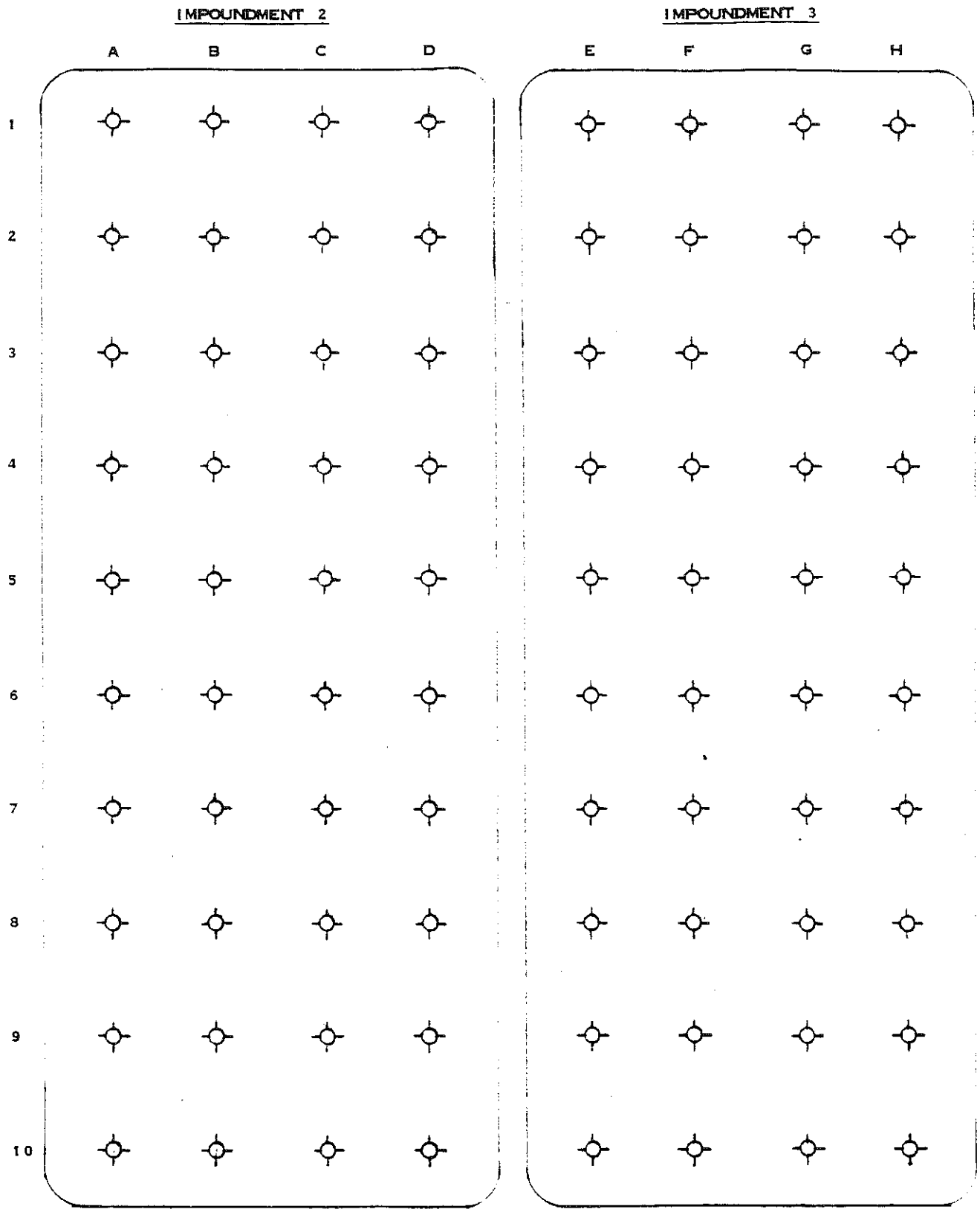
IMPOUNDMENT 1



SAMPLE POINT LOCATIONS

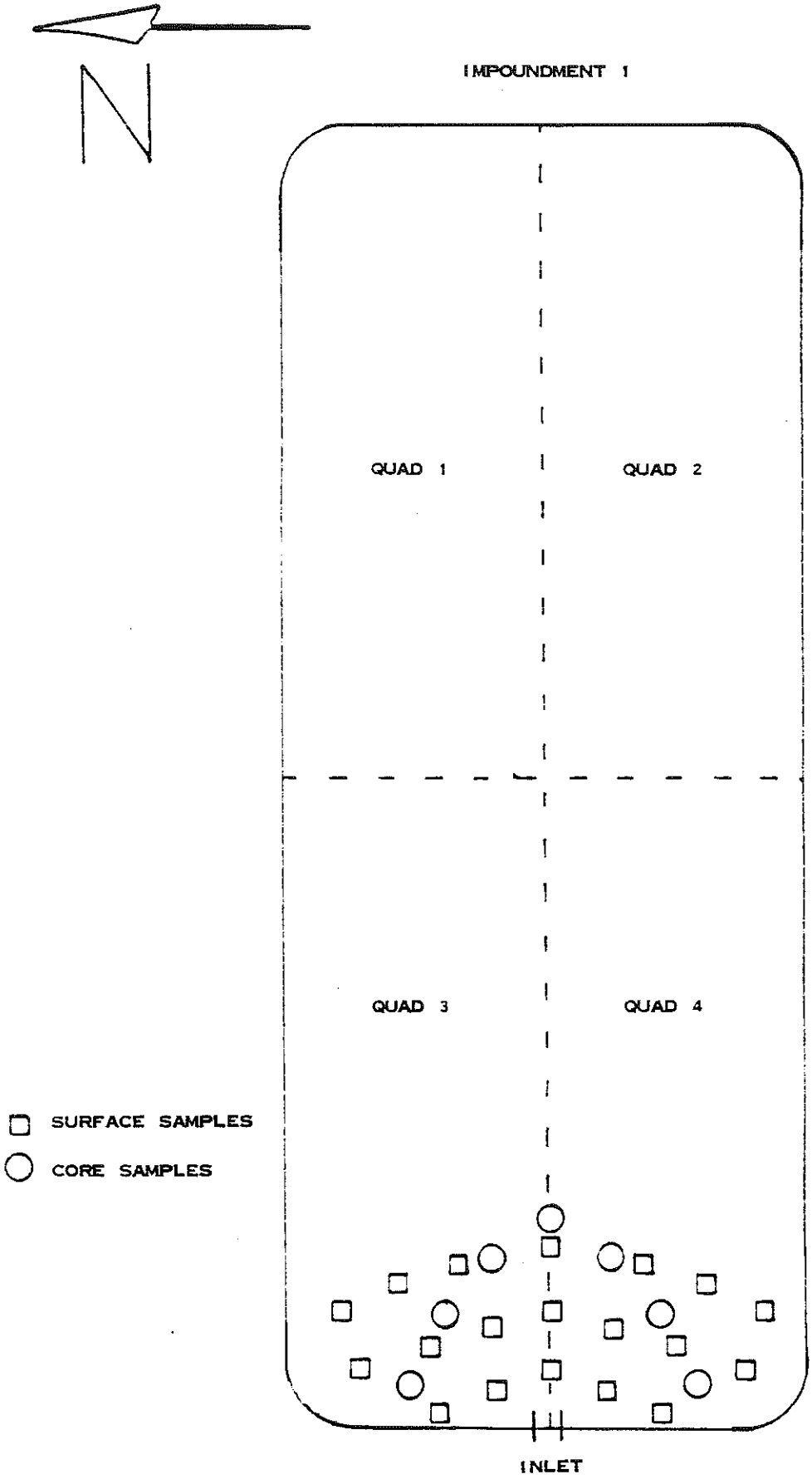
CSS1040-L83

Scale: 1 inch = 63.4 feet



DISCHARGE SAMPLE LOCATIONS

CSS1040H84



C. Total Metal Concentrations - Raw Waste

For each impoundment, two (2) representative samples of the untreated material from each of the quadrant composites and each of the individual grab samples were digested in concentrated nitric acid at 125°C under pressure. The acid digests were used to determine the total concentration of metals in the waste. CTI analyzed the digests using a Perkin-Elmer Model 560 Atomic Absorption Spectrophotometer, for arsenic, barium, cadmium, chromium, copper, iron, lead, mercury, nickel, selenium, silver, and zinc. Average values for metal concentrations in the quadrant composite digests and in the individual grab sample digests are reported on the following two (2) pages.

Impoundment #2 is generally uniform with regard to all constituents for which it was analyzed. However, portions of impoundment #2 are marginally higher in lead concentration than the average of individual points within the impoundment. Throughout impoundment #2, chromium, nickel, and lead were found in significant quantities. Impoundments #2 and #3 are uniform with regard to all constituents for which they were analyzed. Throughout the impoundment, chromium and nickel were found in significant quantities.

For each impoundment, comparison with results for individual grab samples illustrates that the quadrant composites are representative of the nature of the waste. In addition, preparation of the impoundments involves thorough physical mixing prior to field processing utilizing the CHEMFIX® process. Therefore, though marginal variations may be seen within the impoundments, no constituent variation is sufficient to prohibit laboratory simulation of field treatment of a blended impoundment waste.

TOTAL CONSTITUENT CONCENTRATIONS BY QUADRANT
UNTREATED WASTE
CSS1040-H84

IMPOUNDMENT #1

Constituent	Quad. 1 (mg/kg)	Quad. 2 (mg/kg)	Quad. 3 (mg/kg)	Quad. 4 (mg/kg)	Impoundment Avg. (mg/kg)
Arsenic	1.1	0.6	0.7	0.9	0.8
Barium	117	102	147	119	121
Cadmium	2.0	2.0	2.3	2.7	2.3
Chromium	13,300	9,200	10,600	11,300	11,100
Chromium, $^{+6}$	2.2	1.5	1.2	1.1	1.5
Copper	4,050	3,100	3,110	3,730	3,500
Cyanide, Total	0.9	2.2	1.3	1.6	1.5
Cyanide, Free	<1.0	<1.0	<1.0	<1.0	<1.0
Iron	3,550	3,350	2,390	4,310	3,400
Lead	49	40	46	48	46
Mercury	0.5	0.5	0.5	0.5	0.5
Nickel	3,990	3,430	3,590	3,020	3,510
PCB	<1.0	<1.0	<1.0	<1.0	<1.0
Phenol	<10.0	<10.0	<10.0	<10.0	<10.0
Selenium	<1.0	<1.0	<1.0	<1.0	<1.0
Silver	1.4	1.6	1.7	1.7	1.6
Zinc	2,190	2,380	2,970	3,090	2,660

TOTAL CONSTITUENT CONCENTRATIONS BY QUADRANT
UNTREATED WASTE
CSS1040-L83

IMPOUNDMENT #2

Constituent	Quad. 1 (mg/kg)	Quad. 2 (mg/kg)	Quad. 3 (mg/kg)	Quad. 4 (mg/kg)	Impoundment Avg. (mg/kg)
Arsenic	1.46	1.66	0.84	1.71	1.42
Barium	160.	225.	222.	174.	195.
Cadmium	2.2	2.3	2.4	2.5	2.4
Chromium	15,100	16,900	16,700	13,800	15,600
Chromium, $^{+6}$	2.0	1.3	1.1	0.8	1.3
Copper	5,740	5,750	5,520	5,540	5,640
Cyanide, Total	1.2	1.2	2.2	1.2	1.4
Cyanide, Free	1.2	0.9	0.6	0.8	0.9
Iron	2,840	2,840	3,680	3,520	3,220
Lead	76.	79.	151.	269.	144.
Mercury	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	6,010	6,120	5,050	5,610	5,700
PCB	<1.0	<1.0	<1.0	<1.0	<1.0
Phenol	<10.0	<10.0	<10.0	<10.0	<10.0
Selenium	<1.0	1.3	<1.0	<1.0	<1.0
Silver	3.4	3.0	2.6	2.8	3.0
Zinc	1,750	1,830	1,760	1,770	1,780

IMPOUNDMENT #3

Constituent	Quad. 1 (mg/kg)	Quad. 2 (mg/kg)	Quad. 3 (mg/kg)	Quad. 4 (mg/kg)	Impoundment Avg. (mg/kg)
Arsenic	2.21	1.02	1.28	1.76	1.57
Barium	52.	58.	205.	66.	95.
Cadmium	1.2	2.0	1.9	1.6	1.7
Chromium	8,580	9,720	9,070	8,520	9,000
Chromium, $^{+6}$	0.9	1.2	1.5	1.0	1.1
Copper	3,450	3,940	3,980	3,160	3,630
Cyanide, Total	3.9	2.9	4.7	2.2	3.4
Cyanide, Free	1.5	1.8	2.5	2.1	2.0
Iron	1,050	1,280	1,580	1,110	1,260
Lead	27.	33.	63.	24.	37.
Mercury	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	2,590	3,150	2,921	2,460	2,780
PCB	<1.0	<1.0	<1.0	<1.0	<1.0
Phenol	<10.0	<10.0	<10.0	<10.0	<10.0
Selenium	<1.0	1.2	<1.0	<1.0	<1.0
Silver	1.0	1.1	1.5	0.9	1.1
Zinc	1,150	1,180	1,290	1,180	1,200

TOTAL CONSTITUENT CONCENTRATIONS

UNTREATED WASTE GRAB SAMPLES

CSS1040-H84

IMPOUNDMENT #1

Constituent	Q1-Pt. J5 (mg/kg)	Q2-Pt. K2 (mg/kg)	Q3-Pt. J8 (mg/kg)	Q4-Pt. L6 (mg/kg)
Arsenic	0.1	0.3	<0.1	0.1
Barium	101	135	324	125
Cadmium	0.8	0.8	0.8	1.1
Chromium	10,190	12,260	9,365	9,825
Copper	1,860	2,360	1,835	2,235
Iron	1,730	1,535	2,075	1,835
Lead	27	36	35	29
Mercury	0.8	0.5	0.1	<0.1
Nickel	8,945	4,945	7,540	4,890
Selenium	<1.0	<1.0	<1.0	<1.0
Silver	3.2	2.5	2.0	1.8
Zinc	3,985	2,580	6,315	2,525

TOTAL CONSTITUENT CONCENTRATIONS

UNTREATED WASTE GRAB SAMPLES

CSS1040-L83

IMPOUNDMENT #2

Constituent	Point D1 (mg/kg)	Point B3 (mg/kg)	Point A8 (mg/kg)	Point D8 (mg/kg)
Arsenic	0.76	2.15	1.16	2.44
Barium	260.	46.	178.	172.
Cadmium	2.3	1.3	2.2	1.9
Chromium	13,400	3,530	14,000	14,900
Copper	4,350	1,830	5,780	5,830
Iron	4,480	530	3,160	3,210
Lead	82.	15.	67.	80.
Mercury	<0.1	<0.1	<0.1	<0.1
Nickel	8,740	1,600	5,690	6,300
Selenium	1.0	<1.0	<1.0	<1.0
Silver	2.5	0.8	1.7	1.9
Zinc	2,340	540	1,930	1,980

IMPOUNDMENT #3

Constituent	Point G3 (mg/kg)	Point E4 (mg/kg)	Point F9 (mg/kg)	Point H9 (mg/kg)
Arsenic	0.9	<0.2	0.3	<0.2
Barium	59.	166.	35.	24.
Cadmium	1.3	1.3	1.4	1.1
Chromium	8,060	10,150	10,070	9,510
Copper	3,630	4,150	3,470	3,440
Iron	1,190	1,540	1,960	1,360
Lead	26.	72.	58.	36.
Mercury	<0.1	<0.1	<0.1	<0.1
Nickel	2,550	2,600	2,340	2,140
Selenium	0.6	0.5	0.6	0.8
Silver	2.3	2.0	1.8	1.2
Zinc	1,240	1,330	1,210	1,150

TOTAL CONSTITUENT CONCENTRATIONS

UNTREATED WASTE GRAB SAMPLES

FRESH DISCHARGE MATERIAL COMPOSITES

CSS1040-H84

IMPOUNDMENT #1

Constituent	Stream (mg/kg)	Surface Samples (mg/kg)	Core Samples (mg/kg)
Arsenic	0.3	<0.1	<0.1
Barium	89	572	268
Cadmium	1.1	1.9	1.9
Chromium	4,220	12,300	20,750
Copper	450	2,180	2,440
Iron	655	2,600	2,160
Lead	35	51	46
Mercury	0.9	1.0	0.7
Nickel	485	4,850	4,860
Selenium	<1.0	<1.0	<1.0
Silver	1.7	2.9	2.2
Zinc	3,260	6,800	3,200

D. Non-Metallic Constituents - Untreated Waste

Total organic carbon was determined for the untreated waste with an OI Corporation Model 524D Carbon Analyzer using the U.S. EPA-specified Combustion or Oxidation Method. Oil and grease content of the untreated waste was determined using the U.S. EPA-specified Gravimetric, Separatory Funnel Extraction for Total Recoverable Oil and Grease. The polychlorinated biphenyl (PCB) concentration within the untreated waste was determined using Method 8080 as specified in the U.S. EPA "Test Methods for Evaluating Solid Waste", 2nd edition.

IMPOUNDMENT #1

Constituent Within Untreated Waste Sample	Quad. 1 (mg/l)	Quad. 2 (mg/l)	Quad. 3 (mg/l)	Quad. 4 (mg/l)	Impoundment Avg. (mg/l)
Total Organic Carbon	15,600	15,600	13,800	13,300	14,600
Oil and Grease	18,100	18,400	18,200	18,400	18,300
Polychlorinated Biphenyls	<1	<1	<1	<1	<1

IMPOUNDMENT #2

Constituent Within Untreated Waste Sample	Quad. 1 (mg/l)	Quad. 2 (mg/l)	Quad. 3 (mg/l)	Quad. 4 (mg/l)	Impoundment Avg. (mg/l)
Total Organic Carbon	15,300	13,100	15,000	13,200	14,100
Oil and Grease	10,300	6,100	10,400	7,200	8,500
Polychlorinated Biphenyls	<1	<1	<1	<1	<1

IMPOUNDMENT #3

Constituent Within Untreated Waste Sample	Quad. 1 (mg/l)	Quad. 2 (mg/l)	Quad. 3 (mg/l)	Quad. 4 (mg/l)	Impoundment Avg. (mg/l)
Total Organic Carbon	12,000	7,700	12,100	7,500	9,000
Oil and Grease	10,500	9,400	9,800	8,600	9,600
Polychlorinated Biphenyls	<1	<1	<1	<1	<1

E. Chemical and Physical Characteristics of Untreated Waste

The characteristics of ignitability, corrosivity, and reactivity were determined for the untreated waste using the methods noted below, which are specified in the U.S. EPA "Test Methods for Evaluating Solid Waste", 2nd edition.

Constituent	Method
Ignitability	1010
Corrosivity	1110 and 9040
Reactivity	9010 and 9030

Results of these determinations are listed below. Also noted are results of pH and percent solids at 105°C determinations.

IMPOUNDMENT #1

Parameter	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4	Average
Ignitability	None* (116°F)	None* (128°F)	None* (124°F)	None* (136°F)	None* (126°F)
Corrosivity to Steel (mm/yr)	0.54	0.13	1.00	0.16	0.46
Reactivity** (as sulfide)	<2.0mg/kg	<2.0mg/kg	<2.0mg/kg	<2.0mg/kg	<2.0mg/kg
pH	10.1	10.1	10.6	10.1	10.2
Solids (105°C)	—	—	—	—	23.3%

*The sample did not ignite. The flame was extinguished at the temperature noted in parentheses. Water vapor may have been responsible for extinguishing the flame.

**The sample is not reactive in the presence of air or water.

IMPOUNDMENT #2

Parameter	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4	Average
Ignitability	None* (178°F)	None* (168°F)	None* (182°F)	None* (188°F)	None* (179°F)
Corrosivity to Steel	None	None	None	None	None
Reactivity** (as sulfide)	<2.0mg/kg	<2.0mg/kg	<2.0mg/kg	<2.0mg/kg	<2.0mg/kg
pH	8.0	7.9	8.7	8.2	8.2
Solids (105°C)	—	—	—	—	26.6%

IMPOUNDMENT #3

Parameter	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4	Average
Ignitability	None* (182°F)	None* (174°F)	None* (196°F)	None* (188°F)	None* (185°F)
Corrosivity to Steel	None	None	None	None	None
Reactivity** (as sulfide)	<2.0mg/kg	5.3mg/kg	2.7mg/kg	7.3mg/kg	4.3mg/kg
pH	11.0	10.7	11.4	11.1	11.1
Solids (105°C)	—	—	—	—	15.5%

*The sample did not ignite. The flame was extinguished at the temperature noted in parentheses. Water vapor may have been responsible for extinguishing the flame.

**The sample is not reactive in the presence of air or water.

F. Hexavalent Chromium - Untreated Waste and CHEMFIX® Product

Hexavalent chromium levels within the untreated waste from the impoundments were determined using the alkaline digest Method 3060 as specified in the U.S. EPA "Test Methods for Evaluating Solid Waste", 2nd edition.

Duplicate samples of each quadrant composite were treated by the CHEMFIX® process at appropriate reagent levels. The resulting products were subjected to the Extraction Procedure for Toxicity (EP) as specified in the U.S. EPA "Identification and Listing of Hazardous Waste", Federal Register, May 19, 1980. The resulting EP extract was analyzed for hexavalent chromium. Average results are reported below.

IMPOUNDMENT #1

Hexavalent Chromium Analysis	Quad. 1 (mg/l)	Quad. 2 (mg/l)	Quad. 3 (mg/l)	Quad. 4 (mg/l)	Impoundment Avg. (mg/l)
Total, Untreated Waste	2.2	1.5	1.2	1.1	1.5
Extractable, CHEMFIX® Product	0.05	0.06	0.06	0.10	0.07

IMPOUNDMENT #2

Hexavalent Chromium Analysis	Quad. 1 (mg/l)	Quad. 2 (mg/l)	Quad. 3 (mg/l)	Quad. 4 (mg/l)	Impoundment Avg. (mg/l)
Total, Untreated Waste	2.0	1.3	1.1	0.8	1.3
Extractable, CHEMFIX® Product	0.23	0.21	0.12	0.29	0.21

IMPOUNDMENT #3

Hexavalent Chromium Analysis	Quad. 1 (mg/l)	Quad. 2 (mg/l)	Quad. 3 (mg/l)	Quad. 4 (mg/l)	Impoundment Avg. (mg/l)
Total, Untreated Waste	0.9	1.2	1.5	1.0	1.1
Extractable, CHEMFIX® Product	0.03	0.02	0.04	0.02	0.03

Variation in hexavalent chromium concentrations within each impoundment is minimal. No observed variation is sufficient to prohibit laboratory simulation of field treatment success. CHEMFIX® processing includes thorough mixing of the surface impoundment prior to reagent addition. Therefore, the average hexavalent chromium values for each impoundment accurately describe the character of the waste and of the CHEMFIX® product. The chemical reactions which occur during the CHEMFIX® process preferentially react with trivalent rather than hexavalent chromium. However, sufficient reagent levels are employed to chemically stabilize all forms of chromium present in the waste. CTI also has the capability to pretreat for hexavalent chromium reduction if necessary. However, there is not sufficient hexavalent chromium present in the waste to warrant pretreatment.

G. Cyanide - Untreated Waste and CHEMFIX® Product

Total and free cyanide levels within the untreated waste from the impoundments were determined using Method 9010 as specified in the U.S. EPA "Test Methods for Evaluating Solid Waste", 2nd edition.

For the impoundment, duplicate samples of each quadrant composite were treated by the CHEMFIX® process at appropriate reagent levels. The resulting products were subjected to a variation of the Extraction Procedure for Toxicity (EP) as specified in the U.S. EPA "Identification and Listing of Hazardous Waste", Federal Register, May 19, 1980. The variation consists of replacing acetic acid solution with distilled water. The resulting distilled water extracts were analyzed for extractable cyanide. Average results are reported below.

IMPOUNDMENT #1

Cyanide Analysis	Quad. 1 (mg/l)	Quad. 2 (mg/l)	Quad. 3 (mg/l)	Quad. 4 (mg/l)	Impoundment Avg. (mg/l)
Total, Untreated Waste	0.9	2.2	1.3	1.6	1.5
Free, Untreated Waste	<1.0	<1.0	<1.0	<1.0	<1.0
Extractable, CHEMFIX® Product	0.018	0.014	0.018	0.013	0.016

IMPOUNDMENT #2

Cyanide Analysis	Quad. 1 (mg/l)	Quad. 2 (mg/l)	Quad. 3 (mg/l)	Quad. 4 (mg/l)	Impoundment Avg. (mg/l)
Total, Untreated Waste	1.2	1.2	2.2	1.2	1.4
Free, Untreated Waste	1.2	0.9	0.6	0.8	0.9
Extractable, CHEMFIX® Product	0.017	0.012	0.025	0.030	0.021

IMPOUNDMENT #3

Cyanide Analysis	Quad. 1 (mg/l)	Quad. 2 (mg/l)	Quad. 3 (mg/l)	Quad. 4 (mg/l)	Impoundment Avg. (mg/l)
Total, Untreated Waste	3.9	2.9	4.7	2.2	3.4
Free, Untreated Waste	1.5	1.8	2.5	2.1	2.0
Extractable, CHEMFIX® Product	0.070	0.070	0.120	0.070	0.083

Variation in cyanide concentrations within each impoundment is minimal. No observed variation is sufficient to prohibit laboratory simulation of field treatment success. CHEMFIX® processing includes thorough mixing of the surface impoundment prior to reagent addition. Therefore, the average cyanide values for each impoundment accurately describe the character of the waste and of the CHEMFIX® product. CTI has the capability to pretreat for cyanide if necessary. However, there is not sufficient extractable cyanide present in the CHEMFIX® product to warrant pretreatment.

H. Extraction Procedure Results CHEMFIX® Product

For each impoundment, duplicate samples of each quadrant composite were treated by the CHEMFIX® process at appropriate reagent levels. The resulting products were subjected to the Extraction Procedure for Toxicity (EP) as specified in the U. S. EPA "Identification and Listing of Hazardous Waste", Federal Register, May 19, 1980. The resulting EP extracts were analyzed for arsenic, barium, cadmium, chromium, lead, mercury, nickel, selenium, and silver.

For the CHEMFIX® product extractions, all constituent concentrations were well within maximum allowable levels as specified by the EPA. Further, all constituents were within 16 times drinking water standards. Results are listed below:

IMPOUNDMENT #1

Constituent Within CHEMFIX® Product EP Extract	Quad. 1 (mg/l)	Quad. 2 (mg/l)	Quad. 3 (mg/l)	Quad. 4 (mg/l)	Impoundment Avg. (mg/l)
Arsenic	<0.005	<0.005	0.006	<0.005	<0.005
Barium	0.352	0.275	0.509	0.489	0.406
Cadmium	0.028	0.024	0.023	0.026	0.025
Chromium	0.344	0.355	0.456	0.470	0.406
Lead	0.36	0.38	0.35	0.38	0.37
Mercury	0.006	0.006	0.005	0.003	0.005
Nickel	0.510	0.478	0.388	0.498	0.469
Selenium	0.001	0.002	0.003	0.002	0.002
Silver	0.030	0.031	0.029	0.032	0.031

IMPOUNDMENT #2

Constituent Within CHEMFIX® Product EP Extract	Quad. 1 (mg/l)	Quad. 2 (mg/l)	Quad. 3 (mg/l)	Quad. 4 (mg/l)	Impoundment Avg. (mg/l)
Arsenic	0.002	0.005	0.001	0.001	0.002
Barium	0.485	0.374	0.216	0.523	0.399
Cadmium	0.024	0.019	0.019	0.017	0.019
Chromium	0.540	0.479	0.397	0.333	0.437
Lead	0.34	0.35	0.34	0.33	0.34
Mercury	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	0.377	0.454	0.313	0.352	0.364
Selenium	<0.001	0.006	<0.001	0.002	0.002
Silver	0.033	0.035	0.034	0.034	0.034

IMPOUNDMENT #3

Constituent Within CHEMFIX® Product EP Extract	Quad. 1 (mg/l)	Quad. 2 (mg/l)	Quad. 3 (mg/l)	Quad. 4 (mg/l)	Impoundment Avg. (mg/l)
Arsenic	0.001	0.001	0.001	0.001	0.001
Barium	0.507	0.385	0.495	0.381	0.442
Cadmium	0.046	0.042	0.045	0.042	0.043
Chromium	0.409	0.392	0.439	0.767	0.501
Lead	0.38	0.37	0.39	0.40	0.38
Mercury	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	0.336	0.361	0.288	0.382	0.341
Selenium	0.001	0.001	0.001	0.001	0.001
Silver	0.035	0.035	0.037	0.038	0.036

I. Multiple Extraction Procedure Results - CHEMFIX® Product

Half-pond composites of CHEMFIX® product were subjected to the U.S. EPA-specified Multiple Extraction Procedure (MEP). For the MEP, a 100 gram sample of CHEMFIX® product ground to 100 mesh was subjected to the EP. After filtration, the resulting residue was agitated in the same extractor system as was used for the EP in 20 times its weight of a synthetic acid rain solution. The solution consists of a 60/40 weight percent mixture of sulfuric and nitric acids in distilled deionized water at pH 3.0 $\pm$ 0.2. The extraction continued 24 hours (MEP 1). After filtration of the MEP 1, the extraction was performed upon the residue through eight (8) sequential replications (MEP 2 through 9). Extract metal concentrations are reported on the following page. Constituent concentrations in all extracts were well within maximum allowable levels. The constituent concentrations decreased with each subsequent extraction, indicating the constituents were permanently bound within the product matrix. Therefore, the product matrix retained its chemical and physical integrity throughout the test.

CHEMFIX® PRODUCT

MULTIPLE EXTRACTION PROCEDURE

CSS1040-H84

IMPOUNDMENT#1

HALF-POND COMPOSITE: QUADRANTS 1 AND 2

Constituent	EP	MEP 1	MEP 2	MEP 3	MEP 4	MEP 5	MEP 6	MEP 7	MEP 8	MEP 9
Arsenic	<0.005	0.026	0.022	0.014	<0.005	0.006	<0.005	<0.005	<0.005	<0.005
Barium	0.67	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium	0.040	0.005	0.004	0.005	0.002	0.002	0.005	0.003	0.002	<0.001
Chromium	0.395	0.142	0.077	0.050	0.060	0.067	0.055	0.048	0.038	0.027
Lead	0.43	0.10	0.09	0.10	0.07	0.06	0.09	0.07	0.05	0.05
Mercury	0.003	0.001	0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	0.466	0.115	0.053	0.049	0.029	0.020	0.014	0.026	0.022	0.015
Selenium	0.004	0.002	0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver	0.033	0.001	0.001	0.001	<0.001	0.002	0.003	0.002	0.002	0.001

HALF-POND COMPOSITE: QUADRANTS 3 AND 4

Constituent	EP	MEP 1	MEP 2	MEP 3	MEP 4	MEP 5	MEP 6	MEP 7	MEP 8	MEP 9
Arsenic	0.019	0.028	0.018	0.017	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Barium	0.44	0.09	<0.05	<0.05	<0.05	0.07	0.05	<0.05	0.07	<0.05
Cadmium	0.031	0.006	0.003	0.002	0.003	0.003	0.004	0.005	0.005	0.004
Chromium	0.419	0.145	0.073	0.046	0.048	0.029	0.046	0.024	0.026	0.025
Lead	0.42	0.11	0.08	0.10	0.08	0.09	0.07	0.03	0.02	0.01
Mercury	0.003	<0.001	0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.002	<0.001
Nickel	0.473	0.125	0.060	0.044	0.041	0.031	0.039	0.034	0.044	0.021
Selenium	0.002	0.002	0.003	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver	0.036	0.003	0.001	0.002	<0.001	0.004	0.002	0.004	0.003	0.001

Concentrations of constituents in above extracts are reported in mg/l

CHEMFIX® PRODUCT

MULTIPLE EXTRACTION PROCEDURE

CSS1040-L83

IMPOUNDMENT #2

HALF-POND COMPOSITE: QUADRANTS 1 AND 2

Constituent	EP	MEP 1	MEP 2	MEP 3	MEP 4	MEP 5	MEP 6	MEP 7	MEP 8	MEP 9
Arsenic	0.002	0.002	0.004	0.002	0.002	0.003	0.002	0.001	0.001	0.001
Barium	0.705	0.055	0.076	0.050	0.045	0.057	0.055	0.038	0.049	0.036
Cadmium	0.044	0.010	0.010	0.003	0.004	0.003	0.002	<0.001	<0.001	<0.001
Chromium	1.263	0.434	0.370	0.256	0.195	0.156	0.100	0.077	0.070	0.067
Lead	0.35	0.06	0.07	0.04	0.05	0.05	0.05	0.02	0.02	0.01
Mercury	0.003	<0.001	0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	4.536	0.625	0.370	0.240	0.157	0.121	0.057	0.052	0.047	0.038
Selenium	0.002	0.001	0.002	0.002	0.002	0.002	0.001	0.001	<0.001	<0.001
Silver	0.032	0.006	0.001	0.001	0.001	<0.001	<0.001	0.002	0.001	<0.001

HALF-POND COMPOSITE: QUADRANTS 3 AND 4

Constituent	EP	MEP 1	MEP 2	MEP 3	MEP 4	MEP 5	MEP 6	MEP 7	MEP 8	MEP 9
Arsenic	0.007	0.003	0.003	0.003	0.002	0.002	0.001	0.001	0.002	0.002
Barium	0.575	<0.010	<0.010	0.035	0.047	0.053	0.046	0.045	0.032	0.027
Cadmium	0.036	0.008	0.011	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	1.494	0.541	0.445	0.313	0.225	0.174	0.110	0.084	0.063	0.053
Lead	0.28	0.04	0.01	0.06	0.10	0.06	0.05	0.02	<0.01	<0.01
Mercury	0.006	0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	3.708	0.543	0.312	0.223	0.153	0.090	0.061	0.040	0.032	0.030
Selenium	0.001	0.001	0.003	0.002	0.002	0.002	0.002	0.001	0.001	<0.001
Silver	0.035	0.004	0.002	<0.001	0.002	<0.001	0.004	<0.001	0.002	<0.001

Concentrations of constituents in above extracts are reported in mg/l

CHEMFIX® PRODUCT

MULTIPLE EXTRACTION PROCEDURE

CSS1040-L83

IMPOUNDMENT #3

HALF-POND COMPOSITE: QUADRANTS 1 AND 2

Constituent	EP	MEP 1	MEP 2	MEP 3	MEP 4	MEP 5	MEP 6	MEP 7	MEP 8	MEP 9
Arsenic	0.003	0.003	0.002	0.003	0.002	0.002	0.004	0.003	0.003	0.002
Barium	0.406	0.012	0.107	0.058	0.062	0.028	0.038	0.051	0.042	0.036
Cadmium	0.036	0.011	0.004	0.003	<0.001	0.002	0.003	0.002	0.002	<0.001
Chromium	0.314	0.166	0.014	0.078	0.055	0.050	0.038	0.023	0.023	0.018
Lead	0.35	0.06	0.03	0.05	0.09	0.05	0.07	0.05	<0.01	<0.01
Mercury	0.003	0.002	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	0.419	0.115	0.065	0.037	0.027	0.023	0.019	0.015	0.010	0.003
Selenium	0.003	0.002	0.003	0.002	0.005	0.002	<0.001	0.001	0.002	0.001
Silver	0.036	0.004	0.004	0.002	0.002	0.002	0.003	0.002	0.002	0.001

HALF-POND COMPOSITE: QUADRANTS 3 AND 4

Constituent	EP	MEP 1	MEP 2	MEP 3	MEP 4	MEP 5	MEP 6	MEP 7	MEP 8	MEP 9
Arsenic	0.002	<0.001	<0.001	0.004	0.003	0.002	0.003	0.004	0.004	0.003
Barium	0.361	0.095	0.029	0.105	0.090	0.072	0.033	0.040	0.032	0.022
Cadmium	0.044	0.009	0.008	0.005	0.003	<0.001	0.006	<0.001	<0.001	<0.001
Chromium	0.336	0.175	0.134	0.079	0.060	0.057	0.035	0.018	0.015	0.012
Lead	0.35	0.09	0.07	0.10	0.04	0.05	0.04	0.04	0.03	0.02
Mercury	<0.001	0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	0.354	0.095	0.055	0.041	0.034	0.029	0.012	0.018	0.013	0.011
Selenium	0.001	0.008	0.003	0.002	0.002	0.002	0.001	0.002	0.001	<0.001
Silver	0.030	0.001	<0.001	<0.001	0.001	0.001	0.002	0.002	0.001	0.001

Concentrations of constituents in above extracts are reported in mg/l

J. Chemical and Physical Characteristics - CHEMFIX® Product

For each impoundment, equal amounts of the four (4) quadrant composites were mixed to obtain total-pond composites. Total-pond composites represent the configuration an impoundment will have following agitation to obtain a uniform mixture prior to CHEMFIX® processing. Each total-pond composite of the CHEMFIX® product was tested to determine its permeability, unconfined compressive strength (UCS), total alkalinity, and cation exchange capacity (CEC). Total alkalinity and CEC were determined using methods described in the U.S. Department of Agriculture Handbook #60. UCS and permeability determination methods are specified in ASTM-D2166 and ASTM-D2434, respectively. Results of the determinations indicate that CHEMFIX® product has a high structural integrity and that it retains its integrity under water. The extremely low permeability of the product indicates little or no leachate would be produced under actual field conditions. Due to its reserve alkalinity and high CEC, the product also has the ability to capture metals and neutralize acids which may come in contact with it. The results are tabulated below along with CHEMFIX® product pH determinations.

Parameter	Impound. #1	Impound. #2	Impound. #3
Cation Exchange Capacity meq/100g	19	29	28
Permeability (cm/sec)	2.7×10^{-7}	1.1×10^{-7}	1.8×10^{-6}
Total Alkalinity (mg/kg as $CaCO_3$)	192,900	172,900	167,960
Unconfined Compressive Strength (lbs/ft^2)	5,830	12,795	7,830

Total-pond composites of CHEMFIX® product were also subjected to increasing levels of pressure immediately after they were produced. During the procedure, the newly-produced product was placed within a Millipore pressure filtration unit and the gauge pressure increased until the point was reached at which extractable liquid flowed from the unit. The wet density of CHEMFIX® product and the gauge pressure were used to determine (equation below) the maximum depth to which CHEMFIX® product may be placed in a discharge area to insure that no extractable liquid is produced:

$$\text{Maximum CHEMFIX® Product Depth, feet} = \frac{(\text{Gauge pressure, psig})(144\text{in}^2/\text{ft}^2)}{\text{Product Wet Density, lb/ft}^3}$$

For impoundments #1, #2 and #3, samples of newly-produced CHEMFIX® product, when subjected to increasing pressure, produced extractable liquid at 30, 20, and 10 psig, respectively. The wet density of the product is approximately 72 pcf. Therefore, 60 feet, 19.73 feet and 39.45 feet of newly-produced CHEMFIX® product from each impoundment respectively may be placed in a discharge area before extractable liquid is produced. After 48 hours, no extractable liquid is produced at pressures in excess of 100 psig.

K. Quality Control

The method of standard additions was used to screen for potential metal and cyanide interferences. No significant interferences were noted. Results of all evaluations are noted below:

IMPOUNDMENT #1 - QUADRANT 1

Constituent	Spike #1	Recovery #1	Spike #2	Recovery #2	Spike #3	Recovery #3
Arsenic	0.002	0.002	0.005	0.006	0.010	0.013
Barium	0.200	0.131	0.400	0.253	0.600	0.771
Cadmium	0.010	0.008	0.025	0.019	0.050	0.040
Chromium, Total	0.150	0.124	0.300	0.239	0.600	0.477
Chromium, Hexavalent	0.05	0.05	0.10	0.10	0.20	0.20
Cyanide, Extractable	0.010	0.009	0.020	0.020	0.040	0.038
Lead	0.15	0.17	0.30	0.35	0.60	0.66
Mercury	.002	.001	0.005	0.003	0.010	0.006
Nickel	0.250	0.287	0.500	0.580	1.000	1.151
Selenium	0.001	<0.001	0.002	0.001	0.003	0.002
Silver	0.015	0.017	0.030	0.033	0.060	0.066

IMPOUNDMENT #2 - QUADRANT 1

Constituent	Spike #1	Recovery #1	Spike #2	Recovery #2	Spike #3	Recovery #3
Arsenic	0.001	0.001	0.002	0.001	0.003	0.003
Barium	0.200	0.198	0.400	0.402	0.600	0.600
Cadmium	0.020	0.019	0.040	0.039	0.060	0.060
Chromium, Total	0.300	0.309	0.600	0.603	0.900	0.900
Chromium, Hexavalent	1.0	1.0	2.0	2.0	4.0	3.6
Cyanide, Extractable	0.010	<0.010	0.020	0.020	0.040	0.042
Lead	0.100	0.080	0.200	0.199	0.300	0.300
Mercury	0.002	<0.001	0.004	0.002	0.006	0.006
Selenium	0.004	<0.001	0.008	0.011	0.012	0.012
Silver	0.014	0.014	0.028	0.027	0.042	0.042

IMPOUNDMENT #3 - QUADRANT 1

Constituent	Spike #1	Recovery #1	Spike #2	Recovery #2	Spike #3	Recovery #3
Arsenic	0.001	0.002	0.002	0.003	0.003	0.003
Barium	0.200	0.191	0.400	0.406	0.600	0.600
Cadmium	0.020	0.022	0.040	0.044	0.060	0.060
Chromium, Total	0.278	0.275	0.556	0.563	0.834	0.834
Chromium, Hexavalent	1.0	0.9	2.0	1.8	4.0	3.6
Cyanide, Extractable	0.010	<0.010	0.025	0.023	0.050	0.046
Lead	0.100	0.110	0.200	0.201	0.300	0.300
Mercury	0.002	<0.001	0.004	0.005	0.006	0.006
Selenium	0.004	<0.001	0.008	0.007	0.012	0.012
Silver	0.014	0.012	0.028	0.030	0.043	0.043

All results are in mg/l

M. Field Project Quality Assurance

1. Reagent Addition

Optimum reagent ratio for the CHEMFIX® process is defined as the combination of reagents required to insure proper physical characteristics of the resulting CHEMFIX® product. Chemical integrity of the CHEMFIX® product is provided throughout a wide range of reagent ratios. This flexibility allows for slight fluctuation in reagent levels while still insuring the production of a non-hazardous material.

Liquid reagent flow is metered and is controlled at a rate proportional to the flow rate of raw sludge through the process unit. Reagent addition is monitored and calibrated each production day to insure proper addition over the complete range of raw sludge processing rates. These addition methods fall within tolerance limits necessary to insure the production of a non-hazardous material.

Prior to beginning the project, the lab will develop optimum ratios for the range of raw waste solids percentages to be encountered during processing. During processing, solids are monitored continually with any necessary ratio adjustments being made accordingly.

2. Sample Collection

Untreated waste samples will be collected once per two (2) hours of production time and composited for each production day. One (1) liter of each sample composite will be retained for archival storage. The samples will be obtained from the surge box of the process unit.

CHEMFIX® product samples will be collected once per hour of production time prior to allowing them to solidify. The samples will be

obtained at the end of the discharge hose. A portion of each sample will be retained for archival storage. The remaining portion of each sample will be composited for each production day.

The CHEMFIX® product produced each day will be identified within the discharge area by means of a transit. The boundaries and depth of the product will be determined and the information logged to permit each day's production to be relocated at a later date.

3. Sample Analyses

A sample of each CHEMFIX® product daily composite will be subjected to the U.S. EPA-specified Extraction Procedure for Toxicity (EP) within 24 hours of its collection. All EP extracts will be analyzed for arsenic, barium, cadmium, chromium, cyanide, lead, mercury, nickel, selenium, and silver. All extractable EP extract constituents must be within U.S. EPA-specified maximum allowable concentrations in order for the CHEMFIX® product to be considered non-hazardous. Any waste material which is not rendered non-hazardous will be identified, located within the discharge area, and retreated or otherwise handled in an environmentally-acceptable manner.

CHEMFIX® product obtained at the discharge hose is monitored for 48 hours. Any produced material which has not solidified within that period, sufficiently to pass the U.S. EPA-specified Paint Filter Test, will require that the material produced since the occurance of unacceptable material be identified, located within the discharge area, and retreated or otherwise handled in an environmentally-acceptable manner.

One (1) sample from every series of 20 samples submitted for analyses will be split in the field and submitted as a blind replicate.

4. Personnel

Sample collection and analyses will be performed under the direction of CTI's Quality Assurance Chemist, a degreed scientist with training and experience in hazardous materials management.

N. Conclusions

Based upon results of these analyses, the CHEMFIX® process converts an F006 electroplating waste from a hazardous semi-liquid sludge to a non-hazardous solid. The level of all constituents in the CHEMFIX® product EP extracts are well within the maximum limits established by the U.S. EPA, and are, in all cases, less than 16 times Drinking Water Standards. No interferences within the extracts were found to affect results. Cyanide and hexavalent chromium concentrations in the EP extracts are such that pretreatment prior to CHEMFIX® processing is not necessary.

Chemical reactions within the CHEMFIX® process begin immediately upon reagent addition, binding the metals present in a waste within the CHEMFIX® product structure. The reactions continue over time. In addition, because metals are chemically bound to the CHEMFIX® product structure, after free metals are extracted from the product, no additional metal leaching may occur. This is illustrated by results of the Multiple Extraction Procedure (MEP).

The MEP is designed to determine the long-term chemical and physical stability of chemically stabilized products under simulated 1,000-year acid-rain conditions. The concentrations of constituents in each MEP extract of the CHEMFIX® products were well within maximum allowable U.S. EPA-determined levels, and continued to decrease during subsequent extractions. These results illustrate that CHEMFIX® product maintains its integrity when subjected to simulated severe weathering conditions.

The high reserve alkalinity of the CHEMFIX® product will inhibit the formation of organic acids in a weathering environment. The substantial cation exchange capacity will continue to chemically bind any heavy metals which may

come into contact with the CHEMFIX® product subsequent to processing. The structural strength and integrity of the CHEMFIX® product, as evidenced by its permeability and unconfined compressive strength values, insures that the product may be handled as a non-hazardous, stable, soil substitute.

PERSONNEL TRAINING PROGRAM

Initial Hazardous Waste Training was completed in February, 1981. General course content included:

I Definition of Hazardous Waste
II Identification of our Hazardous Wastes
III Handling and safety precautions
IV EPA labelling requirements
V Review of record keeping requirements

This training was given to both hourly and salaried personnel who would be likely to generate or move Hazardous Waste or be required to handle related paperwork. Documentation of this training was kept in the Personnel Dept.

Training was developed and conducted by R. A. Fisco, Sr. Engineer and Wastewater Treatment Plant Supervisor, R. A. Reinecke, Sr. Engineer Process Engineering, and J. A. Wright, Plant Safety Director.

Followup training has been in the form of periodic safety talks given to effected hourly personnel by their immediate supervisors. Engineering and other technical personnel have attended offsite seminars and training related to RCRA activities.

Future training will be included with the OSHA right-to-know standards and will cover all employees at Fisher-Guide Elyria. Content of this training program is not yet available, but training is scheduled to be complete by mid-1986. Records of training completion will be kept in Employee Personnel Records on a permanent basis.

General Motors Corporation

Mr. Robert H. Maynard, Director
Ohio Environmental Protection Agency
Post Office Box 1049
Columbus, Ohio 43215

Attention: Ms. Deborah L. Tegtemeyer
OEPA-DHMM

Dear Mr. Maynard:

I am the Chief Financial Officer of General Motors Corporation, 3044 West Grand Boulevard, Detroit, Michigan 48202. This letter is in support of the use of the financial test to demonstrate financial responsibility for liability coverage and closure and/or post-closure care as specified in Chapters 3745-55 and 3745-66 of the Administrative Code.

The owner or operator identified above is the owner or operator of the following facilities for which liability coverage is being demonstrated through the financial test specified in Chapters 3745-55 and 3745-66 of the Administrative Code: See Attachment OH.

1. The owner or operator identified above owns or operates the following facilities for which financial assurance for closure or post-closure care is demonstrated through the financial test specified in Chapters 3745-55 or 3745-66 of the Administrative Code. The current closure and/or post-closure cost estimates covered by the test are shown for each facility: See Attachments OH, A and B.

2. The owner or operator identified above guarantees, through the corporate guarantee specified in Chapters 3745-55 and 3745-66 of the Administrative Code, the closure and post-closure care of the following facilities owned or operated by its subsidiaries. The current cost estimates for the closure or post-closure care so guaranteed are shown for each facility: None.

3. The owner or operator identified above owns or operates the following hazardous waste management facilities for which financial assurance for closure or, if a disposal facility, post-closure care, is not demonstrated to the Director through the financial test or any other financial assurance mechanism specified in Chapters 3745-55 or 3745-66 of the Administrative Code. The current closure and/or post-closure cost estimates not covered by such financial assurance are shown for each facility: None.

3706f-27

This owner or operator is required to file a Form 10-K with the Securities and Exchange Commission (SEC) for the latest fiscal year.

The fiscal year of this owner or operator ends on December 31. The figures for the following items marked with an asterisk are derived from this owner's or operator's independently audited, year-end financial statements for the latest completed fiscal year, ended December 31, 1984.

ALTERNATIVE I
($ In Millions)

1.	Sum of current closure and post-closure cost estimates (total of all cost estimates listed above)	$ 37.0
2.	Amount of annual aggregate liability coverage to be demonstrated	$ 8.0
3.	Sum of lines 1 and 2	$ 45.0
*4.	Total liabilities (if any portion of your closure or post-closure cost estimates is included in your total liabilities, you may deduct that portion from this line and add that amount to lines 5 and 6)	$ 27,930.6
*5.	Tangible net worth	$ 22,275.8
*6.	Net worth	$ 24,214.3
*7.	Current assets	$ 23,713.3
*8.	Current liabilities	$ 17,436.6
9.	Net working capital (line 7 minus line 8)	$ 6,276.7
*10.	The sum of net income plus depreciation, depletion, and amortization	$ 9,482.2
*11.	Total assets in U.S. (required only if less than 90% of assets are located in the U.S.)	$ 41,692.7

		YES	NO
12.	Is line 5 at least $10 million?	X	
13.	Is line 5 at least 6 times line 3?	X	
14.	Is line 9 at least 6 times line 3?	X	
*15.	Are at least 90% of assets located in the U.S.? If not complete line 16.		X
16.	Is line 11 at least 6 times line 3?	X	
17.	Is line 4 divided by line 6 less than 2.0?	X	
18.	Is line 10 divided by line 4 greater than 0.1?	X	
19.	Is line 7 divided by line 8 greater than 1.5?		X

I hereby certify the wording of this letter is identical to the wording specified in Paragraph (G) of Rule 3745-55-51 of the Administrative Code as such regulations were constituted on the date shown immediately below.

F. A. Smith
Executive Vice President
March 15, 1985

3706f-28

Deloitte
Haskins & Sells

1114 Avenue of the Americas
New York, New York 10036
(212) 790-0500
Telex 12267

General Motors Corporation:

We have examined the consolidated balance sheet of General Motors Corporation (the "Corporation") and consolidated subsidiaries as of December 31, 1984, and the related statements of consolidated income and changes in consolidated financial position for the year then ended and have issued our opinion thereon dated February 4, 1985. Our examination was made in accordance with generally accepted auditing standards and, accordingly, included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances. We have not examined any financial statements of the Corporation as of any date or for any period subsequent to December 31, 1984; accordingly, this report is based on our knowledge as of the date of our opinion on the 1984 financial statements and should be read with that understanding.

At your request, we have performed the procedures enumerated below with respect to the accompanying letter from Mr. F. A. Smith to the Director, Ohio Environmental Protection Agency dated March 15, 1985. It is understood that this report is solely for filing with the addressee of the accompanying letter, and is not to be used for any other purpose. The procedures that we performed are summarized as follows:

1. We compared the amounts included in items 6, 7, 8 and 11 under the caption Alternative I in the letter referred to above with the corresponding amounts in the financial statements referred to in the first paragraph.

2. We recomputed from, or reconciled to, the financial statements referred to in the first paragraph the information included in items 4, 5, 10 and 15 under the caption Alternative I in the letter referred to above.

Because the procedures referred to in the preceding paragraph were not sufficient to constitute an examination made in accordance with generally accepted auditing standards, we do not express an opinion on any of the information or amounts listed under the caption Alternative I in the aforementioned letter. In performing the procedures referred to above, however, no matters came to our attention that caused us to believe that the information or amounts included in items 4, 5, 6, 7, 8, 10, 11 and 15 should be adjusted.

Deloitte Haskins + Sells

March 15, 1985

AMENDED

ATTACHMENT OH

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

Ohio EPA 02-78-0356

OHD020632998
Facility EPA I.D. Number

GMC BOC GROUP LORDSTOWN ASSEMBLY PLANT *
Name of Facility

PO Box 1406
Facility Mailing Address (Street or P.O. Box)

Warren	OH	44482
City or Town	**State**	**Zip Code**

2300 HALLOCK-YOUNG RD.
Facility Location (Street, Route No. or other specific identifier)

LORDSTOWN	TRUMBULL	OH	44482
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 510,800.00

*FORMERLY: GMC GM ASSEMBLY DIVISION LORDSTOWN PLANT

OHD083321091
Facility EPA I.D. Number

GMC BOC GROUP LORDSTOWN PRESSED METAL PLANT*
Name of Facility

PO BOX 1427
Facility Mailing Address (Street or P.O. Box)

WARREN	OH	44482
City or Town	**State**	**Zip Code**

2369 ELLSWORTH-BAILEY RD.
Facility Location (Street, Route No. or other specific identifier)

LORDSTOWN	TRUMBULL	OH	44482
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $6,900.00

*FORMERLY: GMC FISHER BODY DIVISION LORDSTOWN PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

Ohio EPA 03-20-0221

OHD005050273
Facility EPA I.D. Number

GMC CENTRAL FOUNDRY DIVISION DEFIANCE PLANT
Name of Facility

PO BOX 70
Facility Mailing Address (Street or P.O. Box)

DEFIANCE	OH	43512
City or Town	**State**	**Zip Code**

STATE ROUTE 281 EAST
Facility Location (Street, Route No. or other specific identifier)

DEFIANCE	DEFIANCE	OH	43512
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 428,500.00

Ohio EPA 05-31-0441

OHD004260089
Facility EPA I.D. Number

GMC CPC GROUP - NORWOOD PLANT*
Name of Facility

4726 SMITH RD.
Facility Mailing Address (Street or P.O. Box)

NORWOOD	OH	45212
City or Town	**State**	**Zip Code**

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	HAMILTON		
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 224,900.00

*FORMERLY: GMC GM ASSEMBLY DIVISION NORWOOD PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

Ohio Epa 02-18-0114

OHD086631Q1
Facility EPA I.D. Number

GMC CPC GROUP - PARMA PLANT*
Name of Facility

PO BOX 6436
Facility Mailing Address (Street or P.O. Box)

CLEVELAND	OH	44101
City or Town	**State**	**Zip Code**

5400 CHEVROLET BOULEVARD
Facility Location (Street, Route No. or other specific identifier)

PARMA	CUYAHOGA	OH	44130
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $3,200.00

*FORMERLY: GMC CHEVROLET MOTOR DIVISION PARMA PLANT

Ohio EPA 05-57-0274

OHD060928561
Facility EPA I.D. Number

GMC DELCO MORAINE DIVISION - DAYTON SOUTH PLANT
Name of Facility

1420 WISCONSIN PLANT
Facility Mailing Address (Street or P.O. Box)

DAYTON	OH	45401
City or Town	**State**	**Zip Code**

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	MONTGOMERY		
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $72,500.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

Ohio EPA 05-57-0273

OHD045557766
Facility EPA I.D. Number

GMC DELCO MORAINE DIVISION - DAYTON NORTH PLANT
Name of Facility

1420 WISCONSIN BLVD.
Facility Mailing Address (Street or P.O. Box)

DAYTON	OH	45401
City or Town	State	Zip Code

3100 NEEDMORE RD.
Facility Location (Street, Route No. or other specific identifier)

DAYTON	MONTGOMERY	OH	45414
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 71,100.00

Ohio Epa 05-57-0407

OHD000817585
Facility EPA I.D. Number

GMC DELCO PRODUCTS DIVISION - DAYTON PLANT XX
Name of Facility

PO BOX 1042
Facility Mailing Address (Street or P.O. Box)

DAYTON	OH	45401
City or Town	State	Zip Code

1619 KUNTZ RD.
Facility Location (Street, Route No. or other specific identifier)

DAYTON	MONTGOMERY	OH	45404
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 4,400.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

Ohio EPA 05-57-0405

OHD004255410
Facility EPA I.D. Number

GMC DELCO PRODUCTS DIVISION - KETTERING PLANTS
Name of Facility

PO BOX 1042
Facility Mailing Address (Street or P.O. Box)

DAYTON	OH	45401
City or Town	**State**	**Zip Code**

2000 FORRER BLVD.
Facility Location (Street, Route No. or other specific identifier)

DAYTON	MONTGOMERY	OH	45420
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 77,300.00

Ohio EPA 05-57-0115

OHD980569388
Facility EPA I.D. Number

GMC DETROIT DIESEL ALLISON DIVISION - MORAINE ENGINE PLANT*
Name of Facility

PO BOX 1291
Facility Mailing Address (Street or P.O. Box)

DAYTON	OH	45401
City or Town	**State**	**Zip Code**

4100 SPRINGBORO PIKE
Facility Location (Street, Route No. or other specific identifier)

MORAINE	MONTGOMERY	OH	45439
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 81,700.00

*FORMERLY: GMC CHEVROLET MOTOR DIVISION - MORAINE ENGINE PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

Ohio EPA 01-25-0440

OHD004294419

Facility EPA I.D. Number

GMC FISHER GUIDE DIVISION - COLUMBUS PLANT*

Name of Facility

2000 GEORGESVILLE RD.

Facility Mailing Address (Street or P.O. Box)

COLUMBUS	OH	43228
City or Town	**State**	**Zip Code**

SAME AS ABOVE

Facility Location (Street, Route No. or other specific identifier)

	FRANKLIN		
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $9,400.00

*FORMERLY: GMC FISHER BODY DIVISION COLUMBUS PLANT

Ohio EPA 02-47-0192

OHD004201091

Facility EPA I.D. Number

GMC FISHER GUIDE DIVISION - ELYRIA PLANT*

Name of Facility

PO BOX 4025

Facility Mailing Address (Street or P.O. Box)

ELYRIA	OH	44036
City or Town	**State**	**Zip Code**

1400 LOWELL STREET

Facility Location (Street, Route No. or other specific identifier)

ELYRIA	LORAIN	OH	44036
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $2,589,200.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

OHD045719895
Facility EPA I.D. Number

GMC GM WAREHOUSING & DIST. DIVISION - CLEVELAND PLANT
Name of Facility

6060 W. BRISTOL RD.
Facility Mailing Address (Street or P.O. Box)

FLINT	MI	48554
City or Town	State	Zip Code

12990 SNOW RD.
Facility Location (Street, Route No. or other specific identifier)

PARMA	CUYAHOGA	OH	44130
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 3,700.00

Ohio EPA 05-57-0256

OHD017958604
Facility EPA I.D. Number

GMC HARRISON RADIATOR DIVISION - DAYTON PLANT
Name of Facility

PO BOX 824
Facility Mailing Address (Street or P.O. Box)

DAYTON	OH	45401
City or Town	State	Zip Code

300 TAYLOR STREET
Facility Location (Street, Route No. or other specific identifier)

DAYTON	MONTGOMERY	OH	45401
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 32,500.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

Ohio EPA 05-57-0272

OHD000817577
Facility EPA I.D. Number

GMC HARRISON RADIATOR DIVISION - MORAINE PLANT
Name of Facility

PO BOX 824
Facility Mailing Address (Street or P.O. Box)

DAYTON	OH	45401
City or Town	**State**	**Zip Code**

3600 DRYDEN RD.
Facility Location (Street, Route No. or other specific identifier)

MORAINE	MONTGOMERY	OH	44439
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 48,300.00

CURRENT POST-CLOSURE COST ESTIMATE OF FACILITY $147,300.00

Ohio EPA 05-57-0317

OHD000817023
Facility EPA I.D. Number

GMC INLAND DIVISION - DAYTON PLANT
Name of Facility

PO BOX 1224
Facility Mailing Address (Street or P.O. Box)

DAYTON	OH	45401
City or Town	**State**	**Zip Code**

2701 HOME AVE.
Facility Location (Street, Route No. or other specific identifier)

DAYTON	MONTGOMERY	OH	45417
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 40,800.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

Ohio EPA 02-18-0260

OHD097622336

Facility EPA I.D. Number

GMC INLAND DIVISION - EUCLID PLANT*

Name of Facility

20001 EUCLID AVE.

Facility Mailing Address (Street or P.O. Box)

CLEVELAND	OH	44117
City or Town	**State**	**Zip Code**

SAME AS ABOVE

Facility Location (Street, Route No. or other specific identifier)

	CUYAHOGA		
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 33,100.00

*FORMERLY: GMC FISHER BODY DIVISION - EUCLID PLANT

Ohio EPA 05-57-0316

OHD052151701

Facility EPA I.D. Number

GMC INLAND DIVISION - VANDALIA PLANT

Name of Facility

PO BOX 1224

Facility Mailing Address (Street or P.O. Box)

DAYTON	OH	45401
City or Town	**State**	**Zip Code**

480 N. DIXIE DR.

Facility Location (Street, Route No. or other specific identifier)

VANDALIA	MONTGOMERY	OH	45337
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 52,600.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

Ohio EPA 03-22-0464

OHD001880442
Facility EPA I.D. Number

GMC NEW DEPARTURE-HYATT BEARINGS DIVISION - SANDUSKY PLANT
Name of Facility

2509 HAYES AVE.
Facility Mailing Address (Street or P.O. Box)

SANDUSKY	OH	44870
City or Town	**State**	**Zip Code**

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	ERIE		
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 268,800.00

Ohio EPA 02-78-0123

OHD018414292
Facility EPA I.D. Number

GMC PACKARD ELECTRIC DIVISION - WARREN CITY PLANT
Name of Facility

PO BOX 431
Facility Mailing Address (Street or P.O. Box)

WARREN	OH	44486
City or Town	**State**	**Zip Code**

408 DANA STREET
Facility Location (Street, Route No. or other specific identifier)

WARREN	TRUMBULL	OH	44482
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 11,700.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

Ohio EPA 02-78-0124

OHD000817346
Facility EPA I.D. Number

GMC PACKARD ELECTRIC DIVISION - NORTH RIVER ROAD PLANTS
Name of Facility

PO BOX 431
Facility Mailing Address (Street or P.O. Box)

WARREN	OH	44486
City or Town	**State**	**Zip Code**

N. RIVER ROAD AT LARCHMONT
Facility Location (Street, Route No. or other specific identifier)

WARREN	TRUMBULL	OH	44484
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 149,700.00

Ohio EPA 05-57-0116

OHD041063074
Facility EPA I.D. Number

GMC TRUCK & BUS MANUFACTURING GROUP - MORAINE ASSEMBLY PLANT*
Name of Facility

PO BOX 1291
Facility Mailing Address (Street or P.O. Box)

DAYTON	OH	45401
City or Town	**State**	**Zip Code**

2601 W. STROOP
Facility Location (Street, Route No. or other specific identifier)

DAYTON	MONTGOMERY	OH	45439
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 255,600.00

*FORMERLY: GMC CHEVROLET MOTOR DIVISION MORAINE ASSEMBLY PLANT

ATTACHMENT A

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

MID980568745
Facility EPA I.D. Number

GMC AC SPARK PLUG DIVISION AVERILL AVE PLANT
Name of Facility

1300 N DORT HWY
Facility Mailing Address (Street or P.O. Box)

FLINT	MI	48556
City or Town	State	Zip Code

4143 DAVISON RD
Facility Location (Street, Route No. or other specific identifier)

FLINT	GENESEE	MI	48556
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 46,600.00

MID005356647
Facility EPA I.D. Number

GMC AC SPARK PLUG DIVISION DORT HWY PLANT
Name of Facility

1300 N DORT HWY
Facility Mailing Address (Street or P.O. Box)

FLINT	MI	48556
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

FLINT	GENESEE	MI	48556
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 45,300.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

MID980568620
Facility EPA I.D. Number

GMC AC SPARK PLUG DIVISION ENGINEERING PLANT
Name of Facility

1300 N DORT HWY
Facility Mailing Address (Street or P.O. Box)

FLINT	MI	48556
City or Town	State	Zip Code

1601 N AVERILL AVE
Facility Location (Street, Route No. or other specific identifier)

FLINT	GENESEE	MI	48556
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 6,300.00

MID980568570
Facility EPA I.D. Number

GMC AC SPARK PLUG DIVISION WASTEWATER TREATMENT PLANT
Name of Facility

1300 N DORT HWY
Facility Mailing Address (Street or P.O. Box)

FLINT	MI	48556
City or Town	State	Zip Code

3026 ROBERT T LONGWAY BLVD
Facility Location (Street, Route No. or other specific identifier)

FLINT	GENESEE	MI	48556
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ NA

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

MID005356712
Facility EPA I.D. Number

GMC BOC GROUP FLINT BUICK OPERATIONS*
Name of Facility

902 E HAMILTON
Facility Mailing Address (Street or P.O. Box)

FLINT	MI	48550
City or Town	**State**	**Zip Code**

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	GENESSEE		
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 1,830,200.00

CURRENT POST-CLOSURE COST ESTIMATE OF FACILITY $ 198,400.00

*FORMERLY: GMC BUICK MOTOR DIVISION BUILDING 85

MIT270010069
Facility EPA I.D. Number

GMC BOC GROUP DETROIT CENTRAL PLANT 37*
Name of Facility

6051 HASTINGS
Facility Mailing Address (Street or P.O. Box)

DETROIT	MI	48211
City or Town	**State**	**Zip Code**

950 MILWAUKEE
Facility Location (Street, Route No. or other specific identifier)

DETROIT	WAYNE	MI	48211
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 1,300.00

*FORMERLY: GMC FISHER BODY DIVISION CENTRAL PLANT 37

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

MID005356704
Facility EPA I.D. Number

GMC BOC GROUP DETROIT CLARK AVE PLANT *
Name of Facility

2860 CLARK ST
Facility Mailing Address (Street or P.O. Box)

DETROIT	MI	48232
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	WAYNE		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 37,900.00

*FORMERLY: GMC CADILLAC MOTOR CAR DIVISION CLARK PLANT

MID908795488
Facility EPA I.D. Number

GMC BOC GROUP HAMTRAMCK PLANT *
Name of Facility

800 STEPHENSEN HWY
Facility Mailing Address (Street or P.O. Box)

TROY	MI	48084
City or Town	State	Zip Code

2500 E GRAND BLVD
Facility Location (Street, Route No. or other specific identifier)

DETROIT	WAYNE	MI	48202
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 109,500.00

*FORMERLY: GMC GM ASSEMBLY DIVISION PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

MID000718544
Facility EPA I.D. Number

GMC BOC GROUP LAKE ORION PLANT *
Name of Facility

PO BOX 347
Facility Mailing Address (Street or P.O. Box)

LAKE ORION	MI	48035
City or Town	State	Zip Code

4555 GIDDINGS RD
Facility Location (Street, Route No. or other specific identifier)

LAKE ORION	OAKLAND	MI	48055
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 109,500.00

*FORMERLY: GMC GM ASSEMBLY DIVISION LAKE ORION PLANT

MID005356894
Facility EPA I.D. Number

GMC BOC GROUP LANSING OLDSMOBILE PLANT *
Name of Facility

920 TOWNSEND ST
Facility Mailing Address (Street or P.O. Box)

LANSING	MI	48921
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	INGHAM		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 36,300.00

*FORMERLY: GMC OLDSMOBILE DIVISION PLANT 1

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

MID980700827
Facility EPA I.D. Number

GMC BOC GROUP OLDSMOBILE PLANTS 2 & 3 *
Name of Facility

920 TOWNSEND ST
Facility Mailing Address (Street or P.O. Box)

LANSING	MI	48921
City or Town	State	Zip Code

W SAGINAW ST
Facility Location (Street, Route No. or other specific identifier)

LANSING	INGHAM	MI	48917
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 1,089,700.00

*FORMERLY: GMC OLDSMOBILE DIVISION PLANTS 2 & 3

MID980700843
Facility EPA I.D. Number

GMC BOC GROUP OLDSMOBILE PLANT 5 *
Name of Facility

920 TOWNSEND ST
Facility Mailing Address (Street or P.O. Box)

LANSING	MI	48921
City or Town	State	Zip Code

CANAL RD
Facility Location (Street, Route No. or other specific identifier)

LANSING	EATON	MI	48917
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 61,300.00

*FORMERLY: GMC OLDSMOBILE DIVISION PLANT 5

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

MID005356795
Facility EPA I.D. Number

GMC BOC GROUP WILLOW RUN PLANT*
Name of Facility

2625 TYLER RD
Facility Mailing Address (Street or P.O. Box)

YPSILANTI	MI	48197
City or Town	**State**	**Zip Code**

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	WASHTENAW		
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 1,206,400.00

*FORMERLY: GMC GM ASSEMBLY DIVISION WILLOW RUN PLANT

MID005356951
Facility EPA I.D. Number

GMC TRUCK & BUS MANUFACTURING GROUP VAN SLYKE COMPLEX PLANTS*
Name of Facility

G 3248 VAN SLYKE RD
Facility Mailing Address (Street or P.O. Box)

FLINT	MI	48552
City or Town	**State**	**Zip Code**

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	GENESEE		
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 694,200.00

* FORMERLY: GMC CHEVROLET MOTOR DIVISION PLANT VAN SLYKE COMPLEX PLANTS
GMC CHEVROLET MOTOR DIVISION METAL FAB PLANT
GMC CHEVROLET MOTOR DIVISION V8 ENGINE PLANT
GMC TRUCK & BUS MANUFACTURING GROUP ASSEMBLY PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

MID041793340
Facility EPA I.D. Number

GMC CENTRAL FOUNDRY DIVISION SAGINAW GREY IRON & NODULAR IRON CASTING PLANTS *
Name of Facility

2100 VERERANS MEMORIAL PARKWAY
Facility Mailing Address (Street or P.O. Box)

SAGINAW	MI	48601
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	SAGINAW		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 35,600.00

*FORMERLY: GMC CHEVROLET MOTOR DIVISION SAGINAW CASTING & PARTS PLANT
GMC CHEVROLET MOTOR DIVISION SAGINAW PARTS PLANT CLOSED 10/1/83

MID005356696
Facility EPA I.D. Number

GMC CENTRAL FOUNDRY DIVISION SAGINAW PLANT
Name of Facility

77 W CENTER ST
Facility Mailing Address (Street or P.O. Box)

SAGINAW	MI	48605
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	SAGINAW		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 48,300.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

MID084571256
Facility EPA I.D. Number

GMC CPC GROUP ADRIAN PLANT *
Name of Facility

1450 E BEECHER ST
Facility Mailing Address (Street or P.O. Box)

ADRIAN	MI	49221
City or Town	**State**	**Zip Code**

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	LENAWEE		
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 22,300.00

*FORMERLY: GMC CHEVROLET MOTOR DIVISION ADRIAN PLANT

MID005356688
Facility EPA I.D. Number

GMC CPC GROUP BAY CITY PLANT *
Name of Facility

100 FITZGERALD ST
Facility Mailing Address (Street or P.O. Box)

BAY CITY	MI	48707
City or Town	**State**	**Zip Code**

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	BAY		
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 12,100.00

*FORMERLY: GMC CHEVROLET MOTOR DIVISION BAY CITY PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

MID005356654
Facility EPA I.D. Number

GMC CPC GROUP FLINT MFG PLANTS *
Name of Facility

300 N CHEVROLET AVE
Facility Mailing Address (Street or P.O. Box)

FLINT	MI	48555
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	GENESEE		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 62,700.00

*FORMERLY: GMC CHEVROLET MOTOR DIVISION FLINT MFG PLANTS

MID005356621
Facility EPA I.D. Number

GMC CPC GROUP LIVONIA PLANT *
Name of Facility

13000 ECKLES RD
Facility Mailing Address (Street or P.O. Box)

LIVONIA	MI	48151
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	WAYNE		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 7,500.00

*FORMERLY: GMC CHEVROLET MOTOR DIVISION LIVONIA PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

MID005356886
Facility EPA I.D. Number

GMC CPC GROUP PONTIAC PLANT *
Name of Facility

1 PONTIAC PLAZA
Facility Mailing Address (Street or P.O. Box)

PONTIAC	MI	48053
City or Town	**State**	**Zip Code**

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	OAKLAND		
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 30,200.00

*FORMERLY: GMC PONTIAC MOTOR DIVISION PONTIAC PLANT

MID005356910
Facility EPA I.D. Number

GMC CPC GROUP PONTIAC FIERO PLANT *
Name of Facility

900 BALDWIN AVE
Facility Mailing Address (Street or P.O. Box)

PONTIAC	MI	48055
City or Town	**State**	**Zip Code**

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	OAKLAND		
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 20,000.00

*FORMERLY: GMC PONTIAC MOTOR DIVISION P-CAR PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

MID005356803
Facility EPA I.D. Number

GMC DETROIT DIESEL ALLISON DIVISION REDFORD PLANT
Name of Facility

13400 W OUTER DRIVE
Facility Mailing Address (Street or P.O. Box)

DETROIT	MI	48239
City or Town	**State**	**Zip Code**

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	WAYNE		
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 43,800.00

MID000809905
Facility EPA I.D. Number

GMC DETROIT DIESEL ALLISON ROMULUS PLANT
Name of Facility

36880 ECORSE RD
Facility Mailing Address (Street or P.O. Box)

ROMULUS	MI	48174
City or Town	**State**	**Zip Code**

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	WAYNE		
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 38,400.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

MID005356845
Facility EPA I.D. Number

GMC DELCO MORAINE SAGINAW PLANT *
Name of Facility

2328 E GENESEE AVE
Facility Mailing Address (Street or P.O. Box)

SAGINAW	MI	48603
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	SAGINAW		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 12,100.00

*FORMERLY: GMC CHEVROLET MOTOR DIVISION SAGINAW PLANT

MID005356787
Facility EPA I.D. Number

GMC FISHER GUIDE DIVISION FORT ST PLANT *
Name of Facility

6307 W FORT ST
Facility Mailing Address (Street or P.O. Box)

DETROIT	MI	48209
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	WAYNE		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 12,500.00

*FORMERLY: GMC FISHER BODY DIVISION FORT ST PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

MID005356860
Facility EPA I.D. Number

GMC FISHER GUIDE DIVISION FLINT PLANT
Name of Facility

1245 E COLDWATER RD
Facility Mailing Address (Street or P.O. Box)

FLINT	MI	48559
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	GENESEE		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 3,205,800.00

*FORMERLY: GMC FISHER BODY DIVISION COLDWATER RD PLANT

MID082220757
Facility EPA I.D. Number

GMC PROVING GROUND MILFORD
Name of Facility

HICKORY RIDGE & GM ROAD
Facility Mailing Address (Street or P.O. Box)

MILFORD	MI	48042
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	OAKLAND		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 17,700.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

MID064169154
Facility EPA I.D. Number

GENERAL MOTORS TECHNICAL CENTER
Name of Facility

30800 MOUND RD SERVICE SECTION
Facility Mailing Address (Street or P.O. Box)

WARREN	MI	48090
City or Town	**State**	**Zip Code**

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	MACOMB		
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 149,500.00

MID003912920
Facility EPA I.D. Number

GMC GM WAREHOUSING & DIST DIVISION DRAYTON PLAINS PLANT
Name of Facility

6060 W BRISTOL RD
Facility Mailing Address (Street or P.O. Box)

FLINT	MI	48554
City or Town	**State**	**Zip Code**

5260 WILLIAMS LAKE RD
Facility Location (Street, Route No. or other specific identifier)

DRAYTON PLAINS	OAKLAND	MI	48020
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 60,200.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

MID003906773
Facility EPA I.D. Number

GMC WAREHOUSING & DIST DIVISION FLINT PLANT
Name of Facility

6060 W BRISTOL RD
Facility Mailing Address (Street or P.O. Box)

FLINT	MI	48554
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	GENESEE		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 90,300.00

MID00724740
Facility EPA I.D. Number

GMC HYDRA-MATIC DIVISION CONSTANTINE PLANT
Name of Facility

ONE HYDRA-MATIC DR
Facility Mailing Address (Street or P.O. Box)

THREE RIVERS	MI	49093
City or Town	State	Zip Code

INDUSTRIAL PARK
Facility Location (Street, Route No. or other specific identifier)

CONSTANTINE	ST JOSEPH	MI	49042
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 4,500.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

MID000718551
Facility EPA I.D. Number

GMC HYDRA-MATIC DIVISION THREE RIVERS PLANT
Name of Facility

ONE HYDRA-MATIC DR
Facility Mailing Address (Street or P.O. Box)

THREE RIVERS	MI	49093
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	ST JOSEPH		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 16,400.00

MID270012560
Facility EPA I.D. Number

GMC HYDRA-MATIC DIVISION YPSILANTI PLANT
Name of Facility

WILLOW RUN
Facility Mailing Address (Street or P.O. Box)

YPSILANTI	MI	48197
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	WASHTENAW		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 8,300.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

MID020105565
Facility EPA I.D. Number

GMC NEW DEPARTURE-HYATT BEARINGS DIVISION DETROIT PLANT *
Name of Facility

8435 ST AUBIN
Facility Mailing Address (Street or P.O. Box)

DETROIT	MI	48212
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	WAYNE		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 24,200.00

*FORMERLY: GMC CHEVROLET MOTOR DIVISION DETROIT FORGE PLANT

MID000721738
Facility EPA I.D. Number

GMC ROCHESTER PRODUCTS DIVISION COOPERSVILLE PLANT
Name of Facility

2100 BURLINGAME
Facility Mailing Address (Street or P.O. Box)

GRAND RAPIDS	MI	49501
City or Town	State	Zip Code

999 RANDALL
Facility Location (Street, Route No. or other specific identifier)

COOPERSVILLE	OTTAWA	MI	49404
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 1,300.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

MID017079625
Facility EPA I.D. Number

GMC ROCHESTER PRODUCTS DIVISION GRAND RAPIDS PLANT
Name of Facility

2100 BURLINGAME
Facility Mailing Address (Street or P.O. Box)

GRAND RAPIDS	MI	49501
City or Town	**State**	**Zip Code**

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	KENT		
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 44,900.00

MID086744802
Facility EPA I.D. Number

GMC SAGINAW STEERING GEAR DIVISION DETROIT PLANT*
Name of Facility

1840 HOLBROOK
Facility Mailing Address (Street or P.O. Box)

DETROIT	MI	48212
City or Town	**State**	**Zip Code**

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	WAYNE		
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 96,200.00

*FORMERLY: GMC CHEVROLET MOTOR DIVISION DETROIT GEAR & AXLE PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

MID005356902
Facility EPA I.D. Number

GMC TRUCK & BUS OPERATION PONTIAC EAST & CENTRAL PLANTS*
Name of Facility

660 S BLVD E
Facility Mailing Address (Street or P.O. Box)

PONTIAC	MI	48053
City or Town	**State**	**Zip Code**

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	OAKLAND		
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 228,700.00

*FORMERLY: GMC TRUCK AND COACH DIVISION PONTIAC EAST PLANT

MID980458836
Facility EPA I.D. Number

GMC TRUCK & BUS OPERATIONS PONTIAC WEST ASSEMBLY PLANT*
Name of Facility

660 S BLVD E
Facility Mailing Address (Street or P.O. Box)

PONTIAC	MI	48053
City or Town	**State**	**Zip Code**

275 FRANKLIN RD
Facility Location (Street, Route No. or other specific identifier)

PONTIAC	OAKLAND	MI	48053
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 32,000.00

*FORMERLY: GMC TRUCK AND COACH DIVISION PONTIAC EAST PLANT

AMENDED

ATTACHMENT B

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION I

MAD019369602
Facility EPA I.D. Number

GMC CPC GROUP FRAMINGHAM PLANT*
Name of Facility

63 WESTERN AVE
Facility Mailing Address (Street or P.O. Box)

FRAMINGHAM	MA	01701
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	MIDDLESEX		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 19,600.00

*FORMERLY: GMC GM ASSEMBLY DIVISION FRAMINGHAM PLANT

CTD018625632
Facility EPA I.D. Number

GMC NEW DEPARTURE-HYATT BEARINGS DIVISION BRISTOL PLANT
Name of Facility

780 JAMES P. CASEY RD
Facility Mailing Address (Street or P.O. Box)

BRISTOL	CT	06010
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	HARTFORD		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 805,000.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION II

NYD012871489
Facility EPA I.D. Number

GMC CENTRAL FOUNDRY DIVISION MASSENA PLANT
Name of Facility

PO BOX 460
Facility Mailing Address (Street or P.O. Box)

MASSENA	NY	13662
City or Town	State	Zip Code

ROOSEVELTOWN HWY
Facility Location (Street, Route No. or other specific identifier)

MASSENA	ST. LAWRENCE	NY	13662
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 17,000.00

NJD002186690
Facility EPA I.D. Number

GMC CPC GROUP LINDEN PLANT*
Name of Facility

1016 W EDGAR RD
Facility Mailing Address (Street or P.O. Box)

LINDEN	NJ	07036
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	UNION		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 18,100.00

*FORMERLY: GMC GM ASSEMBLY DIVISION LINDEN PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION II

NYD002026565
Facility EPA I.D. Number

GMC CPC GROUP TARRYTOWN PLANT*
Name of Facility

BEEKMAN AVE
Facility Mailing Address (Street or P.O. Box)

NORTH TARRYTOWN	NY	10591
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	WESTCHESTER		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 18,100,00

*FORMERLY: GMC GM ASSEMBLY DIVISION TARRYTOWN PLANT

NYD002127157
Facility EPA I.D. Number

GMC CPC GROUP TONAWANDA PLANTS*
Name of Facility

PO BOX 21
Facility Mailing Address (Street or P.O. Box)

BUFFALO	NY	14240
City or Town	State	Zip Code

RIVER RD
Facility Location (Street, Route No. or other specific identifier)

TONAWANDA	ERIE	NY	14240
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 57,900.00

*FORMERLY: GMC CENTRAL FOUNDRY DIVISION TONAWANDA CASTING PLANT
GMC CHEVROLET DIVISION TONAWANDA ENGINE PLANT
GMC CHEVROLET DIVISION TONAWANDA FORGE PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION II

NYD002215226
Facility EPA I.D. Number

GMC DELCO PRODUCTS DIVISION ROCHESTER PLANT
Name of Facility

PO BOX 230
Facility Mailing Address (Street or P.O. Box)

ROCHESTER	NY	14601
City or Town	State	Zip Code

1555 LYELL AVE
Facility Location (Street, Route No. or other specific identifier)

ROCHESTER	MONROE	NY	14606
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 19,900.00

NJD068699107
Facility EPA I.D. Number

GMC DELCO-REMY DIVISION NEW BRUNSWICK PLANT
Name of Facility

PO BOX 911
Facility Mailing Address (Street or P.O. Box)

NEW BRUNSWICK	NJ	08903
City or Town	State	Zip Code

186 JERSEY AVE
Facility Location (Street, Route No. or other specific identifier)

NEW BRUNSWICK	MIDDLESEX	NJ	08903
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 901,400.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION II

NYD002239440
Facility EPA I.D. Number

GMC FISHER GUIDE DIVISION SYRACUSE PLANT*
Name of Facility

PO BOX 4869
Facility Mailing Address (Street or P.O. Box)

SYRACUSE	NY	13221
City or Town	State	Zip Code

1000 TOWN LINE RD
Facility Location (Street, Route No. or other specific identifier)

SYRACUSE	ONONDAGA	NY	13221
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 33,700.00

*FORMERLY: GMC FISHER BODY DIVISION SYRACUSE PLANT

NJD002353951
Facility EPA I.D. Number

GMC FISHER GUIDE DIVISION TRENTON PLANT*
Name of Facility

PO BOX 9019
Facility Mailing Address (Street or P.O. Box)

TRENTON	NJ	08650
City or Town	State	Zip Code

1445 PARKWAY AVE
Facility Location (Street, Route No. or other specific identifier)

TRENTON	MERCER	NJ	08650
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 2,872,000.00

*FORMERLY: GMC FISHER BODY DIVISION TRENTON PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION II

NYD002126852
Facility EPA I.D. Number

GMC HARRISON RADIATOR DIVISION WEST LOCKPORT PLANT
Name of Facility

200 UPPER MOUNTAIN RD
Facility Mailing Address (Street or P.O. Box)

LOCKPORT	NY	14094
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	NIAGRA		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 9,304,700.00

NYD980592901
Facility EPA I.D. Number

GMC HARRISON RADIATOR DIVISION WASTEWATER TREATMENT PLANT
Name of Facility

200 UPPER MOUNTAIN RD
Facility Mailing Address (Street or P.O. Box)

LOCKPORT	NY	14094
City or Town	State	Zip Code

5707 UPPER MOUNTAIN RD
Facility Location (Street, Route No. or other specific identifier)

LOCKPORT	NIAGRA	NY	14094
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ NA

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION II

NYD002215234
Facility EPA I.D. Number

GMC ROCHESTER PRODUCTS DIVISION LEXINGTON AVENUE PLANT
Name of Facility

PO BOX 1790
Facility Mailing Address (Street or P.O. Box)

ROCHESTER	NY	14603
City or Town	**State**	**Zip Code**

1000 LEXINGTON AVE
Facility Location (Street, Route No. or other specific identifier)

ROCHESTER	MONROE	NY	14603
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 33,200.00

NYD002127165
Facility EPA I.D. Number

GMC SAGINAW STEERING GEAR DIVISION BUFFALO PLANT*
Name of Facility

PO BOX 972
Facility Mailing Address (Street or P.O. Box)

BUFFALO	NY	14240
City or Town	**State**	**Zip Code**

1001 E DELAVAN AVENUE
Facility Location (Street, Route No. or other specific identifier)

BUFFALO	ERIE	NY	14215
City or Town	**County**	**State**	**Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 600.00

*FORMERLY: GMC CHEVROLET MOTOR DIVISION BUFFALO PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION III

PAD000800490
Facility EPA I.D. Number

GMC BOC GROUP PITTSBURGH PLANT *
Name of Facility

PO BOX 158
Facility Mailing Address (Street or P.O. Box)

McKEESPORT	PA	15134
City or Town	State	Zip Code

1451 LEBANON SCHOOL RD
Facility Location (Street, Route No. or other specific identifier)

W MIFFLIN BOROUGH	ALLEGHENY	PA	15122
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 27,200.00

*FORMERLY: GMC FISHER BODY DIVISON PITTSBURGH PLANT

DED002369205
Facility EPA I.D. Number

GMC CPC GROUP WILMINGTON PLANT*
Name of Facility

PO BOX 1512
Facility Mailing Address (Street or P.O. Box)

WILMINGTON	DE	19899
City or Town	State	Zip Code

BOXWOOD RD
Facility Location (Street, Route No. or other specific identifier)

WILMINGTON	NEW CASTLE	DE	19899
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 213,900.00

*FORMERLY: GMC GM ASSEMBLY DIVISION WILMINGTON PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION III

VAD091222588
Facility EPA I.D. Number

GMC DELCO MORAINE DIVISION FREDERICKSBURG PLANT
Name of Facility

3401 TIDEWATER TRAIL
Facility Mailing Address (Street or P.O. Box)

FREDERICKSBURG	VA	22401
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	SPOTSYLVANIA		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 26,800.00

WVD044145209
Facility EPA I.D. Number

GMC GM WAREHOUSING & DIST DIVISION MARTINSBURG PLANT
Name of Facility

6060 W BRISTOL RD
Facility Mailing Address (Street or P.O. Box)

FLINT	MI	48554
City or Town	State	Zip Code

1000 WARM SPRINGS AVE
Facility Location (Street, Route No. or other specific identifier)

MARTINSBURG	BERKELY	WV	25401
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 90,300.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION III

PAD980555072
Facility EPA I.D. Number

GMC GM WAREHOUSING & DIST DIVISION PHILADELPHIA PLANT
Name of Facility

6060 W BRISTOL RD
Facility Mailing Address (Street or P.O. Box)

FLINT	MI	48554
City or Town	State	Zip Code

EXP 95 IND CTR PROG DR AND WINKS LANE
Facility Location (Street, Route No. or other specific identifier)

BENSALEM	BUCKS	PA	19020
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 3,700.00

PAD074978792
Facility EPA I.D. Number

GMC GM WAREHOUSING & DIST DIVISION PITTSBURGH FACILITY
Name of Facility

6060 BRISTOL RD
Facility Mailing Address (Street or P.O. Box)

FLINT	MI	48554
City or Town	State	Zip Code

RUSSELTON RD
Facility Location (Street, Route No. or other specific identifier)

CHESWICK	ALLEGHENY	PA	15024
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 3,700.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION III

MDD003091972
Facility EPA I.D. Number

GMC TRUCK & BUS GROUP BALTIMORE PLANT*
Name of Facility

2122 BROENING HWY
Facility Mailing Address (Street or P.O. Box)

BALTIMORE	MD	21203
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	BALTIMORE		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 534,600.00

*FORMERLY: GMC GM ASSEMBLY DIVISION BALTIMORE PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION IV

KYT000622993
Facility EPA I.D. Number

GMC CPC GROUP BOWLING GREEN PLANT*
Name of Facility

PO BOX 0
Facility Mailing Address (Street or P.O. Box)

BOWLING GREEN	KY	42101
City or Town	State	Zip Code

165 AT HWY 31 W
Facility Location (Street, Route No. or other specific identifier)

BOWLING GREEN	WARREN	KY	42101
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 36,300.00

*FORMERLY: GMC GM ASSEMBLY DIVISION BOWLING GREEN PLANT

GAD003310810
Facility EPA I.D. Number

GMC CPC GROUP DORAVILLE PLANT *
Name of Facility

3900 INDUSTRIAL WAY
Facility Mailing Address (Street or P.O. Box)

DORAVILLE	GA	30360
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	DEKALB		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 53,000.00

*FORMERLY: GMC GM ASSEMBLY DIVISION DORAVILLE PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION IV

GAD059522870
Facility EPA I.D. Number

GMC CPC GROUP LAKEWOOD PLANT*
Name of Facility

PO BOX 16505
Facility Mailing Address (Street or P.O. Box)

ATLANTA	GA	30321
City or Town	State	Zip Code

510 SAWTELL AVE SE
Facility Location (Street, Route No. or other specific identifier)

ATLANTA	FOLTON	GA	30315
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 144,300.00

*FORMERLY: GMC GM ASSEMBLY DIVISION LAKEWOOD PLANT

GAD092375377
Facility EPA I.D. Number

GMC DELCO-REMY DIVISION ALBANY PLANT
Name of Facility

PO BOX 3210
Facility Mailing Address (Street or P.O. Box)

ALBANY	GA	31706
City or Town	State	Zip Code

601 HOLLY DR
Facility Location (Street, Route No. or other specific identifier)

ALBANY	DOUGHERTY	GA	31705
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 44,600.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION IV

GAD075942706
Facility EPA I.D. Number

GMC DELCO-REMY DIVISION FITZGERALD PLANT
Name of Facility

PERRYHOUSE RD
Facility Mailing Address (Street or P.O. Box)

FITZGERALD	GA	31750
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	BEN HILL		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 65,700.00

MSD083451039
Facility EPA I.D. Number

GMC DELCO-REMY DIVISION LAUREL PLANT
Name of Facility

PO BOX 1981
Facility Mailing Address (Street or P.O. Box)

LAUREL	MS	38440
City or Town	State	Zip Code

ONE THAMES AVE
Facility Location (Street, Route No. or other specific identifier)

LAUREL	JONES	MS	39440
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 17,900.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION IV

GAD000814343
Facility EPA I.D. Number

GMC GM WAREHOUSING & DIST DIVISION ATLANTA FACILITY
Name of Facility

6060 W BRISTOL RD
Facility Mailing Address (Street or P.O. Box)

FLINT	MI	48554
City or Town	State	Zip Code

4040 MOTORS INDUSTRIAL WAY
Facility Location (Street, Route No. or other specific identifier)

DORAVILLE	KEBALB	GA	30360
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 3,700.00

MSD084668367
Facility EPA I.D. Number

GMC PACKARD ELECTRIC DIVISION BROOKHAVEN PLANT
Name of Facility

PO BOX 431
Facility Mailing Address (Street or P.O. Box)

WARREN	OH	44486
City or Town	State	Zip Code

INDUSTRIAL PARK RD
Facility Location (Street, Route No. or other specific identifier)

BROOKHAVEN	LINCOLN	MS	39601
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 7,200.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION IV

MSD065462517
Facility EPA I.D. Number

GMC PACKARD ELECTRIC DIVISION CLINTON PLANT
Name of Facility

PO BOX 431
Facility Mailing Address (Street or P.O. Box)

WARREN	OH	44486
City or Town	State	Zip Code

CLINTON INDUSTRIAL PARK
Facility Location (Street, Route No. or other specific identifier)

CLINTON	HINDS	MS	39056
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 79,800.00

ALD097751317
Facility EPA I.D. Number

GMC ROCHESTER PRODUCTS TUSCALOOSA PLANT
Name of Facility

3440 KAULOOSA AVE
Facility Mailing Address (Street or P.O. Box)

TUSCALOOSA	AL	35401
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	TASCALOOSA		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 8,400.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

WID071147813
Facility EPA I.D. Number

GMC AC SPARK PLUG DIVISION MILWAUKEE PLANT
Name of Facility

PO BOX 562
Facility Mailing Address (Street or P.O. Box)

MILWAUKEE	WI	53201
City or Town	State	Zip Code

7929 SOUTH HOWELL AVE
Facility Location (Street, Route No. or other specific identifier)

MILWAUKEE	OAK CREEK	WI	53154
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 85,000.00

Ohio EPA 02-78-0356

OHD020632998
Facility EPA I.D. Number

GMC BOC GROUP LORDSTOWN ASSEMBLY PLANT *
Name of Facility

PO BOX 1406
Facility Mailing Address (Street or P.O. Box)

WARREN	OH	44482
City or Town	State	Zip Code

2300 HALLOCK-YOUNG RD
Facility Location (Street, Route No. or other specific identifier)

LORDSTOWN	TRUMBULL	OH	44482
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 510,800.00

*FORMERLY: GMC GM ASSEMBLY DIVISION LORDSTOWN PLANT

DELETE

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

OHD083321091
Facility EPA I.D. Number

GMC BOC GROUP LORDSTOWN PRESSED METAL PLANT*
Name of Facility

PO BOX 1427
Facility Mailing Address (Street or P.O. Box)

WARREN	OH	44482
City or Town	State	Zip Code

2369 ELLSWORTH-BAILEY RD
Facility Location (Street, Route No. or other specific identifier)

LORDSTOWN	TRUMBULL	OH	44482
City or Town	County	State	Zip Code

DELETE

CURRENT CLOSURE COST ESTIMATE OF FACILITY $6,900.00

*FORMERLY: GMC FISHER BODY DIVISION LORDSTOWN PLANT

IND006036099
Facility EPA I.D. Number

GMC CENTRAL FOUNDRY DIVISION BEDFORD PLANT
Name of Facility

PO BOX 271
Facility Mailing Address (Street or P.O. Box)

BEDFORD	IN	47421
City or Town	State	Zip Code

NORTH JACKSON ST
Facility Location (Street, Route No. or other specific identifier)

BEDFORD	LAWRENCE	IN	47421
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 17,200.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

ILD005141551
Facility EPA I.D. Number

GMC CENTRAL FOUNDRY DIVISION DANVILLE PLANT
Name of Facility

PO BOX 592
Facility Mailing Address (Street or P.O. Box)

DANVILLE	IL	61832
City or Town	State	Zip Code

NORTH H ST
Facility Location (Street, Route No. or other specific identifier)

TILTON	VERMILION	IL	61832
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $871,400.00

Ohio EPA 03-20-0221

OHD005050273
Facility EPA I.D. Number

GMC CENTRAL FOUNDRY DIVISION DEFINANCE PLANT
Name of Facility

PO BOX 70
Facility Mailing Address (Street or P.O. Box)

DEFIANCE	OH	43512
City or Town	State	Zip Code

STATE ROUTE 281 EAST
Facility Location (Street, Route No. or other specific identifier)

DEFIANCE	DEFIANCE	OH	43512
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 428,500.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

IND000715086
Facility EPA I.D. Number

GMC CPC GROUP MARION PLANT*
Name of Facility

2400 W SECOND ST
Facility Mailing Address (Street or P.O. Box)

MARION — City or Town
IN — State
46952 — Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

City or Town — MARION County — State — Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 13,700.00

*FORMERLY: GMC FISHER BODY DIVISION MARION PLANT

Ohio EPA 05-31-0441

OHD004260089
Facility EPA I.D. Number

GMC CPC GROUP NORWOOD PLANT*
Name of Facility

4726 SMITH RD
Facility Mailing Address (Street or P.O. Box)

NORWOOD — City or Town
OH — State
45212 — Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

City or Town — HAMILTON County — State — Zip Code

DELETE

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 224,900.00

*FORMERLY: GMC GM ASSEMBLY DIVISION NORWOOD PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

Ohio EPA 02-18-0114

OHD086631 01
Facility EPA I.D. Number

GMC CPC GROUP PARMA PLANT*
Name of Facility

PO BOX 6436
Facility Mailing Address (Street or P.O. Box)

CLEVELAND | OH | 44101
City or Town | State | Zip Code

5400 CHEVROLET BOULEVARD
Facility Location (Street, Route No. or other specific identifier)

PARMA | CUYAHOGA | OH | 44130
City or Town | County | State | Zip Code

DELETE

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 3,200.00

*FORMERLY: GMC CHEVROLET MOTOR DIVISION PARMA PLANT

IND006068050
Facility EPA I.D. Number

GMC DELCO ELECTRONICS DIVISION KOKOMO BYPASS PLANT
Name of Facility

700 E FIRMIN ST MS 9152
Facility Mailing Address (Street or P.O. Box)

KOKOMO | IN | 46902
City or Town | State | Zip Code

1800 E LINCOLN RD
Facility Location (Street, Route No. or other specific identifier)

KOKOMO | HOWARD | IN | 46902
City or Town | County | State | Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 132,300.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

IND000806844
Facility EPA I.D. Number

GMC DELCO ELECTRONICS DIVISION KOKOMO PLANT 1
Name of Facility

700 E FIRMIN ST MS 9152
Facility Mailing Address (Street or P.O. Box)

KOKOMO	IN	46902
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	HOWARD		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 4,100.00

IND000806869
Facility EPA I.D. Number

GMC DELCO ELECTRONICS DIVISION KOKOMO PLANT 5
Name of Facility

700 E FIRMIN ST MS 9152
Facility Mailing Address (Street or P.O. Box)

KOKOMO	IN	46902
City or Town	State	Zip Code

1723 N WASHINGTON ST
Facility Location (Street, Route No. or other specific identifier)

KOKOMO	HOWARD	IN	46902
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 1,700.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

WID006427215
Facility EPA I.D. Number

GMC DELCO ELECTRONICS DIVISION MILWAUKEE PLANT
Name of Facility

700 E FIRMIN STREET MS 9152
Facility Mailing Address (Street or P.O. Box)

KOKOMO	IN	46902
City or Town	State	Zip Code

7929 SOUTH HOWELL AVE
Facility Location (Street, Route No. or other specific identifier)

MILWAUKEE	OAK CREEK	WI	53154
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 23,400.00

Ohio EPA 05-57-0274

OHD060928561
Facility EPA I.D. Number

GMC DELCO MORAINE DIVISION DAYTON SOUTH PLANT
Name of Facility

1420 WISCONSIN PLANT
Facility Mailing Address (Street or P.O. Box)

DAYTON	OH	45401
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	MONTGOMERY		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 72,500.00

DELETE

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

Ohio EPA 05-57-0273

OHD045557766

Facility EPA I.D. Number

GMC DELCO MORAINE DIVISION DAYTON NORTH PLANT

Name of Facility

1420 WISCONSIN BLVD

Facility Mailing Address (Street or P.O. Box)

DAYTON | OH | 45401

City or Town | State | Zip Code

3100 NEEDMORE RD

Facility Location (Street, Route No. or other specific identifier)

DAYTON | MONTGOMERY | OH | 45414

City or Town | County | State | Zip Code

DELETE

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 71,100.00

IND000806836

Facility EPA I.D. Number

GMC DEFENSE OPS & PWR PROD GROUP MAYWOOD PLANT 5*

Name of Facility

PO BOX 894 P-12

Facility Mailing Address (Street or P.O. Box)

INDIANAPOLIS | IN | 46206

City or Town | State | Zip Code

2355 S TIBBS AVE

Facility Location (Street, Route No. or other specific identifier)

INDIANAPOLIS | MARION | IN | 46206

City or Town | County | State | Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 124,500.00

*FORMERLY: GMC DETROIT DIESEL ALLISON DIVISION PLANT 5

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

IND094469913
Facility EPA I.D. Number

GMC DEFENSE OPS & PWR GROUP MAYWOOD PLANT 8*
Name of Facility

PO BOX 894 P-12
Facility Mailing Address (Street or P.O. Box)

INDIANAPOLIS	IN	46206
City or Town	State	Zip Code

2001 S TIBBS AVE
Facility Location (Street, Route No. or other specific identifier)

INDIANAPOLIS	MARION	IN	46206
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 2,000.00

*FORMERLY: GMC DETROIT DIESEL ALLISON DIVISION PLANT 8
Ohio EPA 05-57-0407

OHD000817585
Facility EPA I.D. Number

GMC DELCO PRODUCTS DIVISION DAYTON PLANT XX
Name of Facility

PO BOX 1042
Facility Mailing Address (Street or P.O. Box)

DAYTON	OH	45401
City or Town	State	Zip Code

1619 KUNTZ RD
Facility Location (Street, Route No. or other specific identifier)

DAYTON	MONTGOMERY	OH	45404
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 4,400.00

DELETE

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

Ohio EPA 05-57-0405

OHD004255410
Facility EPA I.D. Number

GMC DELCO PRODUCTS DIVISION KETTERING PLANTS
Name of Facility

PO BOX 1042
Facility Mailing Address (Street or P.O. Box)

DAYTON | OH | 45401
City or Town | State | Zip Code

DELETE

2000 FORRER BLVD
Facility Location (Street, Route No. or other specific identifier)

DAYTON | MONTGOMERY | OH | 45420
City or Town | County | State | Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 77,300.00

IND98053825
Facility EPA I.D. Number

GMC DELCO-REMY DIVISION ANDERSON ACRE PLANT
Name of Facility

2401 COLUMBUS AVE
Facility Mailing Address (Street or P.O. Box)

ANDERSON | IN | 46018
City or Town | State | Zip Code

ACRE AREA
Facility Location (Street, Route No. or other specific identifier)

ANDERSON | MADISON | IN | 46018
City or Town | County | State | Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 90,000.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

IND980503840
Facility EPA I.D. Number

GMC DELCO-REMY DIVISION COLUMBUS AVE PLANTS
Name of Facility

2401 COLUMBUS AVE
Facility Mailing Address (Street or P.O. Box)

ANDERSON	IN	46018
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	MADISON		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 3,700.00

IND000806877
Facility EPA I.D. Number

GMC DELCO-REMY DIVISION MUNCIE PLANT
Name of Facility

4500 SOUTH DELAWARE DR
Facility Mailing Address (Street or P.O. Box)

MUNCIE	IN	47302
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	DELAWARE		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 107,000.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

Ohio EPA 05-57-0115

OHD980569388
Facility EPA I.D. Number

GMC DETROIT DIESEL ALLISION DIVISION MORAINE ENGINE PLANT*
Name of Facility

PO BOX 1291
Facility Mailing Address (Street or P.O. Box)

DAYTON | OH | 45401
City or Town | State | Zip Code

DELETE

4100 SPRINGBORO PIKE
Facility Location (Street, Route No. or other specific identifier)

MORAINE | MONTGOMERY | OH | 45439
City or Town | County | State | Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 81,700.00

*FORMERLY: GMC CHEVROLET MOTOR DIVISION MORAINE ENGINE PLANT

IND006066286
Facility EPA I.D. Number

GMC DETROIT DIESEL ALLISON DIVISION MUNCIE PLANT*
Name of Facility

PO BOX 2527
Facility Mailing Address (Street or P.O. Box)

MUNCIE | IN | 47302
City or Town | State | Zip Code

1200 W EIGHT ST
Facility Location (Street, Route No. or other specific identifier)

MUNCIE | DELAWARE | IN | 47302
City or Town | County | State | Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 31,400.00

*FORMERLY: GMC CHEVROLET MOTOR DIVISION MUNCIE PLATN

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

IND006413348
Facility EPA I.D. Number

GMC DETROIT DIESEL ALLISON DIVISION PLANT 3
Name of Facility

PO BOX 894 P-12
Facility Mailing Address (Street or P.O. Box)

INDIANAPOLIS	IN	46206
City or Town	State	Zip Code

4700 W TENTH ST
Facility Location (Street, Route No. or other specific identifier)

INDIANAPOLIS	MARION	IN	46206
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 46,600.00

IND000806802
Facility EPA I.D. Number

GMC DETROIT DIESEL ALLISON DIVISION PLANT 12 & 14
Name of Facility

PO BOX 894 P-12
Facility Mailing Address (Street or P.O. Box)

INDIANAPOLIS	IN	46206
City or Town	State	Zip Code

901 GRANDE AVE
Facility Location (Street, Route No. or other specific identifier)

INDIANAPOLIS	MARION	IN	46206
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 6,700.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

ILD006009690
Facility EPA I.D. Number

GMC ELECTRO-MOTIVE DIVISION LA GRANGE PLANT
Name of Facility

9301 W 55TH ST DEPT 1400
Facility Mailing Address (Street or P.O. Box)

LA GRANGE — IL — 60525
City or Town — State — Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

COOK
City or Town — County — State — Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 1,803,800.00

Ohio EPA 01-25-0440

OHD004294419
Facility EPA I.D. Number

GMC FISHER GUIDE DIVISION COLUMBUS PLANT*
Name of Facility

2000 GEORGESVILLE RD
Facility Mailing Address (Street or P.O. Box)

COLUMBUS — OH — 43228
City or Town — State — Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

FRANKLIN
City or Town — County — State — Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 9,400.00

FORMERLY: GMC FISHER BODY DIVISION COLUMBUS PLANT

DELETE

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

Ohio EPA 02-47=0192

OHD004201091
Facility EPA I.D. Number

GMC FISHER GUIDE DIVISION ELYRIA PLANT*
Name of Facility

PO BOX 4025
Facility Mailing Address (Street or P.O. Box)

ELYRIA | OH | 44036
City or Town | State | Zip Code

DELETE

1400 LOWELL ST
Facility Location (Street, Route No. or other specific identifier)

ELYRIA	LORAIN	OH	44036
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $2,589,200.00

IND000803734
Facility EPA I.D. Number

GMC FISHER GUIDE DIVISION WEST PLANT
Name of Facility

2915 PENDELTON AVE
Facility Mailing Address (Street or P.O. Box)

ANDERSON | IN | 46011
City or Town | State | Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	MADISON		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 288,000.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

ILD068603604
Facility EPA I.D. Number

GMC GM WAREHOUSING & DIST DIVISION CHICAGO FACILITY
Name of Facility

6060 W BRISTOL RD
Facility Mailing Address (Street or P.O. Box)

FLINT	MI	48554
City or Town	State	Zip Code

2600 S 25TH AVE
Facility Location (Street, Route No. or other specific identifier)

BROADVIEW	COOK	IL	60153
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 3,700.00

OHD045719895
Facility EPA I.D. Number

GMC GM WAREHOUSING & DIST DIVISION CLEVELAND PLANT
Name of Facility

6060 W BRISTOL RD
Facility Mailing Address (Street or P.O. Box)

FLINT	MI	48554
City or Town	State	Zip Code

12990 SNOW RD
Facility Location (Street, Route No. or other specific identifier)

PARMA	CUYAHOGA	OH	44130
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 3,700.00

DELETE

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

Ohio EPA 05-57-0256

OHD017958604
Facility EPA I.D. Number

GMC HARRISON RADIATOR DIVISION DAYTON PLANT
Name of Facility

PO BOX 824
Facility Mailing Address (Street or P.O. Box)

DAYTON | OH | 45401
City or Town | State | Zip Code

DELETE

300 TAYLOR ST
Facility Location (Street, Route No. or other specific identifier)

DAYTON	MONTGOMERY	OH	45401
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 32,500.00

Ohio EPA 05-57-0272

OHD000817577
Facility EPA I.D. Number

GMC HARRISON RADIATOR DIVISION MORAINE PLANT
Name of Facility

PO BOX 824
Facility Mailing Address (Street or P.O. Box)

DAYTON | 45401
City or Town | Zip Code

DELETE

3600 DRYDEN RD
Facility Location (Street, Route No. or other specific identifier)

MORAINE	MONTGOMERY	OH	44439
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 48,300.00

CURRENT POST-CLOSURE COST ESTIMATE OF FACILITY $ 147,300.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

Ohio EPA 05-57-0317

OHD000817023
Facility EPA I.D. Number

GMC INLAND DIVISION DAYTON PLANT
Name of Facility

PO BOX 1224
Facility Mailing Address (Street or P.O. Box)

DAYTON | OH | 45401
City or Town | State | Zip Code

2701 HOME AVE
Facility Location (Street, Route No. or other specific identifier)

DAYTON | MONTGOMERY | OH | 45417
City or Town | County | State | Zip Code

DELETE

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 40,800.00

Ohio EPA 02-18-0260

OHD097622336
Facility EPA I.D. Number

GMC INLAND DIVISION EUCLID PLANT*
Name of Facility

20001 EUCLID AVE
Facility Mailing Address (Street or P.O. Box)

CLEVELAND | OH | 44117
City or Town | State | Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

CUYAHOGA
City or Town | County | State | Zip Code

DELETE

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 31,800.00

*FORMERLY: GMC FISHER BODY DIVISION EUCLID PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

Ohio EPA 05-57-0316

OHD052151701
Facility EPA I.D. Number

GMC INLAND DIVISION VANDALIA PLANT
Name of Facility

PO BOX 1224
Facility Mailing Address (Street or P.O. Box)

DAYTON | OH | 45401
City or Town | **State** | **Zip Code**

480 N DIXIE DR
Facility Location (Street, Route No. or other specific identifier)

VANDALIA | MONTGOMERY | OH | 45337
City or Town | **County** | **State** | **Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 52,600.00

DELETE

Ohio EPA 03-22-0464

OHD001880442
Facility EPA I.D. Number

GMC NEW DEPARTURE-HYATT BEARINGS DIVISION SANDUSKY PLANT
Name of Facility

2509 HAYES AVE
Facility Mailing Address (Street or P.O. Box)

SANDUSKY | OH | 44870
City or Town | **State** | **Zip Code**

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

ERIE
City or Town | **County** | **State** | **Zip Code**

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 268,800.00

DELETE

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

Ohio EPA 02-78-0123

OHD018414292
Facility EPA I.D. Number

GMC PACKARD ELECTRIC DIVISION WARREN CITY PLANT
Name of Facility

PO BOX 431
Facility Mailing Address (Street or P.O. Box)

WARREN — OH — 44486
City or Town — State — Zip Code

DELETE

408 DANA ST
Facility Location (Street, Route No. or other specific identifier)

WARREN	TRUMBULL	OH	44482
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 11,700.00

Ohio EPA 02-78-0124

OHD000817346
Facility EPA I.D. Number

GMC PACKARD ELECTRIC DIVISION NORTH RIVER ROAD PLANTS
Name of Facility

PO BOX 431
Facility Mailing Address (Street or P.O. Box)

WARREN — OH — 44486
City or Town — State — Zip Code

DELETE

N RIVER RD AT LARCHMONT
Facility Location (Street, Route No. or other specific identifier)

WARREN	TRUMBULL	OH	44484
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 149,700.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION V

IND079583720
Facility EPA I.D. Number

GMC TRUCK & BUS MANUFACTURING GROUP INDIANAPOLIS PLANT *
Name of Facility

PO BOX 388
Facility Mailing Address (Street or P.O. Box)

INDIANAPOLIS	IN	46206
City or Town	State	Zip Code

340 WHITE RIVER PARKWAY
Facility Location (Street, Route No. or other specific identifier)

INDIANAPOLIS	MARION	IN	46222
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 3,200.00

*FORMERLY: GMC CHEVORLET MOTOR DIVISION INDIANAPOLIC PLANT

Ohio EPA 05-57-0116

OHD041063074
Facility EPA I.D. Number

GMC TRUCK & BUS MANUFACTURING GROUP MORAINE ASSEMBLY PLANT*
Name of Facility

PO BOX 1291
Facility Mailing Address (Street or P.O. Box)

DAYTON	OH	45401
City or Town	State	Zip Code

2601 W STROOP
Facility Location (Street, Route No. or other specific identifier)

DAYTON	MONTGOMERY	OH	45439
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 255,600.00

*FORMERLY: GMC CHEVROLET MOTOR DIVISION MORAINE ASSEMBLY PLANT

DELETE

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION VI

TXD095217204
Facility EPA I.D. Number

GMC AS SPARK PLUG DIVISION WICHITA FALLS PLANT
Name of Facility

PO BOX AC
Facility Mailing Address (Street or P.O. Box)

WICHITA FALLS — City or Town
TX — State
76307 — Zip Code

8600 CENTRAL FREEWAY NORTH
Facility Location (Street, Route No. or other specific identifier)

WICHITA FALLS — City or Town
WICHITA — County
TX — State
76306 — Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 6,700.00

TXD008018004
Facility EPA I.D. Number

GMC CPC GROUP ARLINGTON PLANT*
Name of Facility

2525 EAST ABRAHM
Facility Mailing Address (Street or P.O. Box)

ARLINGTON — City or Town
TX — State
76010 — Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

City or Town
TARRANT — County
State
Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 504,800.00

*FORMERLY: GMC GM ASSEMBLY DIVISION ARLINGTON PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION VI

OKD082565714
Facility EPA I.D. Number

GMC CPC GROUP OKLAHOMA CITY PLANT*
Name of Facility

PO BOX 26527
Facility Mailing Address (Street or P.O. Box)

OKLAHOMA CITY	OK	73126
City or Town	State	Zip Code

7446 SE 74TH ST
Facility Location (Street, Route No. or other specific identifier)

OKLAHOMA CITY	OKLAHOMA	OK	73134
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 504,800.00

*FORMERLY: GMC GM ASSEMBLY DIVISION OKLAHOMA CITY PLANT

TXD068994755
Facility EPA I.D. Number

GMC GM WAREHOUSING & DIST DIVISION DALLAS FACILITY
Name of Facility

6060 W BRISTOL RD
Facility Mailing Address (Street or P.O. Box)

FLINT	MI	48554
City or Town	State	Zip Code

8635 STEMMONS FREEWAY
Facility Location (Street, Route No. or other specific identifier)

DALLAS	DALLAS	TX	75247
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 3,700.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION VI

LAD067033944
Facility EPA I.D. Number

GMC GUIDE DIVISION MONROE PLANT
Name of Facility

PO BOX 4707
Facility Mailing Address (Street or P.O. Box)

MONROE	LA	71203
City or Town	State	Zip Code

INTERSTATE 120 & MILLHAVEN RD
Facility Location (Street, Route No. or other specific identifier)

MONROE	OUACHITA	LA	71203
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 25,100.00

LAD089317341
Facility EPA I.D. Number

GMC TRUCK & BUS GROUP SHREVEPORT PLANT*
Name of Facility

PO BOX 30011
Facility Mailing Address (Street or P.O. Box)

SHREVEPORT	LA	71129
City or Town	State	Zip Code

7600 GM BLVD
Facility Location (Street, Route No. or other specific identifier)

SHREVEPORT	CADDO	LA	71130
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 397,800.00

*FORMERLY: GMC GM ASSEMBLY DIVISION SHREVEPORT PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION VII

KSD007145899
Facility EPA I.D. Number

GMC BOC GROUP FAIRFAX PLANT *
Name of Facility

100 KINDELBERGER RD
Facility Mailing Address (Street or P.O. Box)

KANSAS CITY — City or Town
KS — State
66115 — Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

City or Town — County: WYANDOTTE — State — Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 501,400.00

*FORMERLY: GMC GM ASSEMBLY DIVISION FAIRFAX PLANT

MOD000822668
Facility EPA I.D. Number

GMC BOC GROUP LEEDS PLANT *
Name of Facility

6817 STADIUM DR
Facility Mailing Address (Street or P.O. Box)

KANSAS CITY — City or Town
MO — State
64129 — Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

City or Town — County: JACKSON — State — Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 36,000.00

*FORMERLY: GMC GM ASSEMBLY DIVISION LEEDS PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION VII

MOT300010261
Facility EPA I.D. Number

GMC BOC GROUP WENTZVILLE PLANT *
Name of Facility

PO BOX 444
Facility Mailing Address (Street or P.O. Box)

WENTZVILLE — City or Town
MO — State
63385 — Zip Code

MEXICO & EDINGER RD
Facility Location (Street, Route No. or other specific identifier)

WENTZVILLE — City or Town
ST CHARLES — County
MO — State
63385 — Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 109,500.00

*FORMERLY: GMC GM ASSEMBLY DIVISION WENTZVILLE PLANT

KSD007145907
Facility EPA I.D. Number

GMC DELCO-REMY DIVISION OLATHE PLANT
Name of Facility

400 W DENNIS AVE
Facility Mailing Address (Street or P.O. Box)

OLATHE — City or Town
KS — State
66061 — Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

City or Town
JOHNSON — County
State
Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 6,700.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION VII

MOD051728905
Facility EPA I.D. Number

GMC GM WAREHOUSING & DIST DIVISION ST LOUIS FACILITY
Name of Facility

6060 W BRISTOL RD
Facility Mailing Address (Street or P.O. Box)

FLINT	MI	48554
City or Town	State	Zip Code

5801 N. LINDBERGH RD
Facility Location (Street, Route No. or other specific identifier)

HAZELWOOD	ST LOUIS	MO	63042
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 3,700.00

MOD006290118
Facility EPA I.D. Number

GMC TRUCK & BUS MANUFACTURING GROUP ST. LOUIS PLANT *
Name of Facility

3809 UNION BLVD
Facility Mailing Address (Street or P.O. Box)

ST LOUIS	MO	63115
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	ST LOUIS		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 140,400.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION VII

IAD000686899
Facility EPA I.D. Number

GMC ROCHESTER PRODUCTS DIVISION SIOUX CITY PLANT
Name of Facility

1805 ZENITH DR
Facility Mailing Address (Street or P.O. Box)

SIOUX CITY — City or Town
IA — State
51103 — Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

City or Town
WOODBURY — County
State
Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 4,500.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION IX

CAD008295719
Facility EPA I.D. Number

GMC CPC GROUP SOUTHGATE PLANT*
Name of Facility

2700 TWEEDY BLVD
Facility Mailing Address (Street or P.O. Box)

SOUTH GATE	CA	90280
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	LOS ANGELES		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 114,300.00

*FORMERLY: GMC GM ASSEMBLY DIVISION SOUTH GATE PLANT

CAD000051458
Facility EPA I.D. Number

GMC CPC GROUP VAN NUYS PLANT*
Name of Facility

8000 VAN NUYS PLANT
Facility Mailing Address (Street or P.O. Box)

VAN NUYS	CA	91409
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	LOS ANGELES		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 137,100.00

*FORMERLY: GMC GM ASSEMBLY DIVISION VAN NUYS PLANT

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION IX

CAD009305848
Facility EPA I.D. Number

GMC DEFENSE OPS & PWR PROD GROUP SANTA BARBARA PLANT*
Name of Facility

700 E FIRMIN ST
Facility Mailing Address (Street or P.O. Box)

KOKOMO — IN — 46902
City or Town — State — Zip Code

6767 HOLLISTER AVE
Facility Location (Street, Route No. or other specific identifier)

GOLETA — SANTA BARBARA — CA — 93017
City or Town — County — State — Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 14,500.00

*FORMERLY: GMC DELCO ELECTRONICS DIVISION SANTA BARBARA PLANT

CAD008323396
Facility EPA I.D. Number

GMC DELCO-REMY DIVISION ANAHEIM PLANT
Name of Facility

PO BOX 3190
Facility Mailing Address (Street or P.O. Box)

ANAHEIM — CA — 92803
City or Town — State — Zip Code

1201 MAGNOLIA AVE
Facility Location (Street, Route No. or other specific identifier)

ANAHEIM — ORANGE — CA — 92801
City or Town — County — State — Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 13,400.00

GENERAL MOTORS CORPORATION FACILITIES - U.S. EPA REGION IX

AZD020122479
Facility EPA I.D. Number

GMC DESERT PROVING GROUND MESA
Name of Facility

PO BOX 1506
Facility Mailing Address (Street or P.O. Box)

MESA	AZ	85201
City or Town	State	Zip Code

13303 S ELLSWORTH RD
Facility Location (Street, Route No. or other specific identifier)

MESA	MARICOPA	AZ	85208
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 8,600.00